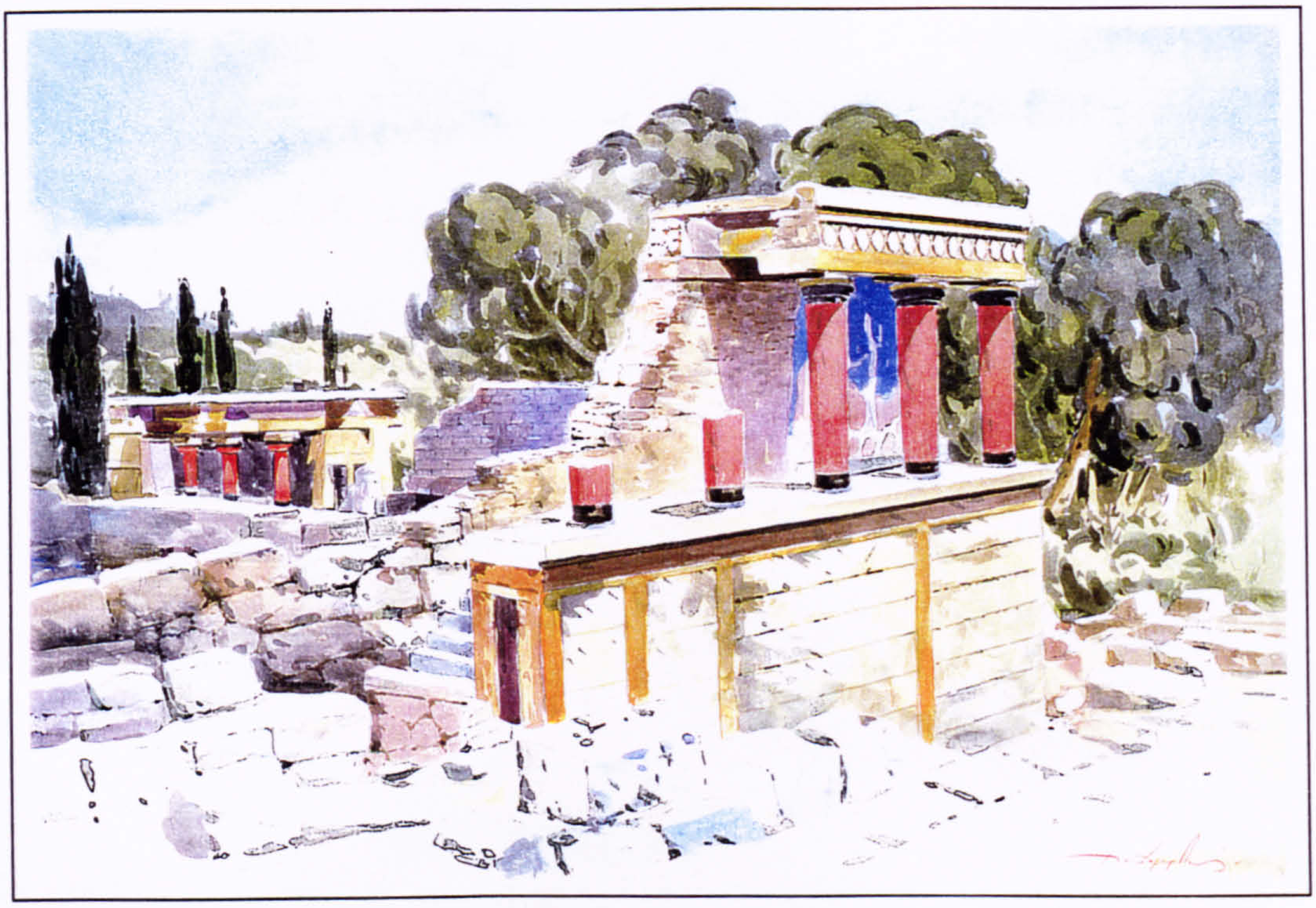
Peter Kienzle
Conservation and Reconstruction at the Palace of Minos at Knossos



The North Entrance Passage - Watercolour by D. Zaverdinos

Conservation and Reconstruction at the Palace of Minos at Knossos

Volume 1

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Dedicated to my parents.
Without their support and encouragement
this work would have been impossible.

Abstract

Conservation and Reconstruction at the Palace of Minos at Knossos

The aim of this thesis is to evaluate the conservation and reconstruction work executed at the Palace of Minos at Knossos between 1900 and 1930. In this period the owner and excavator, Arthur Evans successively employed three architects, Theodore Fyfe, Christian Doll and Piet de Jong respectively, to conserve and reconstruct parts of the excavated Bronze Age palace at Knossos, Crete. The study aims to understand the executed work as an outcome of both building techniques and materials, and the ethical and aesthetic values of its time. Thus, the research question was set:

> *How can the reconstructions at the Palace of Minos at Knossos be evaluated in both their functional and their aesthetic aspects as an appropriate response to the demands of the original design brief?*

This research has been based on both literature study and fieldwork. Both current literature and material contemporary to the reconstruction work such as diaries, photographs and letters originating from Arthur Evans and his team have been studied.

Theory and practice of archaeology and conservation at the early twentieth century will be explored to highlight the background against which the work at Knossos must be set. Furthermore, it examines the life of Arthur Evans and his links to these disciplines. The original building materials and techniques, the destruction of the palace and finally its excavation process are discussed to explore the technical problems which the architects were facing on site. The study examines the building work executed by the three architects which shows how they responded to these problems and how their conservation attitude affected their work. It explores how failures of earlier reconstructions were examined by later architects in order to improve the quality of the work.

The study aims to present a clear understanding 'why' and 'how' the conservation and reconstruction work at Knossos was executed in this particular way. It shows that the reconstructions were the result of a long process with various influencing factors and, finally, analyses the problems the physical reconstructions will face in the future.

The study offers information about the site of Knossos and its particular problems in order to reach a qualified judgement of the reconstruction work. However, it also offers a clearer understanding of the complex relations between building materials and techniques, decay processes, excavation procedures, repair materials and techniques and conservation attitudes on site. The thesis argues to understand the physical reconstructions on site as a result of a process which was influenced by the above named factors.

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Abbreviations

DM	Duncan Mackenzie Diary (followed by date of entry)
EM I	Early Minoan I (early Early Minoan period)
EM II	Early Minoan II (middle Early Minoan period)
EM III	Early Minoan III (late Early Minoan period)
ENB	Evans Notebook (followed by page)
LM I	Late Minoan I (early Late Minoan period)
LM II	Late Minoan II (middle Late Minoan period)
LM III	Late Minoan III (late Late Minoan period)
MM I	Middle Minoan I (early Middle Minoan period)
MM II	Middle Minoan II (middle Middle Minoan period)
MM III	Middle Minoan III (late Middle Minoan period)
PM I	EVANS, Arthur (1921). **"The Palace of Minos. Volume 1"**. MacMillan & Co., London, United Kingdom.
PM II	EVANS, Arthur (1928). **"The Palace of Minos. Volume 2"**. (Two volumes). MacMillan & Co., London, United Kingdom.
PM III	EVANS, Arthur (1930). **"The Palace of Minos. Volume 3"**. MacMillan & Co., London, United Kingdom.
PM IV	EVANS, Arthur (1935). **"The Palace of Minos. Volume 4"**. MacMillan & Co., London, United Kingdom.

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Eric Johnson, Leigh Symmonds and Ratish Nanda corrected my English and all mistakes which are still in this thesis are only my own fault. I am grateful to Stefie Chlouveraki and Vassilis Zervos for translating Greek texts for me and I apologise for not having learned more Greek in the three years of my study. Furthermore, I am grateful to Reni and Keith Parker for translating Pernier's paper from French to English.

Preface

It will be important for the reader to make himself familiar with the history of the site in order to understand the terms and the references in the text. The thesis is not aimed to enter the ongoing and sometimes controversial discussion on the correct way of interpreting the palace. The remains are too few to allow an undisputed interpretation and many scholars researching Minoan history and archaeology are much more qualified to discuss this problem than I will ever be. However, the reconstructions cannot be discussed without any reference to the original Minoan palace. Therefore, I printed Gerald Cadogan's discussion of Knossian history in Appendix 3.[1] Familiarity with the Minoan past would be of help in better understanding this thesis. I chose Cadogan's writing because it is short but nonetheless detailed. It is a rather conservative interpretation of Knossian history which, however, does not imply that other interpretations are automatically wrong.

In 1905 Arthur Evans presented at the Archaeological congress in Athens his system for dating the Minoan past.[2] He suggested dividing the Minoan period in three sections: Early Minoan (EM), Middle Minoan (MM) and Late Minoan (LM). Each of these sections was subdivided into three phases labelled with Roman numbers so that, for example, LM I was the early part of Late Minoan while LM III was the last phase of Late Minoan. Through comparative study with Minoan artefacts in Egypt and Egyptian

[1]Myers, Myers and Cadogan, 1992, p. 124 ff.

[2]Congrès International d'Archéologie, Athens, 1905. (See *The Times,* 12 April 1905, p. 4). Evans's paper, explaining the classification system for the Minoan periods was printed in truncated way in the proceedings of the conference. Subsequently, in 1906 Evans had his paper printed again on his own expenses wit the title: "Essai de Classification des Époques de la Civilisation Minoenne".

artefacts in Knossos, he was able to suggest absolute dates for each of these phases. Modern research has improved and adjusted these dates, and some more sub-groups, labelled with letters, were introduced. However, the general dating principles remain unchanged. The table printed on page thirty-five is based on Cadogan's article in the *Aerial Atlas of Ancient Crete* which gives recent and widely accepted dates.[3] Like the interpretation of the function of the palace these dates are not undisputed and they are not on my part an archaeological statement.[4]

Arthur Evans used to label rooms in the palace with names rather than employing a numerical system. Some of the names have changed and some of them were used twice at different parts of the Palace. Hood and Taylor tried to establish a numbering system for the rooms in 1978 but failed to gain acceptance in the scholarly world. Thus, I used the conventional terminology even if this was sometimes complicated and cumbersome. The names of rooms are indicated by capital letters for example the Room with the Stone Bench or the Hall of the Double Axes. It will be necessary for the reader to make oneself familiar with the names of the rooms. A sketch plan with the names is reproduced at the end of volume two to allow readers to identify the rooms in the palace.

All measurements in this thesis are given in the metric system. Arthur Evans employed the metric system to record archaeological and architectural remains in his notebooks and diaries even before he began work at Knossos.[5] At Knossos, the site was recorded by Theodore Fyfe who also used the metric system. Only later, an imperial scale was added to the metric one on drawings intended for publication. In the text of his publications Evans also used the metric system do give distances or dimensions. I executed my own records in the metric system and also used it in the text.

[3]Myers, Myers and Cadogan, 1992, p. 33.

[4]The dates given in the table and in the thesis use the conventional system of BC and AD. which shall not be understood as an attempt influence anyone's historic perception or religious feelings.

[5]See for example Brown, 1993, p. 68.

3000 BC	Early Minoan I (EMI)	
2900 BC		
2800 BC		
2700 BC		
2600 BC		
2500 BC	Early Minoan II (EMII)	
2400 BC		Prepalatial
2300 BC		
2200 BC		
2100 BC	Early Minoan III (EMIII)	
2000 BC	Middle Minoan IA (MMIA)	
1900 BC	Middle Minoan IB (MMIB)	
1800 BC		Protopalatial (Old Palace)
1700 BC	Middle Minoan II (MMII)	
1600 BC	Middle Minoan III (MMIII)	
1500 BC	Late Minoan IA (LMIA) Late Minoan IB (LMIB)	Neopalatial (New Palace)
1400 BC	Late Minoan II (LMII) Late Minoan IIIA (LMIIIA)	
1300 BC	Late Minoan IIIB (LMIIIB)	
1200 BC		Postpalatial
1100 BC	Late Minoan IIIC (LMIIIC)	
1000 BC	Sub-Minoan (SM)	

Table 1 Chronological chart of Minoan periods. Based on Cadogan.

The thesis is presented in three volumes, the first of which contains the main text with line drawings, the bibliography and the appendices. The second volume contains the plates and the third volume contains the drawings. In the text, I regularly refer to various plates. Frequently it will be necessary to compare two plates in order to recognise the amount of work executed and it is helpful to have the two plates printed next to each other. Within a group of plates of one area it was attempted to print them in chronological order. However, only few of the original photographs were dated and thus their order is sometimes arbitrary.

Introduction

Figure 1 Map of the eastern Mediterranean showing locations mentioned in the thesis.

Introduction

On 23 March 1900 Arthur Evans and his assistant Duncan Mackenzie with thirty-two men began the excavations at Knossos, Crete. By 1 April a hundred men were employed and by the end of the season two acres of the palace site were exposed.[1] Initially Evans was looking for evidence of what was later to be known as Linear A and Linear B script. He believed the site at Kephala Hill could be excavated within a few years[2] but ultimately he was involved at Knossos until his death in 1941. The undertaking he started in 1900 proved to be much larger than he had originally expected.

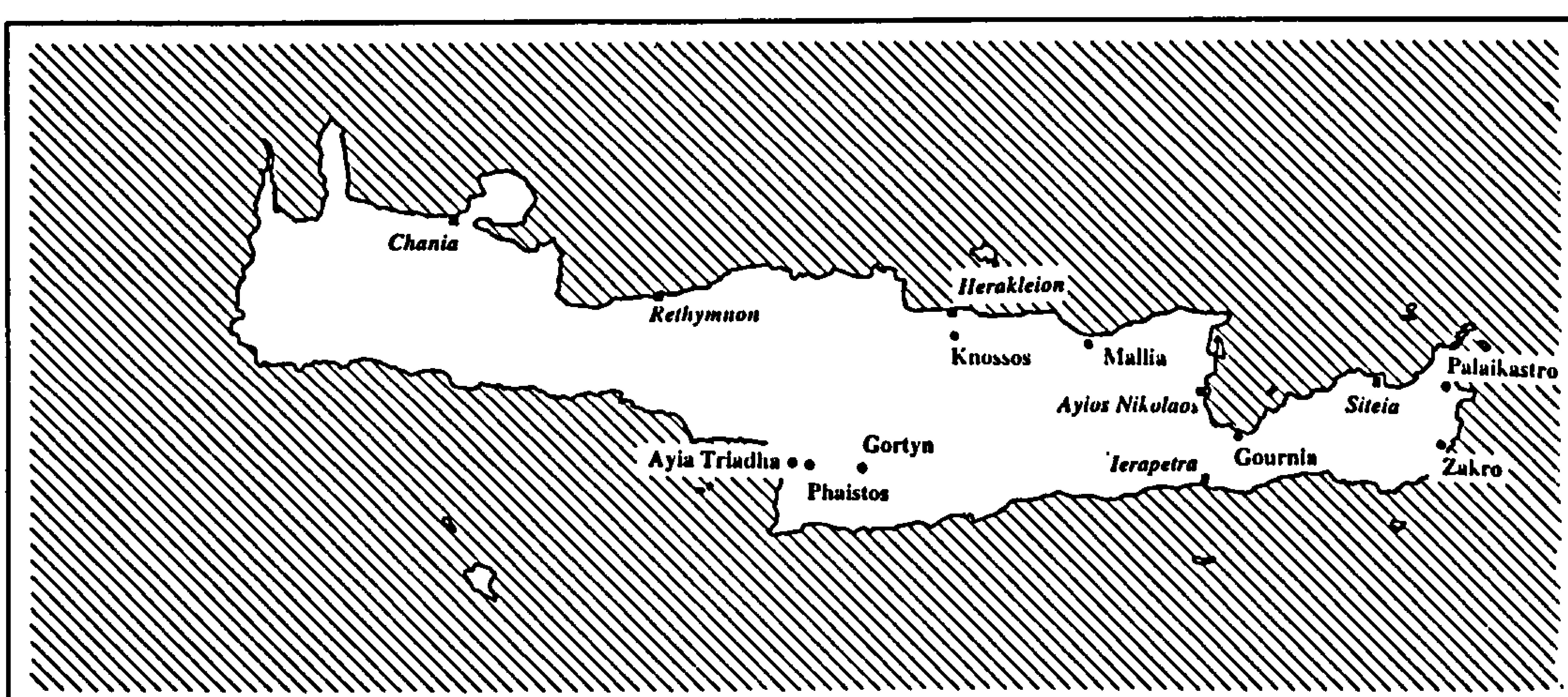

Figure 2 Map of Crete showing Minoan archaeological sites and important modern cities (in italics).

The Palace of Knossos was excavated from 1900 to 1930 and was reconstructed at the same time. Thus, thirty years of excavation history are synonymous with thirty years of reconstitution work. In many areas the remains of upper storeys were found in their original position and frescoes and gypsum paving proved to be too valuable to be left exposed. The result of this, as it presents itself today, is an inextricably interwoven fabric

[1]Brown, 1994, 37.

[2]See for example: Evans, 1943, p. 344.

of old and new, of Minoan walls, original stones reset in a new context and completely new constructions.

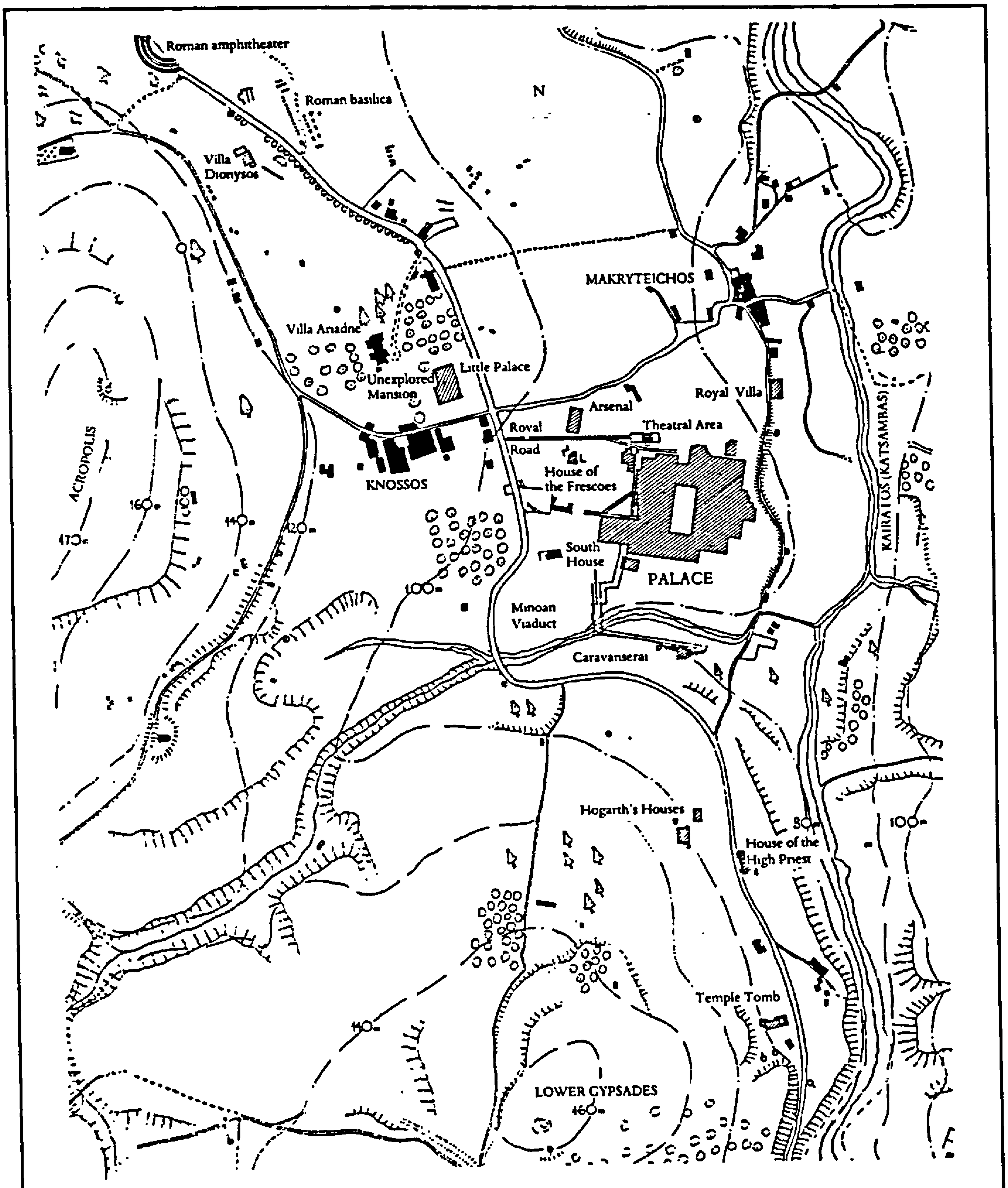

Figure 3 The greater area of Knossos showing important remains outside the palace.

Today, the Palace of Minos at Knossos is one of the most important archaeological sites in Greece, and, indeed, in the entire world. More than one million visitors see the ruins of the palace every year. Due to their preconception - their knowledge of the site and the site's history when they arrive - they will discover various things or gain impressions of architecture and decoration in Bronze Age Knossos. Despite individual preconceptions each tourist's experience will be dominated by the reconstructions which command the site.

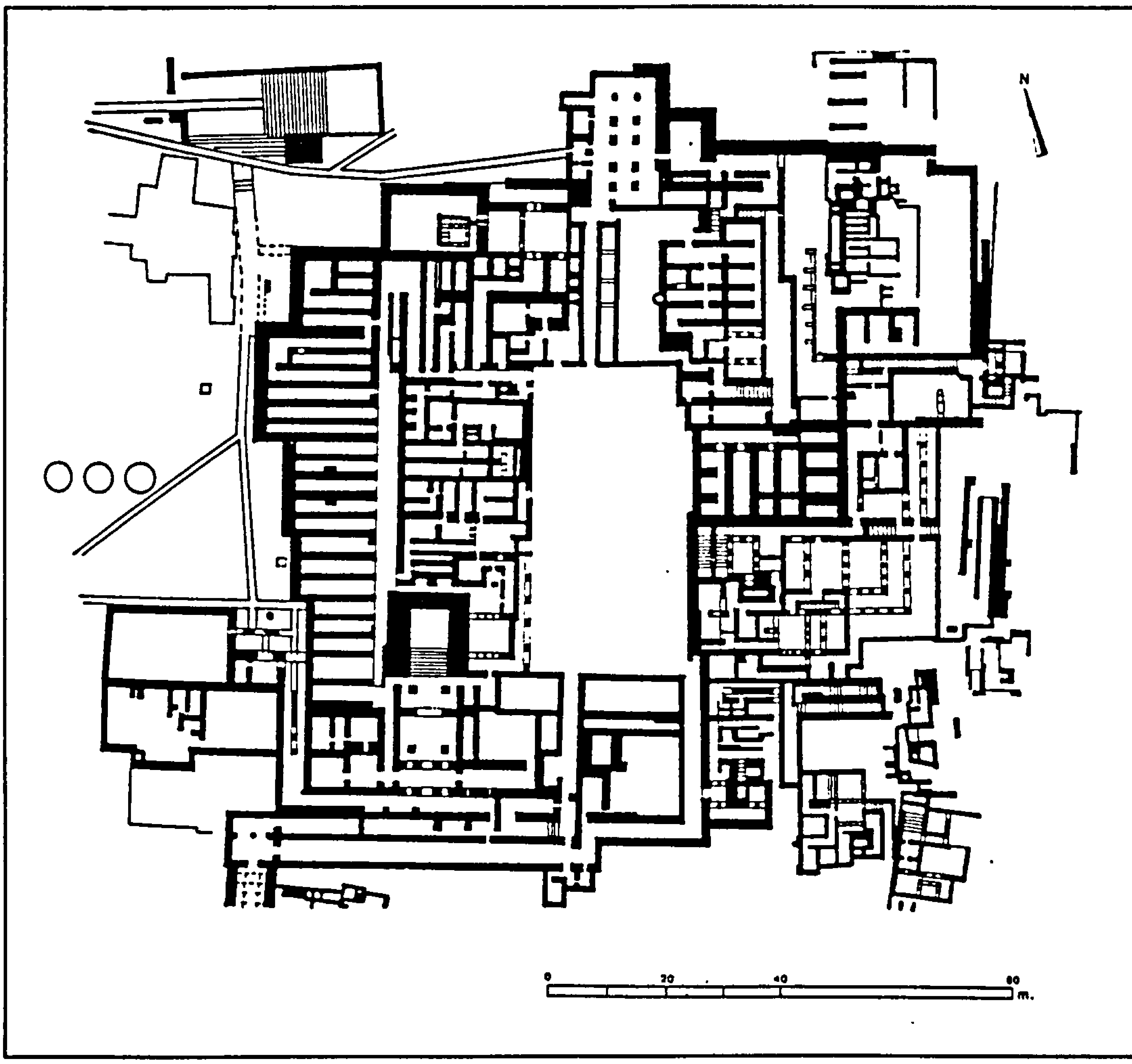

Figure 4 Sketch plan of the Palace of Minos at Knossos.

The image of the Minoan architecture in general and explicitly of the Palace of Minos at Knossos is determined by the reconstructions or, as Evans liked to call them, reconstitutions. Virtually all holiday catalogues of Crete feature at least one image of Knossos but they feature reconstructed parts rather than Minoan material. In a similar way nearly every postcard sold in the stalls at the palace entrance features concrete reconstructions or restored frescoes as the main motif while the excavated Minoan structures are marginalised. The fresco of the lily prince, reconstructed by Gilliéron in

1925 for Arthur Evans became the symbol for Herakleion's shipping company Minoan Lines. The architectural style of the reconstructions and the recreated interior design became the common way of representing 'lost cultures' in popular medias, as for example in the film *Erik the Viking* or the comic book *Asterix and Obelix all at sea.* Today the reconstructions of the Palace are better known than the actual palace remains themselves.

Today, almost a century later, the reconstructions have aged and acquired a patina. The original excavated structures and modern reconstructions have become indistinguishable and difficult to understand. Even architects or archaeologists who are familiar with excavation sites and ancient building methods are confused whether certain parts of the palace are original or reconstructed. How much more puzzled by this site must an untrained visitor be?

Criticism of the Reconstructions

Much has been written about the palace and almost all of this writing includes short paragraphs on the reconstruction work on site.[3] Archaeologists, conservationists, architects, and even travel guides label the reconstructions 'controversial', 'much debated', or 'questionable'. However, none of them ever enters into an extensive discussion of the reconstructions beyond these endlessly repeated basic statements. Many of these assessments of the reconstructions are rooted in personal feelings or in an condemnation of reconstruction work *per se* based on the imperative demand of the Charter of Venice. A detailed investigation is needed on which a sound criticism could be based.

In 1930 the Austrian archaeologist Camillo Praschniker dubbed Knossos "a movie city" which brings the main argument to a point.[4] The reconstructions were seen as a stage set prepared by Evans to convince archaeologists and visitors of his interpretation of the

[3]See Literature review later in this chapter.

[4]As quoted in Horwitz, 1981, p. 201.

Minoan past.[5] The reconstructions, so the argument goes, obstruct the real value of the site, and are - at least to a certain and not yet determined extent - hypothetical. Consequently, they are potentially misleading to the inexperienced visitor.

The reconstructions at the palace literally form a concrete statement of the interpretation of the site. When, in his publications, Arthur Evans describes his findings in his own colourful and enthusiastic way, past periods seem to come alive:

> "If he [the lord of the house] wished to speak, let us say, to Ariadne he hardly had to raise his voice to call her to the balcony opposite . Conversation could be held on both sides, and, if there were music or song in the ladies' chamber their lord, and whoever may have stood on the narrow platform beside the niche, might have the full enjoyment of it. The life of a household rises before us, as it was carried on some sixteen centuries before our era."[6]

The vivid imagination Arthur Evans employed to describe this scene, appears strange in the scholarly world of today where objectivity and accuracy are considered the most important characteristics of research. It is probably this flamboyant style of writing that places Arthur Evans under the suspicion by the scholarly establishment. Can a man who is using such vivid imagination in describing excavated ruins be trusted to be accurate in his reconstitutions? Or, rather, do we have to believe that it was the same fantasy which was not only employed in writing but also in recreating Knossos? It is of interest to learn what was known and what could be known about the Minoan past at the time of the reconstruction. To what extent are these reconstructions based on Evans's imagination, and to what extent are they based on research? If they are based on research, is the result of these investigations reliable?

It has often been questioned whether the amount of reconstitution work at Knossos was needed, or whether it was necessary to execute it at all. This criticism is based on the imperative demand of the Charter of Athens and, much more, the Charter of Venice

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[5]For the discussion of this see: Castleden, 1990a, p. 32
[6]PM II, p 410.

which *a priori* rules out reconstruction work at archaeological sites.[7] The Charter of Athens was agreed upon in 1931, one year after the reconstruction work was completed at the Palace and the Charter of Venice dates from 1964. Clearly, then, they could not have been guiding principles for the work. However, the meetings of architects and archaeologists in both Athens and Venice which have resulted in these charters did not happen without a prehistory. They are landmarks in a long history of ongoing discussions on conservation philosophy. Thus, it will be necessary to set the reconstructions at Knossos against the conservation thoughts of their time but not against the demands of the charters. In fact, the Charter of Athens was influenced by the work at Knossos rather than *vice versa*.[8] Another main area of criticism focuses on the use of reinforced concrete which is commonly seen as inappropriate and harmful; yet there is, to date, no detailed study of the aesthetic and structural performance of the material at Knossos. Also, it has been decried that the reconstructions used, and were directly placed on, historic fabric. Again, an assessment is wanting which analyses the damage caused by these actions.

Besides the negative criticism, the reconstructions were also positively assessed. They help the tourists to understand Minoan architecture and the palaces of Mallia and Phaestos, which have not been reconstructed are understood much better after Knossos has been visited.[9] Furthermore, it is frequently pointed out that the reconstructions were necessary to keep the excavated elements in position and to protect the historic fabric from the weather. Evans frequently argued that the necessity of the reconstruction work was imposed on him because of the very specific circumstances at Knossos. At various places the remains of the second storey survived remarkably well and in certain places even the remains of the third storey were traceable. Another problem particular to Minoan sites, but especially particular to the excavation site of Knossos, is the frequent use of the material 'gypsum'. Gypsum is a fine, but very soft stone which is easily soluble in water. If this material is not protected from weather it will dissolve within a short time. Both the unusually good preservation of parts of the upper storey and the particularities

[7]Venice Charter, Article 15.

[8]See Chapter 7

[9]O'Conell, 1990, p 82. See also Karetsou, 1997, p. 18.

of gypsum required conservation actions not common at other sites. Thus, Arthur Evans claims that he was forced to undertake efforts to preserve the site and his reconstructions respond to this need. In fact, J.D.S. Pendlebury, the noted Mediterranean archaeologist offered support: "without the restorations the palace would be a meaningless heap of ruins".[10] This statement has been widely quoted in the relevant literature.[11] The need for conservation and protection is generally accepted and the reconstructions valued by many scholars for this reason.

The Dilemma

It has been shown above that the negative criticism of the ruins was based on the general philosophical and theoretical aspects of conservation and presentation.[12] In contrast, the positive support of the work was rooted in its practical value for preservation and in its educational value for visitors.[13] Thus, two different systems of evaluation reached a different verdict on the quality of the reconstitutions.

The general dilemma of theory and criticism of architecture has been outlined by Banham.[14] In order to create a general theory the particulars of a specific problem must be left out. But no individual building can be criticised without understanding its brief, the reasons why the building was created in the first place. Unlike fine art, or "portable art" as Banham likes to call it, but like industrial design, criticism of architecture has to accept the fact of utility. Understanding the "why" of architecture is the first step to understand its "how".[15] For criticism it is even more important to understand the original brief as buildings become less formal.[16] Domestic architecture in any one country has a

[10]Pendlebury, 1954, p. 10.

[11]See for example: Lapourtas, 1997, p. 79, Horwitz, 1981, p. 222;

[12]For example Durm, 1910, Schmidt, 1985, p. 30 f., Farnoux, 1996, p. 110 ff.

[13]For example 1959, p. 4 ff., Graham, 1987, p. 26, Papadopoulos, 1997, p. 93 ff.

[14]Banham, 1965.

[15]Banham, 1965, p. 92.

[16]Ibid., p. 96.

formal and accepted brief but the reconstructions at Knossos are a rather exceptional task for an architect. Thus, the original brief needs to be established before there can be any criticism of the work.

The dilemma is that the criticism of the reconstitutions at Knossos, both positive and negative, has seen them as the result of a single, deliberate design process. They are condemned or praised for a single aspect, for example presentation or protection. Generally speaking, architectural theory and criticism infers that the architect starts with a blank sheet of paper, implying that he has the freedom to design structure according to his intentions. It disregards the reality that the physical result of the design process is only a distorted image of the original theory applied, with financial, human and technical constraints being the distorting factors. It will be necessary to apply the dualistic, platonic system of a world of ideas and the imperfect world experienced by the observer. The world in which we live and which we experience consists only of the shadows cast by the original ideas which are accommodated in a overlaying world of the perfect and complete ideals. According to Plato, anything in this world is only an imperfect reproduction of the original idea. So far, criticism of the reconstitutions failed to identify the relationship between the original ideas, the influencing factors and the physical result.

In the literature the reconstructions at Knossos are ascribed solely to Evans, yet it is evident that he could not do the entire work on the site himself. He employed local workers to do all the manual labour but he also employed archaeologists, artists and architects to help him organize and manage the excavation at Knossos. It was left to the archaeologist Duncan Mackenzie to keep a proper excavation diary and to work on the pottery. The two Swiss artists, E. Gilliéron père and fils, who had a workshop in Athens, worked frequently for Arthur Evans. They executed reconstruction drawings of frescoes, pottery and small finds, but they also reproduced and restored these artefacts. Finally Evans successively employed three architects who recorded the excavated structures and produced reconstruction drawings of the site. Theodore Fyfe worked for Evans from 1900 to 1904 and Christian Doll from 1905 to 1910. Piet de Jong was employed partially by Arthur Evans and partially by the British School at Athens between 1921 and 1930.

From the early years, these architects executed conservation and reconstruction work at Knossos. It was the conservation attitude, knowledge and skills of Evans and these employees which influenced the work on site. The work at Knossos was further determined by the particular conservation problems of the excavated structures and materials and also the techniques, skills and materials available for the reconstructions. Finally, Arthur Evans was a wealthy person but even he was subject to financial restrictions.

It is the common practice in architectural history to name the architect of the building, but it is rather less common to talk about the client - the employer of the architects who actually commissioned the work and payed for it. For example, Christopher Wren is well known as the architect of St. Paul's Cathedral, but the person who employed him to create this masterpiece is unknown to most. This is different in Knossos. Arthur Evans employed three architects at the excavation site to plan and execute reconstruction work, but the work is commonly associated with his name whereas the names of these architects are unknown to most. Why is this so? Was the entire conservation and reconstruction effort at Knossos based exclusively on Arthur Evans's ideas? And has he determined the work in such a way that the architects were mere 'vehicles' to execute his plans?[17] Evans was not trained as an architect and consequently had to rely on the architectural knowledge of Theodore Fyfe, Christian Doll and Piet de Jong for the execution of the reconstructions. It will be interesting to see, to what extent the design of the reconstructions was influenced by the artistic feeling and technical knowledge of the architects involved.

[17] As suggested by Lapourtas, 1997, p. 75.

Aim and Objectives

The aim of this dissertation is to work towards a new understanding of how the existing reconstitutions can be assessed. The research is driven by the following question:

> *How can the reconstructions at the Palace of Minos at Knossos be evaluated in both their functional and their aesthetic aspects as an appropriate response to the demands of the original design brief?*

It aims to understand the executed work as the result of design processes which were subject to many influencing factors. The research aims to establish the original design brief in order to evaluate how close the results came to the intended aim of the brief. Thus, the research question directs the investigation towards establishing an architectural history of the site and identifying the how and why of the reconstitutions. Through a new, comprehensive evaluation of the conservation and reconstitution work, a new understanding of the site of Knossos will be developed.

To achieve this aim the following objectives were set:

- Establishing a precise record of the reconstitutions including their materials, construction techniques and building dates.
- Identifying the original design brief for the reconstitutions and investigating the solutions proposed by the architects.
- Identifying the conservation attitude of Evans and the architects in order to establish their influence on the designs.
- Establishing the relationship between the client, Arthur Evans, and his architects.
- Researching conservation philosophy at the time of the execution of the work against which the reconstitutions can be set.
- Establishing to what extent, from the perspective of the late twentieth century, the work on site has satisfied the expectations of excavators and architects?

Methodology

It has been previously discussed that in order to assess the reconstitution work at Knossos, an architectural history of the work has to be written. Three main sources have been used to establish this architectural history of the reconstitutions at Knossos:

- A detailed recording of large parts of the physical reconstitutions

- Contemporary photographs which show the reconstitution work

- Contemporary documents (diaries, notebooks, etc.) by Evans or the architects which give information why and how the work was executed.

The main source for this thesis are the stone by stone recordings of the reconstructed parts of the palace. Theodore Fyfe, the first architect employed at Knossos, executed numerous plans of the site which were published in regular reports in the Annuals of the British School at Athens, the originals of which are still kept in the Evans Archive at the Ashmolean Museum in Oxford.[18] They form the basic plans published in all subsequent reports and papers on the palace by Evans and by later scholars. Christian Doll added to Fyfe's plan which was published as the definitive plan in the second volume of 'The Palace of Minos' in 1928. He also produced reconstruction proposals for the upper storey of the Domestic Quarter and other inked plans and sketches for publication in Evans's book. However, the majority of Doll's plans are unpublished. They include large ink and watercolour proposals for the reconstitution work of the Grand Staircase and the Queen's Megaron. Piet de Jong produced numerous plans of specific details for publication in the later volumes of 'The Palace of Minos'. He also drew the plans and sections of the newly excavated tombs and houses but did not produce a new general plan of the palace site.

[18]For a history of the plans produced so far on Knossos see: Hood and Taylor, 1981, p. 5 f.

In 1981 Sinclair Hood and William Taylor published a plan and sections of the Palace at Knossos.[19] The plans were recorded in 1/100 scale and published in 1/200 scale. They are still the authoritative plans for work on the palace by current scholars. However, these plans feature the outlines of the reconstitutions in dotted lines but omit to give any detailed information. This helps to distinguish the original Minoan archaeology from the reconstructions but was not helpful for this thesis. A more recent photogrammetric survey has been commissioned by the Greek antiquity authorities which was executed in 1/20 scale. The photogrammetric results were plotted on paper but unfortunately never were developed beyond this first stage. An archaeological analysis and interpretation is lacking and thus their information value is limited. They were not published and access to them proved to be rather difficult.

The first and most valuable source of information on any object is the object itself. I spent nine weeks in summer 1996 and seven weeks in summer 1997 at the palace to execute in 1/50 scale stone by stone recordings of large parts of the reconstructions. The careful recording of each individual stone required an intense, long and close observation of the structures on site. The result of this process is not only the actual drawing itself but a deep understanding of the site. Many details which would have been overlooked otherwise were discovered by executing these drawings. For example, the different styles of rubble masonry used by Fyfe and Doll were only observed by drawing them. Furthermore, giving equal attention to various areas of the reconstructions for recording purposes reduces the risk of selecting prejudicial information supporting a preconceived theory.

The second most important source were the historic black and white photographs of the excavation and reconstitution work taken on site in the years 1900 to 1930. Most of these photographs were commissioned by Arthur Evans and taken by Marayiannis, a photographer from Candia (Herakleion), Crete. They were the property of Arthur Evans and after his death were bequeathed to the Ashmolean Museum where I was able to

[19]Hood and Taylor, 1981, Supplementary Volume No. 13. British School at Athens.

study them. Other photographs were taken by Theodore Fyfe and are part of the family's inheritance, currently kept by Fyfe's granddaughter. I also had the opportunity to use these photographs for my research. Finally, I used photographs taken by John Pendlebury in 1929 when he became Curator at Knossos after Mackenzie's death. They are stored in the Archive of the British School at Athens.

Most of these photographs have not been previously published but some were used in Arthur Evans' book *The Palace of Minos*. While a number of these published were touched up with paint, the originals are often still accessible in the archive. They give a clear and untempered image of the work executed. However, few of these photographs were dated and they only can be used correctly in combination with diaries and text sources.

The third major source of information were the diaries and notebooks of the people involved in the work on site. Duncan Mackenzie kept the day to day diary of the excavations and, therefore, is regarded as the most reliable source of information on the excavation process. However, it seems that he was not at all interested in the conservation and reconstruction work on site and comments on this part of the work at Knossos are few. Arthur Evans kept notebooks rather than diaries. They do not follow a chronological order and they are a mixture of sketches, reports and aphorisms, sudden ideas and calculations. Excavation records are inextricably interwoven with plans for the future. Unlike Mackenzie's diaries they allow a wide area of interpretation and speculation which makes them a more interesting but less reliable source.

There are also sketchbooks and notebooks by Theodore Fyfe and Christian Doll which were produced on site and, probably, handed to Evans at the end of a season's work as part of the contract. They give information on the executed work from the architect's perspective. All the above named diaries, notebooks and sketchbooks are kept in the Ashmolean Museum where they have been consulted. Two notebooks of Piet de Jong are kept in the archive of the British School at Athens and have been studied there.

Arthur Evans used to publish a report on the progress of the excavations every year. He wrote short reports for the general public which were printed in *The Times*. Longer more scholarly articles were published in the *Annuals of the British School at Athens* from 1900 to 1905 and from 1907 to 1913 in the *Journal of Hellenic Studies*. After World War I reports were printed more irregularly in the *Antiquaries Journal, Journal of Hellenic Studies* and the *Annuals of the British School at Athens*.[20] These reports were written shortly after the work was completed on site which makes them a more reliable source. The *Palace of Minos*, Arthur Evans's massive six volume book on the excavations at Knossos was written between 1921 and 1935 at his house at Youlbury, Oxford. The *Palace of Minos* is more likely to be biased by lapse of memory or the desire to argue for a certain interpretation due to the spatial and chronological distance to the work at Knossos. Besides Evans, only Theodore Fyfe left a number of articles on the reconstruction work. No articles on related matters by Doll or de Jong could be found.

While biographical material on Arthur Evans was published in several books it proved more difficult to find information on the architects. The archives of R.I.B.A., A.A., S.P.A.B. as well as Camden Public Library, the West Yorkshire Society of Architects and similar organisations allowed me to piece together the life of the architects before and after their work at Knossos. This was comparatively simple for Theodore Fyfe, who later became lecturer and Director of the School of Architecture at Cambridge and, thus, was a 'public figure'. It was more difficult for Christian Doll and, especially, for Piet de Jong.

Contemporary and more recent writing on the palace at Knossos was also used, but this represents secondary comments from authors who were not involved in the work but rather present their own interpretations. The relevant publications will be discussed later in the literature review.

[20] See Hood and Taylor, 1981, p. 11.

Scope of Study

The study will be limited to the buildings of the palace at Knossos and exclude all outlying houses such as the South House, the Little Palace, the Royal Villa, the Temple Tomb, etc. Furthermore, the study will be limited to the reconstitutions executed between 1900 and 1930 which was the period during which Arthur Evans was responsible for the site. More work was executed after World War II by Piet de Jong and Nikolaos Platon, then Ephor in Herakleion and responsible for the site. This includes two areas with a new concrete ceiling (Magazine of the Medallion Pithoi and Room of the Stone Vats) and new lightweight protection roofs made of thin metal poles and corrugated plastic sheets. It also includes repointing of large areas of the ruins and earlier reconstructions with a red coloured mortar. The progress of this work was regularly described in *Kretika Chronika* will not be discussed in the thesis. The aim of the thesis is to establish 'why' and 'how' the reconstitutions were constructed. Furthermore, it does not aim to investigate how they are perceived in the scholarly world[21] or by modern tourists.[22] While the aim of the thesis is to dissect the reconstructions in an archaeological light it does not present a new archaeological interpretation of the Minoan remains.

Literature Review

Much has been written about the Palace of Knossos but most of these books are concerned with Minoan prehistory rather than with the reconstructions themselves. These books commonly discuss the reconstructions in a few sentences which are normally restricted to labelling them 'controversial' or 'much disputed'. In this literature review I will concentrate on books and articles which deal exclusively with the reconstructions or, at least, feature substantial parts of them. The books discussed fall into four groups:

[21]Andreas Lapourtas aims to establish the perception of the reconstitutions in the scholarly world in his PhD at the University of Oxford.

[22]Evi Petropoulou discusses this in an MPhil study at the University of York.

biographies on Evans, scholarly works on the site and its interpretation, scholarly works on reconstruction theory or practice, and a few travel guides.[23]

The biographies of Arthur Evans are the first places to look for detailed information. The most authoritative biography was written by his half-sister Joan Evans. Works of reconstruction are mentioned a few times in their chronological order in the last fifty pages of her four hundred page book *Time and Chance. The story of Arthur Evans and his forbearers.*[24] She explains the need to protect the excavated remains and, thus, the necessity of the work. She presents a lengthy quotation from Hogarth's letter to Evans, explaining that British citizens would be reluctant to donate money for the excavations when seeing the expensive reconstructions on site. Nonetheless, she defends her half brother and approves of the reconstructions for the above stated reasons.

In her book *The Find of a Lifetime*, Sylvia Horwitz dedicates an entire chapter to the reconstructions titled *A New Era in Reconstruction* but out of the thirteen pages only two actually speak about this work.[25] The title itself is borrowed from Evans' chapter heading: *New Era of Reconstitution due to the Use of Ferro-Concrete.*[26] It is interesting that Horwitz replaces the word 'reconstitutions', preferred by Evans, with the more popular 'reconstructions'. A detailed investigation of the reconstruction work was not presented here and Horwitz did not reach any conclusion on it. However, she explained that "his intuition and imagination added visual dimension to what his spade found, until ruin and reconstruction together produced a latter-day awakening of life in the court of King Minos".[27] D.B. Harden's small *Memoir* on Sir Arthur Evans discusses the reconstruction with just one sentence and, also, reaches no conclusion. He wrote:

[23]There are, of course, hundreds of travel guides on Crete and not all of them could be reviewed. I have selected a few which claim to focus on cultural tourism.

[24]Evans, 1943, p. 338 ff.

[25]Horwitz, 1981, p. 197 - 209. The pages on reconstitutions are 198 - 199.

[26]PM III, p. 288.

[27]Horwitz, 1981, p. 260.

> "[Evans] also continued his work, begun many years before, of restoring the Palace ruins and embellishing them with reconstructions of their architecture and coloured decorations".[28]

In 1993 and 1994 Ann Brown published two small but richly illustrated volumes on Arthur Evans based on material from the Evans Archive in the Ashmolean Museum. The first volume, *Before Knossos...Arthur Evans's travels in the Balkans and Crete* dealt with the period before Knossos, while the second, *Arthur Evans and the Palace of Minos* is the first publication which exclusively discussed the excavation and reconstruction work at the palace *per se*. It draws upon the rich photographic archive and the diaries of Duncan Mackenzie and the notebooks of Evans. However, the book is rather descriptive. It presents the dates and the types of work executed on site but refrains from an analysis and evaluation. Since references are missing, its value for scholarly use is limited.

One of the first to criticise Sir Arthur Evans publicly for his reconstruction work was the German architect and professor Joseph Durm. He visited Knossos in 1906 and in 1910 published in his book *Die Baukunst der Griechen* a lengthy discussion of the Minoan architecture as well as a criticism of Evans himself:

> "What is presented to the visitor is much and little, and less would have been more, if one had not done so much concession to modern 'conservation'. Automatically, one asks for whom these reconstructions were made. Only too soon one will see what one has had and what one has lost forever. Too much has happened, to enable some tourists an imagination of the original."[29]

Josef Durm was certainly one of the earliest and most fierce critics of Evans. He criticised the amount of reconstruction work in 1906 when the Throne Room and the Grand Staircase were the only major works executed. He was outraged by the 'inverted' columns which looked, according to Durm, like gigantic table-legs. Durm was an eminent scholar in his time and his assessment became a frequently quoted source in the scholarly literature. Interestingly, when Durm visited Knossos in 1906 only Christian Doll was present while building the Villa Ariadne. Evans was at home in England.

[28]Harden, 1983, p. 15.

[29]Durm, 1910, p 51. Translation by the Author.

Pendlebury, in his *Handbook to the Palace of Minos. Knossos* briefly explains the reconstructions as a necessary reaction to the conservation needs.[30] His term of 'a meaningless heap of ruins' into which the ruins would turn without the reconstructions became a common phrase. In his *Archaeology of Crete* he completely ignores the existence of any reconstructions at Knossos.[31]

Georg Karo visited the excavations at Knossos for the first time in 1900 and frequently after that date. His book *Greifen am Thron. Erinnerungen an Knossos* is a lively and personal account of these visits. He claims that his frequent visits to the site allow him to judge that the reconstructions were based on archaeological evidence. He admits that Evans was occasionally the victim of the temptation to do too much, but claims that very few of the reconstructions were unnecessary. Karo explains both the necessity to prevent the collapse of excavated structures and the need to provide information for visitors. Karo sketches the reconstructions as a well considered and appropriate response to the requirements on site.[32]

Sinclair Hood does not mention the reconstructions at Knossos in his book *The Home of the Heroes*[33] but dedicates a section to them in his later publication *The Bronze Age Palace at Knossos*.[34] The main part of this publication is the large plan and the sections of the Palace which are accompanied by a small booklet with an extensive bibliography and information on the excavations. Hood explains that Evans was confronted with conservation problems in some areas of the palace but concludes that Evans' aim in making the reconstructions was to give some impression how some parts of the palace might have looked in its original state.[35]

[30]Pendlebury, 1954, p. 10.
[31]Pendlebury, 1963.
[32]Karo, 1959, p 24 ff.
[33]Hood, 1967.
[34]Hood and Taylor, 1981.
[35]Ibid., p. 4 f.

Hallager condemns the reconstructions in his *Mycenaean Palace at Knossos* not so much for being reconstructions but mainly because they had been, in his opinion, poorly documented. He explains that the extensive reconstruction work and the lack of its documentation make it impossible to use the palace as a source for current research.[36]

Mellersh refrains, in his *The Destruction of Knossos*, from making clear statements on the quality of the reconstructions but he also states that interpretation is always a dangerous business.[37] He calls the reconstructions of the upper storey of the West Wing 'tentative'[38] but, when describing the palaces of Mallia and Phaistos, suggests that the lack of reconstructions may preclude an easy understanding. Small comments like these are made throughout the book but do not result in a clear evaluation of the work.

Gerald Cadogan presents a very positive assessment of the reconstructions in his *Palaces of Crete*.[39] He not only points out that the work was structurally necessary but also that it was accurate and honest. He writes:

> "Many of the details which make Knossos so fascinating have been preserved and developed by Evans in his work of restoration or, as he called it, 'reconstitution'. These restorations have often been criticised, as people have thought them ugly - but they are of enormous help in understanding Knossos, which would otherwise be an incomprehensible mess: and by understanding Knossos, you can understand better the other palaces which have not been restored. For Evans his 'reconstitutions' were essential to complete the work as he had to shore up what had already been uncovered before proceeding down. The rotted timbers in the timber and rubble walls had dissolved the walls into heaps of stones and made excavation unsafe and the stratigraphy complicated. Evans has normally preserved the evidence for his reconstitutions: I hope readers will find, as I have found, that the closer you look, the more you marvel at how accurate and honest he was. Equally, his landscaping of the ruins show style and imagination, as you will see if you walk on the hills around Knossos. What might seem from inside the palace the random placing of the restored parts appears from afar a pleasing and harmonious whole."[40]

[36]Hallager, 1977, p. 11.
[37]Mellersh, 1970, p. 58.
[38]Ibid., p. 54.
[39]Cadogan, 1980.
[40]Ibid., p 51.

Castleden asks in his *The Knossos Labyrinth* whether the aim of the reconstructions was "persuading with concrete?".[41] He agrees that in the early parts of the excavations Evans was faced with conservation problems. According to Castleden, later serious problems were created by adding elements which Evans thought were originally present or, at least conformable with the function of the rooms. While he agrees that some reconstructions were correct, he criticises others. However, the majority of his adverse comment is directed towards the reconstruction of frescoes rather than the buildings. Castleden's book aims to present a new interpretation of Knossos as a sanctuary rather than a palace. He suggests that the reconstructions were made to support Evans's interpretation rather than to reconstitute what really had been found. Besides, perhaps, the broad flight of stairs north of the South Propylon, he mostly agrees with Evans's physical reconstitutions. However, he allocates different names and functions for each room which better suit his interpretation of the structure as a sanctuary.

In his *Knossos. Unearthing a Legend*, Farnoux claims that Evans was inspired by a strong commitment to preserve the ruins.[42] He describes the conservation necessities and the work executed but also analyses the sources employed by Evans for his reconstructions. He argues that Evans acted with the most honest reasons and with careful deliberation but concludes that Evans nonetheless was influenced by the tastes and methods of his time.[43]

Two recent papers which talked exclusively about the reconstructions at Knossos should be mentioned here. In 1994 Louise Hitchcock presented a paper at the Association of European Archaeologists titled *Virtual Discourse: Arthur Evans and the Reconstructions of the Minoan Palace at Knossos*. She argued that the reconstructions incorporate structures from several phases of the Minoan palace and suggested that the Minoan culture was much more an invention by Evans than factual reality. In an attempt to

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[41] Castleden, 1990a, p. 32 ff.

[42] Farnoux, 1996, p. 85. While this small and richly illustrated book obviously aims at tourists rather than scholars, Farnoux is a scholar and excavator at Mallia. Thus it was discussed under the heading of scholarly discussions of the reconstitutions rather than the guide book section.

[43] Ibid., p. 89.

analyse the scholarly world's opinion of the reconstructions she posted a questionnaire on the Internet but gained hardly more than half a dozen replies which she groups into 1. "Nostalgia", 2. "Apologia" and 3. "The problems that the reconstructions pose for the understanding of the site". She raised many questions on different issues and claimed to prove on the strength of individual replies, certain details of the reconstructions wrong. A clear distinction was drawn between necessary conservation work and the reconstructions, but she failed to define where this line can be found. She called the reconstructions a narrative by Evans, fictional and ahistoric. The "authentic" Knossos, according to Hitchcock, can only be found in the notebooks and diaries by Evans and Mackenzie but they are only accessible to scholars. She posed the general question whether a "genuine" past can be reconstructed, but, again, failed to discuss it. She concluded her paper with the acknowledgement that the reconstructions have today acquired the status of a document of the past themselves and that no solution might be found as to what to do with them. In all, the paper was very theoretical and the data provided was too little as to be conclusive.

Lapourtas published his paper on *Arthur Evans and his Representation of the Minoan Civilisation at Knossos* in the Journal *Museum Archaeologist*.[44] He also draws a clear distinction between the earlier, and in his opinion necessary conservation work by Fyfe and Doll and the later reconstructions by de Jong, which were not justified. He suggests that Evans's directorship at the Ashmolean Museum triggered the desire to mount a permanent display of Minoan Culture at Knossos. It is acknowledged that Evans set examples of systematic approach to excavation and conservation of archaeological sites and on the employment of various specialists (archaeologists, architects, artists) for the individual tasks on site. However, Lapourtas also asserts that Evans was an autocratic despot and that the reconstitutions were his very own idea of a permanent exhibition of the Minoan past. He suggests that the architects "served merely as vehicles to execute his plans".[45] Furthermore, Lapourtas investigates the reception of the reconstructions at Knossos in the scholarly world and how Evans adapted to this criticism.

[44]Lapourtas, 1997, p 71 - 82.
[45]Ibid., p. 75.

In 1988 and 1993 Hartwig Schmidt published two volumes in cooperation with the Architectural Department of the German Archaeological Institute. The first volume discusses protection shelters while the second volume examines reconstruction at archaeological sites. He explains that Evans gradually moved from a predominantly protective aim of the reconstructions to a more representative motivation. He notes that the reconstructed parts are too few to provide effective protection for the site. Many areas were still left exposed to the weather. They were later covered by the Nikolaos Platon and the Greek authorities with lightweight shelters. Schmidt explains that on the other hand, the reconstruction of only some parts of the ruins created a distorted image of the original palace. He suggests that modern visitors experience the palace not as one large structure but as numerous small buildings.[46] Schmidt concludes that Evans failed to achieve his conservation objectives and that the dominance of the reconstructions deprived the site of its archaeological and historical values.[47]

In May 1995 the Getty Conservation Institute hosted a meeting of conservation specialists in the Mediterranean the proceedings of which were published two years later.[48] John Papadopoulos' paper, *Knossos,* discusses the excavation site of the Palace of Minos not only in its historical and scientific perspective but also in its aesthetic, social and economic aspects.[49] He explores various issues such as the prominence of one historic phase in the reconstructions, the introduction of new materials and that, today, the reconstructions acquired their own historical identity. Papadopoulos proves that some details of the reconstructions were not accurate but fails to provide a general judgement on the reconstructions. He explores the wider area of heritage site management with its various issues of tourism and conservation. Thus, he provides the background against which this thesis must be set, but the paper is too short to discuss any of the problems in detail.

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[46] Schmidt, 1993, p. 107.
[47] Compare also Schmidt, 1985, p. 30.
[48] de la Torre, 1997.
[49] Papadopoulos, 1997, p. 93 ff.

While the previous quotes were taken from scholarly literature, another perspective might be taken by the numerous visitors who see Knossos every year. While mass tourism did not exist at the time when the reconstructions were executed, today the tourists form the majority of the audience for this work. It seems that most of the visitors appreciate the reconstructions as a considerable help to understanding the site, which is reflected in the travel literature on Crete. The following quotation was taken from O'Conell's *Groc's Candid Guide to Crete and Mainland Ports* which is clearly in favour of the reconstructions:

> "Evans put into train an imaginative reconstruction. This was based on frescoes found on the site and the artistic recreations of Piet de Jong, which resulted in the most coherent restoration. It is a pity that his distinctive approach caused so much academic controversy. There can be no doubt that the other island palace remains, that have all been 'faithfully' excavated, are much more enjoyable once Knossos has been visited."[50]

O'Conell is one of the few writers who acknowledged that, besides Evans, other people had an influence on the design of the reconstructions. He furthermore highlighted how important the reconstructions are for untrained visitors in order to understand Minoan architecture.

Gallas takes a different view in his travel guide to Crete.[51] Based on the assessment of Schiering, he suggests that the reconstructions must be seen as a document of their time. Contemporary to the reconstruction of the Saalburg in Germany and two generations after Schinkel's proposal for a Royal Palace on the Acropolis, Evans's reconstructions seemed to be a typical product of the early twentieth century. He proposes that no one, including Evans, would dare to execute this work today.

This literature review shows clearly the divide, identified earlier in this chapter, between the need of protection and a reaction to this necessity on the one hand, and on the other hand the philosophical and theoretical discussion on the legitimation for this work. None

[50] O'Conell, 1990, p 82.
[51] Gallas, 1985, p. 184 ff.

of the authors discussed went into a detailed analysis of why the individual reconstructions were built. The result on site was seen as sufficient to infer what motivations Evans had to do this work.

Structure of the Thesis

Along with the introduction, the thesis has seven chapters and a conclusion. A basic history of the site can be found in Appendix 3, to provide readers with basic information on Minoan history. Volume two of the thesis contains the photographs and plans.

In Chapter One background information will be provided. It consists of three parts, the first of which comprises of a short biography of Arthur Evans which will help us to understand his relationship to archaeology and conservation. The second section provides information on archaeological theory and philosophy of the late nineteenth and early twentieth century, while the third section will explore the conservation theory of the same period. This illuminates the background against which the work at Knossos must be set.

Chapter Two will analyse the archaeological remains of the Minoan palace. Here, the historic building materials and techniques will be discussed in order to understand the conservation problems the architects were facing when the site was excavated. Furthermore, the chapter will discuss the way the palace was destroyed, which also had an influence on its state of preservation when it was discovered.

The third chapter describes the conservation and reconstruction works executed work by Theodore Fyfe from the years 1900 to 1904. It will describe the materials and methods used by him and, thus, identify his conservation attitude. Furthermore, the original design brief for his work will be established.

The reconstruction of the Grand Staircase, the Queen's Megaron and other works by Christian Doll will be discussed in Chapter Four. He worked at Knossos from 1905 to

1910. It will be examined how Doll's different background resulted in a change of the work on site and how the design brief was improved in the light of earlier mistakes.

In Chapter Five the work of Piet de Jong who worked at Knossos from 1922 to 1931 will be examined. It will offer a consideration of how Evans' forced absence from Knossos during World War I influenced the design brief for the later reconstruction work. Furthermore, it will be established how financial considerations, the availability of new materials and techniques and technical problems resulted in an accelerated reconstruction programme. Also discussed is the manner Piet de Jong's aesthetic feelings shaped the form of the later reconstructions.

In Chapter Six the technical aspects of the reconstructions will be evaluated. It will include an investigation of how the different materials employed on site by the three architects performed, why they failed and how they benefited the site. Each material will be individually assessed and future conservation problems will be highlighted.

The evaluation of the theoretical and philosophical aspects of the reconstructions will be discussed in Chapter Seven. First, the conservation philosophy of Evans, Fyfe and Doll will be summarised. Secondly, the sources which have been employed for the execution of the work will be investigated and it will be discussed how reliable this information has been. Furthermore, the influence of the reconstructions on the formation of the Charter of Athens will be examined.

In the Conclusions the results of the seven chapters will be summarised and an evaluation of the reconstruction work at Knossos will be presented. Recommendations for further research at Knossos and in the field of conservation at archaeological sites will be made. Furthermore, actions to be taken on site will be recommended.

Chapter 1

Arthur Evans and his Time

Sir Arthur J Evans

In the works of reconstitution, which here so necessarily followed that of the spade, the object of affording an intelligible picture to the visitor had been constantly kept in view.
(Evans in Pendlebury, 1954, p. 7)

Chapter 1

Arthur Evans and his Time

1.0 Introduction

Much has been written about Evans' reconstructions at Knossos. As we will see later on, Arthur Evans was the initiator of the program but he was by no means the only factor which influenced the work on site. Other people had their share in the design of them. Nonetheless, in order to understand Evans's influence on the reconstruction work, it is important to describe his background. Therefore, the first section of this chapter will deal with Arthur Evans's childhood and his travels. Furthermore, it will discuss his work experience including being correspondent for *The Manchester Guardian* in the Balkans and being Keeper of the Ashmolean Museum, before he started excavating at Knossos.

The reconstruction work at Knossos must be seen in its historic context. Archaeology is a rather young discipline and, for quite some time, was regarded as a luxury of wealthy men. The development of archaeology from the mere hunt for treasure to a qualified science was not yet complete when the work at Knossos was executed. In order to reach an assessment of the work on site, the second part of this chapter illustrates contemporary archaeological thought.

Likewise the science of conservation was in its infancy. The Charter of Athens (1931) and, later, the Charter of Venice (1964) set international standards of conservation which subsequently developed into our modern understanding of good conservation practice. However, both charters were concluded after the work at Knossos was completed. While it might be interesting to see to what extent the conservation work at Knossos, now almost a century old, complies with modern standards, these standards cannot serve as a means to assess the work. Therefore, the third part of this chapter illuminates the development of conservation theory and illustrates other contemporary conservation work at the time Evans excavated at Knossos.

1.1 The life of Sir Arthur Evans

The main source for the study of Arthur Evans' life is his half-sister Joan Evans' *Time and Chance. The Story of Arthur Evans and his Forbearers.* This book is the main source of information for all later biographies, such as D B Harden's short *Sir Arthur Evans, A Memoir*, Sylvia Horwitz's *The Chance of a Lifetime* and Ann Brown's two volumes *Before Knossos...Arthur Evans's travels in the Balkans* and *Arthur Evans and the Palace of Minos.* The last two volumes are illustrated with numerous black and white photographs from Evans' collection at the Ashmolean Museum. These photographs and parts of Evans' comprehensive correspondence at the Ashmolean Museum contribute to further understanding of Evans' life and his attitude toward archaeology, conservation and reconstruction. Since Arthur Evans was only one of the influences which determined the final result at Knossos, this discussion of Arthur Evans' background will be superficial yet, nonetheless, essential. It will be left to other scholars to write a detailed, up-to-date biography of Evans and his philosophy.[1]

1.1.1 The early years, school and studies

Since 1840, John Evans, Arthur's father, had worked at the Nash Mills, the paper mill of his uncle John Dickinson.[2] He fell in love with the daughter of his employer, his cousin

[1]In fact, Andreas Lapourtas is currently undertaking research on these issues but his work has not yet been published. First results were published in the *Museum Archaeologist*. See Lapourtas, 1997.

[2]Evans, 1943, p. 57.

Harriet Ann Dickinson whom he married on 12 September 1850.[3] Arthur John Evans, John and Harriet's first child was born on 8 July 1851.[4] His mother died 1 January 1858 after a short illness and Arthur's father remarried only 18 months after the death of his first wife.

At this time, John Evans was a renowned scholar, interested in numismatics and the archaeology of flint tools. He gave papers at several learned societies and was elected fellow to the Royal Society in 1862.[5] He became vice president of both the Royal Society and the Society of Antiquaries in 1876.[6] Sir John Lubbock, who was a neighbour of Charles Darwin at Down House, became a close friend. As we will see later in this chapter, Darwin and his *On the Origins of Species* had an important influence on the development of archaeological thought. Lubbock and Edward B Tylor linked Darwin's biological evolution theory with the evolution of culture in prehistory.[7] While Evans took a great interest in these theories, business activities prevented him from taking a greater part in the discussions.[8] Furthermore, John Evans's friend Lubbock was engaged in the advance of modern conservation thought. He suggested a new *Bill for the Protection of Ancient Monuments*[9] and was one of the founding members of the Society for the Protection of Ancient Buildings on 22 March 1877.[10]

Arthur Evans grew up at Nash Mills, Hertfordshire, in a house filled with the arrowheads and flint tools from his father's excavations. Lubbock, the geologist John Prestwich[11] and other scholars regularly came for dinner and, naturally, talked about the latest advances in archaeological research and conservation. After the untimely death of his mother,

[3]Evans, 1943, p. 78.

[4]Ibid., p. 82.

[5]Ibid., p. 107.

[6]Ibid., p. 156.

[7]Trigger, 1989, p. 114 ff. See also MacEnroe, 1995, p., 4.

[8]Evans, 1943, p. 108.

[9]He was working on the bill since 1871 and it was fist discussed in Parliament in 1874 but became law only in 1882. See Jokilehto, 1986, p. 328.

[10]Jokilehto, 1986, p. 322.

[11]For Prestwich see Trigger, 1989, p. 93 and Daniel, 1975, p 54 ff.

Arthur Evans grew more attached to his father and so he grew up in an environment which appreciated and researched the past. In summer 1860, at the age of nine, he helped his father excavate Roman pottery at Dunwich, Suffolk.[12]

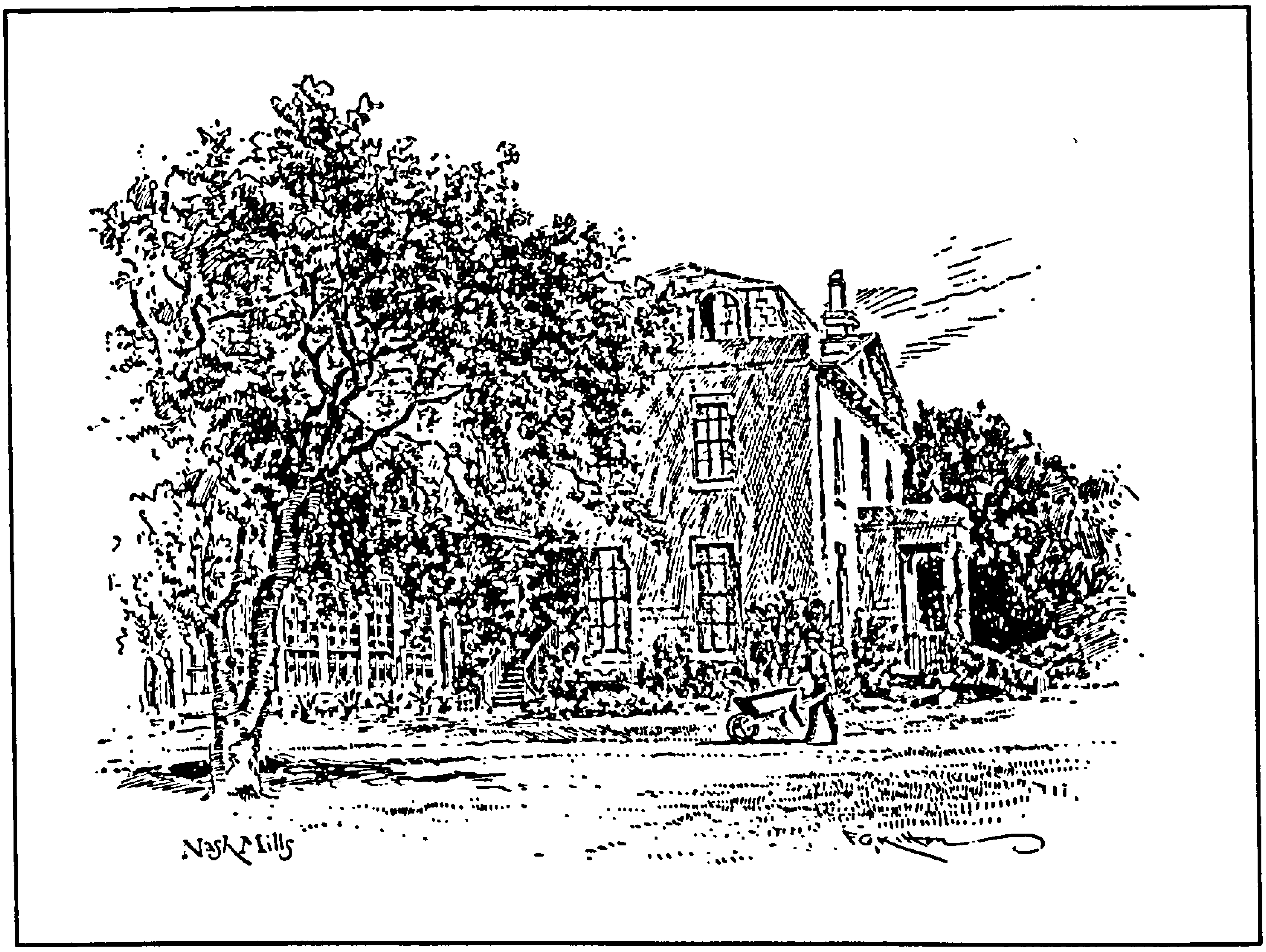

Figure 5 The House of John Evans at Nash Mills. Drawing by F. G. Kitton, 1892.

In autumn 1860, Arthur Evans went to preparatory school near Chipperfield, and in 1865 he went to Harrow School. In 1866 he joined his father on a ten day trip to northern France in order to find flint tools in gravel pits,[13] and in January 1867 he listened to his father read a paper at the Society of Antiquaries.[14] Arthur left Harrow in 1870 and went on to study at Brasenose College, Oxford. While at Oxford, he began travelling widely in Europe. In 1871 he and his brother Lewis visited France just after the Franco-Prussian war had ended. In 1872 he travelled to the Balkans with his brother Norman and a year

[12]Evans, 1943, p. 114.
[13]Ibid., p. 131.
[14]Ibid., p. 124 f.

later he visited Lapland.[15] In 1875 he spent a term in Göttingen and travelled again to the Balkans.[16]

Arthur published accounts of his travels and papers on archaeological and historical subjects which were received well in the scholarly world, but he was still known as 'Little Evans - Son of Evans the Great'.[17] For a long time Arthur Evans was unable to surpass the reputation of his father.

1.1.2 The Balkans

While travelling in the Balkans Arthur Evans realised how the Ottoman occupation of the area prevented freedom for the Slav population. The Ottoman Empire which occupied large parts of the Balkans, was on the brink of collapse and the German, Austrian and Russian Emperors were all trying to expand their areas of influence. In this situation the various indigenous populations of the Balkans fought for their independence. Unlike his father, Arthur did not have a pragmatic attitude to politics. He strongly supported the cause of a pan-Slavonic freedom movement. The publication of his travels in the Balkans in 1876 gained him the reputation of an expert in the political and social circumstances of the Balkans.

On the completion of his studies Arthur Evans applied for a college fellowship, but he was not considered. After having worked for a Balkans relief organisation he was offered a post which he accepted as the Balkans correspondent for *The Manchester Guardian*. He moved to Ragusa (Dubrovnik) in 1877 and immediately began writing on political issues but still had time to conduct some archaeological research. He travelled widely in the area and many of his journeys on foot to remote spots were quite dangerous.[18]

[15]Evans, 1943, p. 164 ff.
[16]Ibid., p. 176 ff.
[17]Ibid., p. 163.
[18]Ibid., p. 182 ff.

On 18 June 1877, while in Ragusa, Arthur Evans met Augustus Edward Freeman who was accompanied by his two daughters Margaret and Helen. Freeman was a well known historian and writer on conservation issues who had published a book on *The Principles of Church Restoration* in 1846.[19] Arthur fell in love with Margaret and married her on 19 September 1878 at Sommerleaze near Wells.[20] They moved to a new house called Casa San Lazzaro in Ragusa, and while Margaret ran the household and provided for guests, Arthur continued to travel and write and to conduct archaeological research. Furthermore, he was still involved in political agitation. He strongly opposed the Austrian Empire's involvement in Balkan politics after the end of the Ottoman occupation, and supported independence for the local population. In 1880 a friend of Arthur's, Felix von Luschan, sent him a coded message that his political activities were being closely watched by the Austrian authorities and that arrest might be imminent.[21]

In autumn 1881 the insurrection broke out in Crivoscia and, naturally, Arthur Evans travelled there to report the issue. He was accused by the Austrian authorities of being the agitator who had caused the uprising. In March 1882 he was issued with a notice of expulsion, but was nevertheless arrested on 7 March when he embarked on a ship in the harbour. Evans was imprisoned at Ragusa for six weeks and finally released on 23 April 1882 and expelled from Austrian territory.[22]

1.1.3 Ashmolean Museum

After returning from the Balkans, Margaret and Arthur Evans settled in Oxford, where Arthur tried to find work for himself. In 1884 Evans was appointed Keeper of the Ashmolean Museum in Oxford, then still in its old and overcrowded rooms in Broad

[19]Jokilehto, 1986, p. 297 f.
[20]Evans, 1943, p. 195 ff.
[21]Ibid., p. 216 ff.
[22]Ibid., P. 239 ff.

Street.[23] At this time the Ashmolean Museum was more a cabinet of curiosities than a museum.[24] Evans enlarged the collections by travelling and acquiring objects; but he also came in contact with the wealthy collector Charles Drury Edward Fortnum, who intended to lend and after his death bequeath his collection to the Ashmolean Museum. Together Evans and Fortnum started to fight for a new building to accommodate the enlarged collections.

Arthur Evans wanted to integrate the University Galleries in the new Ashmolean Museum to form a large art and archaeology museum. This new museum concept reflected the contemporary debate on the development of art history and archaeology at this time.[25] Evans suggested that the new museum should be headed by the director of the Ashmolean Museum. By contrast, the university preferred to link the Ashmolean to the existing University Galleries, with the Keeper of the Galleries responsible for both parts. Besides this conflict with the University, Evans also had fierce battles with the governing body of the Ashmolean Museum itself. While he was an adherent of the newly developed understanding of archaeology, many members of the governing body had a conservative approach.[26] It seems that Evans was disappointed by these political difficulties and almost resigned from being Keeper at the Ashmolean Museum. However, Fortnum convinced him to continue and, finally, in 1891 a hard-fought battle secured the university's support for Evans' scheme of a new Ashmolean Museum for Art and Archaeology.[27] The experience of these battles and, occasionally, the experience of powerlessness in the process of decision-making probably haunted Evans and influenced him.

[23]Brown, 1993, 29 ff.

[24]Evans, 1943, p. 265.

[25]See comment of Charles Bell in Evans, 1943, p. 328 and compare page 381 ff.

[26]Evans, 1943, p. 269 ff. and also Evans, 1943, p. 299. Arthur Evans expressed his view of the new Ashmolean Museum in his inaugural lecture 'The Ashmolean Museum as a Home of Archaeology in Oxford' on 2 November 1884. These different attitudes are also highlighted in two speeches in 1911. Percy Gardener, who retired from the presidency of the Society for the Promotion of Hellenic Studies supported research in the beautiful, classical art. Immediately afterwards, succeeding Gardener as President, spoke Arthur Evans who supported the research in the origins of culture and its evolution. Fitton, 1995, p. 38.

[27]Evans, 1943, p. 299.

In 1894 the new Ashmolean Museum was completed in Beaumont Street.[28] Arthur Evans was involved in setting up a new council merging the governing bodies of the former Ashmolean Museum and the University Galleries. Furthermore, representing the council of the Ashmolean Museum he closely controlled the building work on site and he probably had close contact with the architects.[29]

The difficult situation with the governing body persisted and gradually grew worse. The regulation for the keeper's residency required his presence in Oxford for at least 150 days in each year.[30] Evans had travelled à lot in the years between 1882 and 1900 but with the beginning of the excavations at Knossos in 1900 he was abroad for long stretches of time. After the new Ashmolean Museum had been completed and the collections were arranged Evans was no longer interested in it. His interest shifted to the excavations in Crete and, subsequently, he resigned from the keepership in 1908.[31]

1.1.4 Travels in Crete

After Evans returned to Britain in 1882 he travelled in Greece, the eastern Balkans, Crimea and Caucasus. He conducted several small excavations in Oxford and Kent and wrote numerous articles and papers on Mediterranean and Celtic archaeology.[32] While travelling in Greece he found gemstones which were engraved with symbols which he strongly believed were an early hieroglyphic system of writing.[33] Local antique dealers told Evans that the stones came from Crete, and it was at this moment that Evans's strong interest in the island awoke. At this time Crete was still occupied by the Ottoman forces. Arthur Evans visited Crete for the first time in 1894 and was shown the site of

[28]Surprisingly, both the Journal of the Royal Institute of Architects and the Builder have not reported on the new museum.

[29]Evans, 1943, p. 305.

[30]Ibid., p. 305.

[31]Ibid., 1943, p. 356.

[32]Harden, 1983, p. 17.

[33]Evans, 1943, p. 309.

Knossos on 19 March. Two days later he returned to the site with Minos Kalokairinos who had excavated parts of the Anteroom in 1878 -79.[34] Kalokairinos' work had been halted by the outbreak of a violent uprising of the Greek Christian population against the Turkish occupation. On the same day, Evans spoke to the two men who together owned the site, one of whom owned a quarter of the site and was willing to sell; the other owner refused.[35]

Arthur Evans was by no means the first person, who had expressed an interest in the excavation of Knossos. The existence of prehistoric remains at the hilltop of Kephala, as the site was called in this period, had long been known. The American archaeologist W J Stillmann had visited the site in 1881 and published an account of the excavations of Kalokairinos.[36] In 1883 Heinrich Schliemann tried to obtain an excavation permit and repeated his attempts after he visited the site personally in 1886. After Schliemann's death in 1890, the French School of Archaeology tried to obtain the site but could not achieve any progress in negotiations.[37]

After Evans acquired a quarter of the site in 1894, further negotiations stalled and it took him six years until he finally completed his purchase. He travelled widely in Crete in 1894 and returned in 1895 and 1896 for further explorations of the island. He visited many sites which promised to be of archaeological interest. While he recorded and described many of them, he actually did not excavate any which was probably due to the restrictive Ottoman regulations.[38] In 1897 the political tensions between the Christian and the Muslim populations on Crete worsened. Greek government troops invaded the island, subsequently encouraging the Christian Cretans to massacre their Moslem neighbours. Order was restored by the 'Great Powers' - France, Britain, Russia and Italy.

[34]For more information on Minos Kalokairinos see: Aposkitou, 1979, pp 81 - 94.

[35]Evans, 1943, p. 312 f.

[36]Hood/Taylor, 1981, p. 1.

[37]See Brown 1986. One of the main obstacles was that the local Greek intellectuals who were organised in the Syllogos, a society for the Promotion of Education opposed excavations. They feared that most of the interesting finds would be shipped by the Ottoman officials to museums in Istanbul.

[38]Brown, 1993, p. 37 ff.

Superficially peace had been restored, but tensions continued to grow and more violent encounters occurred in 1898. In 1897 Evans decided to travel in North Africa but he returned to Crete in 1898 and 1899.[39] Finally, in 1899, the last Turkish soldiers left the island and Prince George of Greece was nominated High Commissioner for the Great Powers. He landed on the island on 21 December and subsequently established complete peace.[40] The necessary conditions for the start of the excavation had been provided.

1.1.5 The Excavations at Knossos

Arthur Evans began his excavations at Knossos on 23 March 1900. He, his assistant Duncan Mackenzie and the architect Theodore Fyfe, excavated large parts of the West Wing in the first campaign. Kalokairinos's early excavations indicated the existence of a structure at Kephala which was dated to the Mycenaean period, but provided no clear indication of its size. Even after the first campaign in 1900 Evans still believed that the Palace consisted only of what is today known as the West Wing flanked by a West Court and an East Court.[41] Gradually it emerged that the Palace was far bigger than recognised and that the work on site would take much longer than estimated.

The remaining part of the West Wing and the northern part of the Palace and some parts of the Domestic Quarter were excavated in 1901. In the following year the remaining part of the Domestic Quarter and the East Bastion followed. In 1903 the south east area of the palace was excavated and this completed the main excavation work. In the following years supplementary research was conducted such as excavation work under the pavement which was discovered in earlier campaigns. From 1900 to 1904 Theodore Fyfe was the architect on site who was responsible for the measured drawings and the reconstruction and conservation work.

[39]Brown, 1993, p. 75 ff.
[40]Evans, 1943, p. 326.
[41]Compare Plan 1900 by Theodore Fyfe, Plate 7.

In 1905 the architect Christian Doll began to work for Evans and his first task was to restore the Grand Staircase. Though the main excavation work was completed within the first five campaigns between 1900 and 1904, Evans realised that supplementary excavations, finds processing and the conservation work would take many more years and so, in 1906, the Villa Ariadne was build on site as a comfortable headquarters for the excavations. Christian Doll executed further reconstruction work for Evans in 1908 and 1910.

The immediate publication of preliminary reports of the excavation work in scholarly journals and *The Times* made the work at Knossos known to the world. Arthur Evans became famous and honorary doctorates were conferred upon him and in 1911 he was knighted.[42] Work on site was resumed in 1922 after the interruption of World War I and its aftermath. Evans completed the first volume of his book, *The Palace of Minos*, in 1921 and returned for supplementary research for the following volumes. Piet de Jong joined Evans as architect in 1922 and worked for him until 1931. The site as it stands today is largely the work of this period. Evans finally published the last volume of his monumental book *The Palace of Minos* in 1935 and in the same year he visited Knossos for the last time. He died at Oxford on 11 July 1941, a few days after his 90th birthday.

It has been suggested that Arthur Evans was Victorian in his attitude and that much of his work on site must be seen in this context.[43] Another scholar has proposed that he was influenced by Edwardian thought.[44] Arthur Evans grew up in a wealthy family in the Victorian period. This certainly influenced him. Behavioural patterns such as frequent tea parties for visitors in the palace and the garden of the Villa Ariadne[45] as well as the names Evans gave to the individual rooms and the way he described the palace seem to reinforce

[42]Evans, 1943, p. 366.

[43]For example: Farnoux, 1996, p. 95 ff.

[44]MacEnroe, 1995. John Evans and his friends such as Lubbock and Prestwich were certainly Victorians. Arthur Evans was born in the Victorian period but his work at Knossos was executed mostly in the Edwardian period. It is difficult to distinguish these two periods based on behavioural patterns of the people who lived in them. MacEnroe suggests that the people of the Edwardian period were much more sober than the Victorians and were generally less optimistic about technical advances.

[45]Horwitz, 1981, p. 204, see also Evans, 1943, p. 377 f.

this perception. However, it will be important in the course of this study to analyse to what extent the physical reconstructions were influenced by this attitude.

1.1.6 Conclusions

Arthur Evans's father was at the forefront of developments in archaeological theory and conservation philosophy in his time.[46] Arthur grew up in an environment which provided financial security and had no need to secure an income from his work. He engaged in many activities such as travelling, writing and research and was Keeper of the Ashmolean Museum. When he started to excavate the Palace of Minos at Knossos he was already 48 years old. His wealthy background allowed him to purchase the site and as sole owner to excavate and reconstruct as he pleased. This must certainly have been a welcome freedom after the difficulties he experienced with the governing council of the Ashmolean Museum. Arthur Evans had not himself conducted a large excavation in the Mediterranean and he was not formally trained as an archaeologist. Nonetheless, his family background and his excavations in Britain and the Balkans equipped him well with necessary skills and knowledge to excavate at Knossos.

Arthur Evans' background certainly influenced his work on site. Much of the work at Knossos might be explained from his personal background but other things might be typical for the time period. Thus, it will be necessary to analyse the state of the art of archaeology at the late nineteenth century and to compare Evans' work with that of contemporary archaeologists. This will be done in the next section.

[46] John Evans's role in the development of archaeological method and theory is highlighted in Daniel, 1975.

1.2 Contemporary Archaeological Thought

1.2.0. Introduction

Archaeology is a comparatively young discipline. Glyn Daniel suggested that archaeology is a creation of the Victorians and places the birth and development of archaeological theory and method in the sixty years between 1840 and 1900.[47] From 1900 to the beginning of World War II archaeological methods were refined but no significantly new archaeological thought was created. This suggests that when Arthur Evans excavated at Knossos, the main early development in archaeological theory and methodology had been completed. After World War II the prevailing material-cultural approach to archaeology was questioned and new methodologies and approaches to the past were developed.[48] However, they are not relevant for the thesis and will not be discussed here.

Unfortunately, it is not possible to give here a detailed account of the development of archaeological method and theory; but it is important to sketch the progress archaeology made from its beginnings to the time of Arthur Evans's excavations at Knossos. It will be shown that Arthur's father, John Evans, was one of the leading thinkers in this process of development which probably influenced Arthur Evans considerably.

1.2.1. Overview of the Development of Archaeology

It is difficult to define a convincing starting point for the birth of archaeology. Mankind has probably always been interested in the question of its origins, and mythological and theological explanatory models sufficed until the beginning of the Renaissance in the

[47] Daniel, 1975, p. 10. I understand the term Victorian as an indication for a specific time period rather than a location. Similar developments happened at the same time in countries which were not governed by Queen Victoria such as France, Germany and the Scandinavian countries.

[48] See Daniel, 1975 and Trigger, 1989.

fifteenth century.[49] Then scholars began to research the classical Greek and Roman civilisations which had survived in both literary and archaeological evidence. The study of the material remains of the ancient structures resulted in the creation of the distinctive style of Renaissance architecture. This interest in the past also included material archaeological evidence and wealthy people began collections of archaeological artefacts. These art collections lacked a methodological interpretation and a chronological evaluation being collected purely for their aesthetic qualities.[50] Furthermore, the beginning of scientific research at this time and the creation of universities prepared the ground for a methodological approach to the past which was no longer directed solely by religious narratives.

The second half of the eighteenth century and the early nineteenth century saw an enormous increase in the quantity of material for the study of the past. Many scholars travelled in the Mediterranean and numerous books were published on the antiquities of both Mediterranean and European sites. These publications described antiquities such as buildings, ruins and artefacts but were not able to date them unless written evidence was provided. However, written evidence was only available for the *historic* period, the classical Roman and Greek period, but was not available for *prehistoric* times. Thus, a qualified assessment of Celtic, Germanic or Gaulish periods in Europe or the pre-Roman and pre-Greek periods in the Mediterranean was not possible.[51]

In 1764 the German scholar Johann Winckelmann published his book *Geschichte der Kunst des Alterthums*. The book presented for the first time a periodisation of Greek and Roman sculptures. In the tradition of art history, it still relied on written sources for the chronology of the sculptures but it demonstrated that a stylistic development took place. By implication, the sequence of styles in a specific art form could provide chronological information.[52] After Napoleon's invasion of Egypt in 1798/99 the systematic research

[49]Daniel, 1975, p. 14 ff and see also Fitton, 1995, p. 14 ff.
[50]Daniel, 1975, p. 17.
[51]Ibid., p. 20 ff and Trigger p. 35 ff.
[52]Trigger, 1989, p. 38 and compare with Daniels, 1975, p. 17.

of the Egyptian past began in the early nineteenth century. Once again, no chronological information could be obtained until Champollion deciphered the hieroglyphs in 1822.[53]

One of the problems for a further development of prehistoric archaeology was the role of the Christian Church. The historic model presented by the Church proposed a linear development from the creation to the final salvation. It was commonly accepted that the creation of the world was not earlier than 5000 B.C.[54] With the Egyptian past stretching back until ca. 4000 B.C. not much time was left for prehistory. Thus, much of the prehistoric artefacts such as flint implements and stone axes which decorated the curiosity closets of Europe were regarded as ancient but contemporary. A distinction between individual periods in prehistory was not made.[55]

However, theologians and philosophers began to question biblical narrative. In 1859 Charles Darwin published his theory of evolution in his book *On the Origin of Species by Means of Natural Selection.*[56] Darwin was not the first or only scholar to suggest this theory; he was preceded by other scholars such as the Frenchman Jean Baptiste Lamarck and the geologist Charles Lyell who published his *Principles of Geology* in 1830 -33. However, he became the most popular.[57] His writings influenced archaeology in two ways: first, many of the ideas of evolution theory have their origin in the study of geology. The understanding of how geological features such as rocks and sediments developed and how fossilisation took place suggested a chronology different from the Church's official story. With the creation date of the world pushed further back, there was enough time to allow for a differentiated development of prehistoric societies. Second, the development from simpler species to more sophisticated ones could be applied to archaeological finds.[58]

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[53]Trigger, 1989, p. 39 and Ceram, n. d., p. 130 ff.

[54]Daniel, 1975, p. 27. Daniel suggests that Bishop Ushers date of 4004 B.C. was accepted by many.

[55]Daniel, 1975, p. 31.

[56]Compare Fitton, 1995, p. 34 f.

[57]Daniel, 1975, p. 28 and Trigger, 1989, p. 94.

[58]Compare Emerick, 1997. Even before Darwin published his book in 1859 the Danish scholar Thomsen suggested an evolution of culture and the English architect Rickman proposed the evolution of cultural styles.

On 1 May 1859 John Evans and his friend Prestwich visited a common friend, Boucher de Perthes, who researched flint tools in the area of Abbéville, France.[59] John Prestwich, supported by Evans, read a paper at the Royal Society on 26 May on the results of de Perthe's research.[60] They suggested that the stone age had to be divided into two phases. Man in the earlier period (later called Palaeolithic) used crude artefacts which were found at drifts and caves and man in the later period (later called Neolithic) used more sophisticated artefacts which could be found at barrows and settlements. Herewith, a chronological distinction of archaeological remains was provided which was based exclusively on the remains themselves. From that point on, the pace of development increased. The central figure in this development seemed to be John Lubbock (later Lord Avebury) who was a neighbour of Darwin and a supporter of his theories but also a friend of John Evans.[61] Charles Lyell, to whose work Darwin referred when he wrote *On the Origins of Species*,[62] was another friend of Lubbock and also a member of the Royal Society and actually attended the talk by Prestwich mentioned above.[63] However, the person who is most famous for the integration of the evolution theory into archaeology was General Augustus Fox-Lane Pitt Rivers.[64]

Pitt Rivers, who was the father-in-law of John Lubbock,[65] came from a wealthy background and was educated at the Royal Military College at Sandhurst. He was responsible for the development and improvement of rifles for the British Army and subsequently he developed a theory of how weapons evolved from a simple type to an advanced type following the theories suggested by Darwin. A more effective weapon is superior and will be produced in future while the production of less effective weapons will be discontinued. Pitt Rivers never received a formal education related to art, history or archaeology and

[59]Evans, 1943, p. 101 and Daniel, 1975, p. 58.

[60]Daniel, 1975, p. 60 and Evans, 1943 p. 103.

[61]Evans, 1943, p. 108.

[62]Daniel, 1975, p. 64.

[63]Evans, 1943, p. 103.

[64]For detailed information on Pitt Rivers see: Thompson, 1977, and Bowden, 1991. The information in this section is taken from these books, if not stated otherwise.

[65]Trigger, 1989, p. 197.

his interests in these subjects were of a merely private nature. He collected a wide range of ethnographic and prehistoric artefacts but, unlike other collectors, did not arrange them geographically but rather typologically.[66] In 1875 he gave a paper at the Royal United Service Institution entitled *The Evolution of Culture.*[67] He suggested that more primitive and generalised forms were older, while the more specialised and sophisticated forms were a later development.[68] Pitt Rivers, who excavated in England and Ireland, insisted on a careful and accurate excavation method and stressed the importance of stratigraphy. He understood that the find context was at least as important as the artefact. Furthermore, he insisted that all artefacts and not just the art objects have to be studied.[69] Certainly, this was an important step towards the development of modern archaeology.

Archaeology was transformed from a treasure hunt to a scientific discipline. The ultimate aim was no longer the object itself but the context and information this object gave about the past. This development cannot be attributed to just one person but Pitt-Rivers' contribution is certainly a very significant one. It was described by M. W. Thompson:

> For Fox (Pitt-Rivers) the 1875 season at Cissbury was like the conversion of St. Paul. Excavation, instead of being primarily a search for objects to arrange in series, had become a field of endeavour in its own right. Significant information could be obtained from it both about a monument and about its relationship to others. This after all is the crucial point about digging. You can dig to look for objects, the usual motive for early barrow digging, or you can dig to disencumber foundations to reveal a plan of a building. In both these cases the soil is a nuisance to be disposed as quick as possible, but what Fox was doing was to interpret the history of the site from the way the deposition of soils and stone has taken place. ..... Clearly, in this type of work, although the digger needed to find objects in his deposits to make inferences about the history of the monument, this was secondary to understanding the processes of formation of the deposits.[70]

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[66]Daniel, 1975, p. 170.

[67]Thompson, 1977, p. 35.

[68]Daniels, 1975, p. 171. Pitt-Rivers agreed that periods of degeneration may happen in which the quality of material artefacts decline. However, this need not detract from the fact that there is a general development.

[69]Daniel, 1981, p. 138. See also Trigger, 1989, p. 199. Trigger insists that Pitt-Rivers was not an isolated figure and other scholars similarly accepted new scientific methods of excavation. Readers who are more interested in this subject are suggested to read Trigger's book.

[70]Thompson, 1977, p. 54.

By the end of the nineteenth century the two most important principles of archaeology had been established: first, the application of the evolution theory of archaeology and, second, the principles of stratigraphy. The foremost reason for digging is not to extract beautiful artefacts but to understand the past. However, it is important to note another aspect of early archaeology: the system of patronage. The background of the persons involved in archaeology is almost exclusively wealthy and archaeology is not regarded as a way to earn money. The excavators paid for their excavation work themselves and, thus, the system of patronage was established in archaeology.[71]

1.2.2. Contemporary Archaeology

John Evans' deep interest in the intellectual development of archaeology has been noted. Thus, one may anticipate that Arthur Evans, who shared this interest with his father, was well informed on current archaeological theories and methods. A few excavators and their methods are examined in the next section, some of whom slightly preceded Evans and some of whom are Evans's contemporaries but all of whom were related in one or the other way to Evans and his work at Knossos. This allows the comparison of the excavations at Knossos with contemporary excavation methods used by other scholars.

Heinrich Schliemann is certainly one of the most controversial excavators in the history of archaeology. Born 6 January 1922 to a poor priest and his wife in Neubuckow, Mecklenburg, Germany, he became a merchant of considerable wealth. In 1858 having amassed a considerable fortune he retired from business and dedicated his wealth and time to his childhood dream to excavate Troy. Until then, Greek history had begun with the first Olympiad in 776 B.C. and everything earlier was regarded as mythical including the Homeric tales of *Iliad* and *Odyssey*.[72] Schliemann excavated Hissarlik, the site of Troy, in several campaigns in 1871-73, 1879, 1882-83 and 1889-90.[73] Between these

[71]Compare: Emerick, 1997, p. 52 f.
[72]Fitton, 1995, p. 14 ff. and Cottrell, 1953, p. 24 ff.
[73]Daniel, 1981, p. 125.

campaigns Schliemann excavated at Mycenae in 1876 and Tyrins in 1884-85.[74] Shortly after work on site was completed, he published his results.

Schliemann travelled the Troad[75] and, with the help of the geographical descriptions in Homer's *Iliad,* identified Hissarlik as the site of ancient Troy. For the first time a site which had not survived visibly on the surface or in the memory of locals had been identified with the help of literary sources. Schliemann's main achievement was to push the frontiers of archaeology further into the past and to prove that the mythological narratives of Homer had, at the least, some real background.[76]

However, his excavation methods are more controversial. Some scholars have suggested that he was a complete stranger to archaeological excavation methods.[77] His interest in the jewellery and gold treasures of Troy and Mycenae, and especially the way he presented his finds to the public, suggested a mere treasure hunt rather than an archaeological excavation. Schliemann employed up to 160 workers at his excavations,[78] which seems to reinforce this theory. When Schliemann dug at Mycenae in 1876 the Greek Society of Archaeology would only allow a limited number of workmen. The reason for this demand was not that the Society believed too many workers would result in bad archaeological work; rather it allowed the Greek Ephor[79] Stamatakis to control all work on site and to prevent the theft of artefacts.[80] The deployment of a hundred workmen, supervised by only one or two archaeologists, was not uncommon at this time and accepted as good practice.[81]

[74]Gorys, 1989, p. 56.

[75]Northern part of Asia Minor, south of the Dardanelles.

[76]See Fitton, 1995, p. 57 ff.

[77]Daniel, 1975, p. 167.

[78]Gorys, 1989, p. 56 and Fitton, 1995, p. 64.

[79]In Greece, Ephor is the title of the person officially responsible for the antiquities of a region.

[80]Cottrell, 1953, p. 63. Schliemann had previously taken the treasure of Priam from Turkey without permission of the authorities and the Greek Archaeological Society feared a similar event in Mycenae.

[81]Compare for example Petrie, 1904.

Other scholars have pointed out that Schliemann's excavations followed certain scientific archaeological methods, albeit crude in our modern understanding but consistent with the standards of his time. The 'great trench', a forty metre wide section, was cut through the entire *tell* which exposed all the various levels of settlements. With the application of stratigraphical methods he identified seven different successive settlements.[82] A gold treasure found in the level of Troy II was labelled the 'Treasure of Priam' and, thus, the

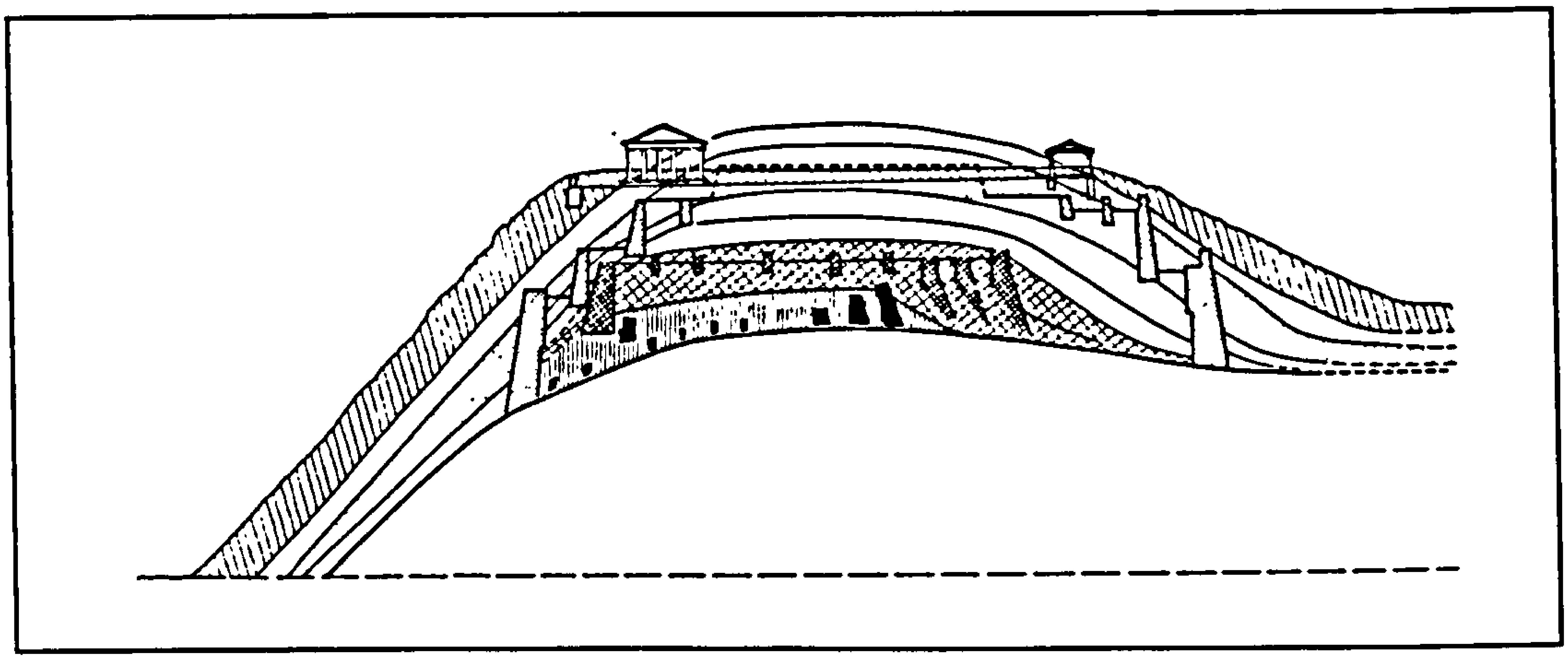

Figure 6 Schematic sketch of the different strata of the *tell* at Hissarlik (Troy)

second city was identified as the Homeric Troy. In 1882 the German architect Wilhelm Dörpfeld became his assistant and suggested that the *tell* at Hissarlik consisted of nine consecutive strata with Troy VI being the Homeric Troy.[83] In the 1880s a reliable system of comparative dating of archaeological strata was still missing. The different settlement strata had been identified and the excavated pottery was of a type which had no parallels in the classical world. Thus, it was impossibility to link any of the successive strata at Hissarlik to absolute dates.[84] Obviously, the principles of stratigraphy were observed but their practical application featured still some imperfection and the lack of comparative data has not allowed for unchallenged interpretation.

[82]Trigger, 1989, p. 197 and compare: Aşkin, 1988, p. 6 ff.

[83]Daniel, 1981, p. 126. In the 1930s the American archaeologist Blegen suggested Troy VIIa to be the Homeric Troy.

[84]Cottrell, 1953, p. 93.

Schliemann had the strata from which an artefact came carefully noted and he had the artefacts recorded and photographed.[85] He understood that the stratigraphy of the site provided the chronological information related to the artefact. However, his excavations still focussed on the artefact rather than on the site as a source of information and, thus, Schliemann's excavation methods were often considered ruthless.[86] It is supposed that much of the scientific excavation methods which were employed later in Schliemann's excavations were due to Dörpfeld rather than to Schliemann.[87]

Arthur Evans was compared frequently with Heinrich Schliemann and it has been suggested that they were like-minded. There were indeed striking similarities. Both Schliemann and Evans were wealthy. They had the necessary funds to buy the sites they excavated and could conduct excavations on a large scale. Furthermore Evans, like Schliemann, had a central idea he pursued when excavating the sites. Schliemann wanted to prove the *Iliad* and the *Odyssey* right and he succeeded by excavating Troy and Mycenae. Evans wanted to find the writing system of the Bronze Age Greek society and discovered the Palace of Minos. Both Evans and Schliemann were driven by a great idea and frequently criticised for this. Finally, many scholars have suggested that Evans' excavation methods were, like Schliemann's, unscientific and wrong.[88]

Evans had visited many of Schliemann's excavations and met him personally in Athens in 1882 where he appreciated the bead seals and signet rings shown to him.[89] As noted above, Schliemann had intended to excavate Knossos but was not successful in obtaining an excavation permit from the Turkish authorities or acquiring the site.[90] However, this meeting furthered Evans' interest in Greek prehistory and the island of Crete.

[85]Daniel, 1975, p. 169 and Fitton, 1995, p. 65.

[86]For example Fitton, 1995, p. 61 ff and Daniel, 1975, p. 167 f.

[87]Cottrell, 1953, p. 87, Fitton, 1995, p. 99.

[88]For Example: Hitchcock, 1994.

[89]Evans, 1943 p. 263.

[90]Fitton, 1995, p. 102 and Brown, 1994, p. 13.

Wilhelm Dörpfeld was a contemporary of Evans. Born 26 December 1853 in Wuppertal-Barmen, Germany, he studied architecture and became an assistant to Ernst Curtius at the excavations at Olympia in 1877. He was responsible for the financial affairs which included payments to up to 350 workers.[91] His approach to antiquity was from an architectural history perspective.[92] In 1882 he became Schliemann's assistant and contributed to the excavation at Troy the scientific methodology which he had acquired at Olympia. In 1887 he became the first director of the German Archaeological Institute in Athens, a position which he held until 1911. After Schliemann's death in 1890 he continued the excavations at Troy until 1894; and between 1900 and 1911 he excavated at Pergamon together with Alexander Conze. In 1902 he built the excavation house of Pergamon on top of the remains of the excavated 'House I' reusing the layout of the ancient structure.[93]

Dörpfeld's main achievement was certainly the integration of systematic architectural history into archaeological thought. However, unlike Evans and Schliemann, he was not able to finance excavations himself but had to earn his living by working on excavation sites. Both Curtius and Schliemann employed him for his excavation skills and for his training as an architect with specialisation in architectural history. German scholars were particularly fortunate in this period because the German Archaeological Institute employed scholars in countries like Greece and gave grants towards excavation projects. Some of the excavations which Dörpfeld conducted himself were financed by the German Archaeological Institute, while others, as at Leukas, were financed by donations.[94] But all were very accurate and to the highest contemporary standards. Dörpfeld's reputation within the scholarly world of archaeology depended on the quality of his research rather than the number of finds he could produce.

[91] Radt, 1988, p. 346.

[92] Gorys, 1989, p. 35 f.

[93] I know the house from my own experience, having stayed there in 1990 for three months. The main building is placed in the peristyle while other rooms of the ancient building have been reconstructed to serve as bedrooms for the excavators. Compare: Radt, 1988, p. 124 ff. See plate 218.

[94] Gorys, 1989, p. 25 and Daniel, 1975, p. 166. The Institute was founded 1829 in Rome by artists and diplomats but soon moved to Berlin and, from 1859 was financed by the Prussian government. In 1874 the German Empire took over and offices were established in Athens (1874), Cairo (1897) and Istanbul (1899).

Evans met Dörpfeld for the first time in February 1892 in Athens and subsequently the two men became friends. It is said that Evans called Dörpfeld "Schliemann's greatest discovery".[95] Without doubt, Evans held Dörpfeld in high esteem and valued his opinion.[96] Dörpfeld visited the site of Knossos for the first time with Schliemann in 1886[97] and returned frequently to the site alone and with travel groups after Evans began excavations in 1900.[98] Wilhelm Dörpfeld spent almost all of his professional life excavating sites in Greece and Turkey and he had the expertise which Evans was lacking when he began at Knossos. It can be assumed that Dörpfeld's approval of the methods of excavation, reconstruction and interpretation of the finds at Knossos were very important for Evans.

The English archaeologist William Matthew Flinders Petrie was born 3 June 1853 in London and, thus, is another contemporary of Evans and Dörpfeld. He began his work as archaeological surveyor in Britain while researching Stonehenge, but he is best known for his work in Egypt.[99] In 1883 the Egyptian Exploration Fund was founded in London and Flinders Petrie became its field director. He excavated at many sites such as Sakkara, Tell el-Amarna, Gurob and Kahun.

Archaeological interest in Egypt started with Napoleon's conquest of the country in 1798.[100] After Champollion's decipherment of the hieroglyphs in 1822 it was possible to read the Egyptian inscriptions and, consequently, to establish a sequence of the Pharaonic dynasties. This allowed for a dating of Egyptian sites by the means of their inscriptions.[101] Petrie developed the system of modern stratigraphy, which allowed the

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[95]Cottrell, 1975, p. 87.

[96]Interestingly, when Evans proposed the term Minoan for the newly discovered prehistoric culture on Crete at the archaeological congress in Athens 1905 he ignored Dörpfeld who thought the name of a legendary King may be inappropriate to describe a culture extending two and a half millennia. Daniel, 1975, p. 192.

[97]Fitton, 1995, p. 123 and Evans, 1943, p. 313.

[98]Compare Evans, 1943, p. 301. These travel groups were known as 'Inselreise'. Maria Lathbury, later to become John Evans's third wife, was a member of such a travel party in 1892.

[99]Gorys, 1989, p. 49 f.

[100]Daniel, 1975, p. 21

[101]Trigger, 1989, p. 200.

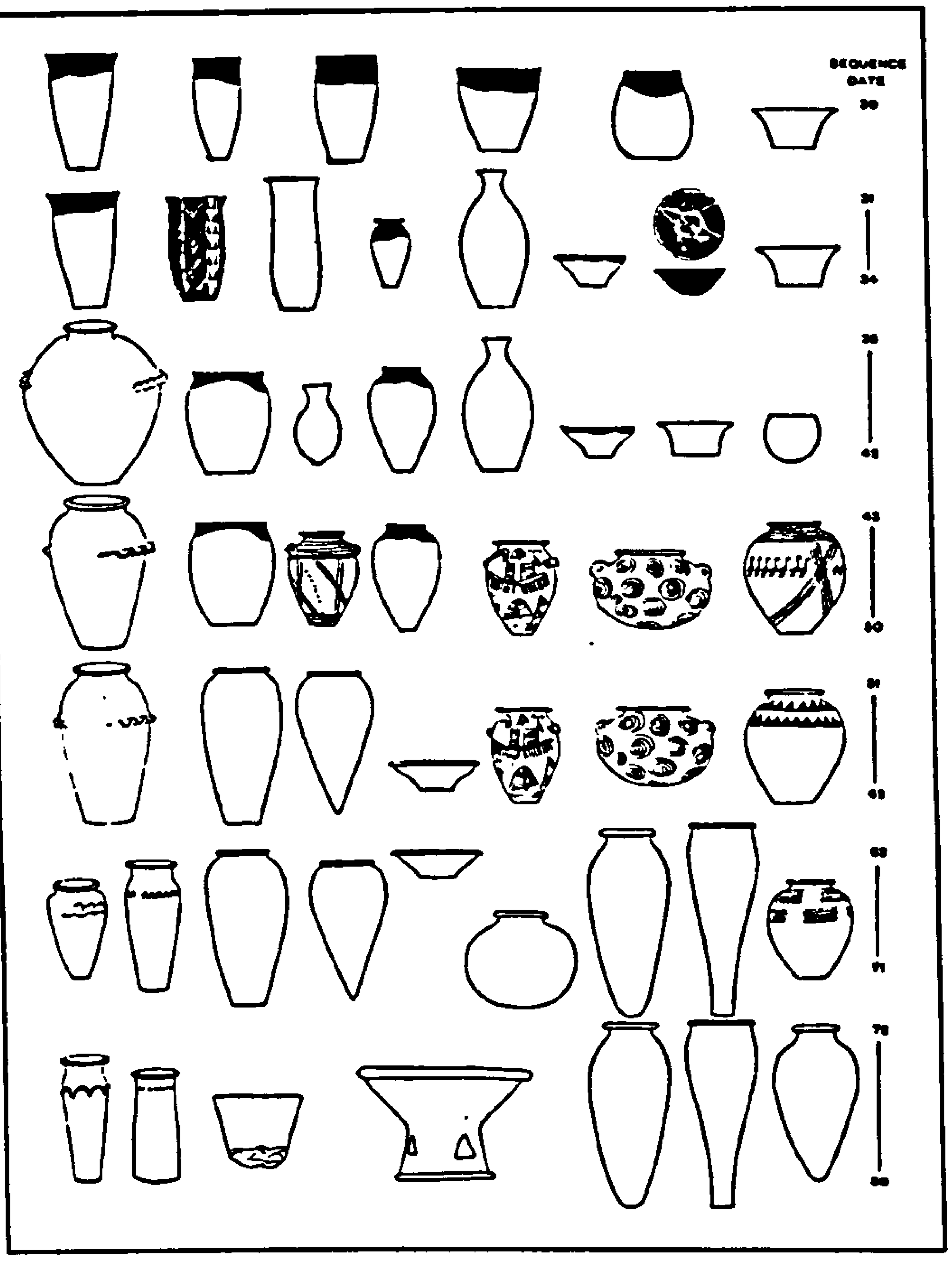

Figure 7 Pottery of successive periods in Petrie's predynastic sequence.

dating pottery and other small finds in successive sequences, so to speak in a relative chronology of pottery types.[102] The combination of the two sequences provided an absolute chronology for finds which were not accompanied by inscriptions. Furthermore, it allowed newly found pottery to be dated to one phase or a few subsequent phases of the chronology. In 1891 Petrie visited Mycenae where he compared Aegean pottery found at Gurob and Kahun sites with the local material and he dated Egyptian objects which were found at Mycenae.[103] Trade in pre-historic times brought Egyptian artefacts to the neighbouring countries and, in exchange, goods from these countries to Egypt. Thus, links between the Egyptian chronology, which could be dated in absolute terms, and the prehistoric Greek chronology could be established. Gradually the relative system of chronology could be transformed into an absolute system which provided quite accurate dates for various pottery types. This system is still in use today.

The importance of Petrie's work for Minoan archaeology is that it provided the fixed points of the chronology.[104] In fact, Evans frequently refers to Petrie in the *Palace of*

[102]See figure 7.
[103]Daniel, 1981, p. 118, Petrie, 1890, p. 273 ff. and Waterhouse, 1986, p. 10 f.
[104]First mentioned Evans, 1900, p. 27.

Minos.[105] However, Petrie also advanced archaeological excavation methods.[106] In 1904 he published a small book, *Methods and Aims in Archaeology*, in which he stated:

> "Archaeology is the latest born of the sciences. It has but scarcely struggled into freedom, out of the swaddling clothes of dilettante speculations. It is still attracted by pretty things rather than by real knowledge. It has to find shelter with the Fine Arts or with History, and not a single home has yet been provided for its real growth."[107]

However, the aims of archaeology were still focussed on the information which could be published and on artefacts. He wrote:

> "The two objects of excavation are (1) to obtain plans and topographical information and (2) to obtain portable antiquities."[108]

He understood that the process of excavation is destructive, and that this process cannot be repeated. If the earth and all the artefacts it contained are once removed, their original context can never again be established. Therefore, he demanded that all information connected with an artefact had to be recorded carefully. He dedicated a chapter in his book to archaeological ethics in which he talks about this process of destruction and the responsibility of the excavator to the public. Furthermore, he demanded that sites should not be restored but that they should be conserved for future generations. The position of groups of finds in chambers or graves should be recorded and published, and generally all finds should be published within one year.[109] These demands seem very modern.

Like Dörpfeld, Petrie relied on the income from his employers, the Egyptian Exploration Fund and later the Egyptian Research account and his professorship at University College London.[110] He was not able to purchase sites like Schliemann and Evans. His education,

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[105]For Example PM I, p. 193 ff and 286 ff, PM II, p. 22 ff and 192 ff.
[106]Daniel, 1975, p. 288 f.
[107]Petrie, 1904, p vii.
[108]Ibid., p. 33.
[109]Ibid., p. 169 f.
[110]Gorys, 1989, p. 49 f.

his scientific approach and his aims were closer to Dörpfeld than to Schliemann or Evans. Evans and Petrie certainly met, yet no correspondence between these two keen letter-writers has survived, if it ever existed. It is difficult to say to what extent Petrie's ethical considerations in archaeology influenced Evans's actions at Knossos.[111]

This short summary of three excavators who were contemporaries of Evans and who influenced his work shows the development of archaeology at this time. The system of patronage had dominated archaeological research until the end of the nineteenth century. Archaeology was not a way to earn money but rather was the interest of wealthy people such as Pitt-Rivers, John Evans and Schliemann. Obviously the quality of their scholarship varied, but common standards began to form with the encouragement of scholarly societies such as the Royal Society, the Society of Antiquaries or the German Archaeological Institute.[112] In Germany, where government funding created a comparatively good environment for scholars, patronage was of a lesser concern than in Britain. Here, funds were set up for specific purposes such as the Palestine Exploration Fund, Egyptian Exploration Fund, Cretan Exploration Fund and the School of Archaeology at Athens.[113] These groups relied on donations from the public and the availability of funds depended on economic circumstances.[114]

Archaeology was changing from an adventure for rich people to a profession for scholars. People like Evans and Schliemann had money and could afford large-scale excavations. But at the turn of the century a new breed of archaeologist had arrived who worked more carefully and slowly.[115] These new archaeologists had no money, but they did have the skills and the knowledge to conduct archaeological excavations in a modern

[111]Dr J S Phillips, University of Cambridge in an e-mail communication 5 March 1998. Dr Phillips suggested that specific archaeological methods at Knossos followed closely Petrie's example or were directly influenced by him.

[112]For the roles of the societies in this development see: Emerick 1997.

[113]Compare MacEnroe, 1995, p. 6. MacEnroe argues that the creation of the individual institutes and funds for different geographical research areas reflected the dominance of the diffusion theory in the Mediterranean while the evolution theory was dominant in northern Europe.

[114]See Waterhouse, 1986, who describes the up and downs of the financial situation of the British School at Athens.

[115]Compare Horwitz, 1981, p. 214 f.

sense and to interpret their results. At Knossos, Mackenzie represented the latter group. Evans, who was certainly not ignorant in archaeological matters, understood the necessity to employ an expert like Mackenzie, and later Pendlebury, for his work.

1.3 Contemporary Conservation Thought

1.3.0 Introduction

Like archaeology, conservation is a rather young discipline and many of the scholars who promoted the development of archaeology were also involved in the development of modern conservation philosophy. Archaeology provided the material sources for the study of the past and the aim of conservation is to preserve these sources. The main issue in the development of a modern understanding of conservation is the principle of authenticity. The following paragraphs will sketch the development of conservation until 1900, with a particular focus on the conservation of archaeological sites. Naturally, this overview will be very short and interested readers are asked to consult the relevant detailed literature.[116]

1.3.1. Overview of the Development of Conservation

The idea of conservation stretches back to the Renaissance when artists and architects became interested in the architecture and the ruins of ancient Rome and Greece. It became obvious that in order to study the past it had to be preserved. Subsequently, architects, artists or art historians were appointed by patrons to look after monuments as was the case with Raphael who was appointed by Pope Leo X in 1516. Successive

[116] I have consulted the unpublished PhD thesis of Jukka Jokilehto which provides a good account of the development of conservation theory. The books of Ruskin, 1849, Brown, 1905, and Powys, 1929, which were written in the period when Evans worked at Knossos are recommended. Surprisingly, no recent publication tackles the historic development of conservation but Chamberlin, 1979, and Thompson, 1981, give good overviews. Schmidt, 1993, is a good account on the conservation of archaeological monuments.

popes followed this example and many rulers issued decrees for the protection and conservation of historic structures, sites and monuments.[117] However, it was not until the nineteenth century that there began a theoretical discussion on which values historic structures possess and how they should be best conserved.

At this time the dominant influence on architectural style in central Europe was historicism and, as far as ecclesiastical buildings were concerned, Gothic revival in particular.[118] In order to construct new churches in the Gothic style, medieval buildings were carefully studied and a comprehensive knowledge of the evolution of Gothic style, its ornaments and its construction technology, was acquired. This new knowledge was not exclusively used for the construction of new buildings; it was also employed to restore existing structures. It was believed that the new understanding of the past allowed for the removal of later additions and inherited shortcomings of the existing building and the revelation of the purified originally intended design.[119]

A conflict between two different values which were inherent in historic structures was discovered quickly. For many architects of the restoration movement the historic buildings were intended to be seen in their perfect form. The meticulous study of the remains, which included archaeological excavations and buildings archaeology in the modern sense, revealed the original plan of the building. They had no doubts that their research provided a comprehensive and complete understanding of the past. This, they believed, enabled them to reconstruct the buildings and also imposed the obligation to reestablish the original beauty of the structure.[120] Opposed to this view were the considerations of the conservation movement. To them the most important inherited value of such a structure was its value as an historical document. The original fabric

[117]Petzet and Mader, 1993, p. 13

[118]Interestingly, architects and architectural historians from England, France and the German countries declared the Gothic style to be the best style for church architecture and the most appropriate national style for their respective countries. Exceptionally, Heinrich Hübsch in Karlsruhe, Germany, proposed 'Rundbogenstil' (neo-Romanesque) to be more appropriate.

[119]Compare Emerick, 1997, p. 55 f. See also Schmidt, 1993, p. 17 ff.

[120]See Schmidt, 1993, p. 17 ff, Petzet and Mader 1993, p. 16 f, Emerick, 1997, p. 52 ff.

witnessed the age of the building and every repair, every alteration and even an imperfect original design had to be regarded as part of the history of this structure. The restoration of a structure destroys its value as a historic document and leaves it as it was perceived by the restoration architect. In order to be of any value for the study of the past, the structures have to be authentic. Many of the historic structures were in need of repair but, in contrast to the restoration movement, the architects of the conservation movement proposed to conserve and repair the structures - but not to restore them to their supposed former glory.

The conservation movement in England was spearheaded by John Ruskin and William Morris. They claimed that constant care and repair of ancient buildings will render restoration work unnecessary. This finally resulted in the foundation of the Society for the Protection of Ancient Buildings (S.P.A.B.) on 22 March 1877, of which John Evans's friend, John Lubbock, was one of the founding members.[121] The aims of the Society were laid down in a manifesto written by William Morris which argued for respect for old buildings, minimal intervention and regular maintenance. Thus, the basic principles of modern conservation were developed. However, the conflict between the conservation movement and the restoration movement continued for several more decades.

The legislative situation in Britain changed with the introduction of the *Ancient Monuments Act* on 18 August 1882.[122] The act applied to standing stones and prehistoric monuments but medieval monuments such as the ruins of monasteries were not included. The implementation of the law was preceded by a long and controversial debate, concerning to what extent the government should be allowed to interfere with private property rights for the sake of the preservation of cultural heritage. Since all these monuments were in private ownership, the state should have only limited powers of interference.[123] In 1913 a new law was introduced which covered medieval structures

[121]Jokilehto, 1986, p. 322. See also Evans, 1943, p. 156 who mentioned that Lubbock brought forward a bill for the protection of ancient monuments in 1876.

[122]This was the bill for which John Lubbock was fighting so long. Compare page 69.

[123]See Jokilehto, 1986, p. 328.

such as the ruins of monasteries as well as prehistoric monuments. Then, it was decided that the state should assume *guardianship* of a monument, which means the state took on the responsibility for the maintenance and management of the structures and could undertake necessary repair without having to request permission of the owner.

The development of conservation thought did not occur in England independently from the continent. France, Italy, Austria and the German countries experienced similar restoration movements to Britain and also reacted by founding conservation movements. In Austria the art historian Alois Riegl defined the intrinsic values of historic structures in 1903, and in 1905 Georg Dehio formulated the principles of conservation in Germany.[124] The contemporary continental efforts were closely watched and analysed by British conservators, and cross-fertilisation between the different countries took place.[125]

At the end of the nineteenth century the importance of the restoration movement gradually declined while the conservation movement gained influence. Historic structures or places were no longer seen exclusively as picturesque sites but also as historic documents of the past. Authenticity had been recognised as an important value of an historic document.[126] The main principles of conservation were established and laid down in documents such as the manifesto of the S.P.A.B. but it took some time until they were codified in the law and universally applicable to all historic structures of import. The change from restoration to conservation was a slow process and for a long time both existed simultaneously.

1.3.2 Discourse: St. Alban's Cathedral

This short discourse illustrates, through the example of St Alban's Abbey, Hertfordshire, the different British approaches to conservation towards the end of the nineteenth

[124]Petzet/Mader, 1993, p. 17 f.
[125]See Brown, 1905, specifically p. 8 ff.
[126]See Stevenson, 1881.

century. This is a particularly interesting case study because it reflects the typical conflict between the restoration and the conservation movement at this time; but it is also significant because it involved John and Arthur Evans. According to the legend, Alban, a Roman of noble descent, was killed while he protected a Christian priest during the prosecution under the Emperor Diolectian in the early fourth century. A monastery was founded at the site of Roman Verulamium, the place of his martyrdom, in the eighth century by King Offa of Mercia and was comprehensively renewed after the Norman conquest in 1066. The main building material was, typically for this area, brick and flint; much of the material was taken from the ruins of the Roman town.[127]

As early as 1856 it had been established that the Abbey of St. Alban's needed repair and collections produced £4,000. Sir George Gilbert Scott was appointed architect and directed the restoration works until 1877.[128] In 1871 the tower of the church was pronounced unstable and immediate action became necessary, but only an additional £3,000 was collected.[129] In 1877 the diocese of St Albans was created and the church became a cathedral. It was suggested that the state of the building was unsuitable for its new function and that it should be improved. Sir Edmund Beckett (later Lord Grimthorpe) offered to finance this work but did not limit his role to that of a benefactor. He took an active part in the decisions of how to restore the cathedral.

At St Alban's Cathedral, two issues were of specific concern; one of which later became known as the 'battle of the roofs', the other was the west front. St Alban's possessed a low-pitched timber roof with a high percentage of original timbers. Instead of repairing the roof in its original form, Beckett insisted that the roof had to be replaced with a high pitched one. Since he was financing the restoration he was able to convince the bishop that the fifteenth century roof should be replaced with a new high pitched roof.[130] The second problem arose when Beckett suggested that the west front of the cathedral

[127]Schäfke, 1983, p. 248 f.
[128]Schäfke, 1983, p. 267.
[129]Evans, 1943, p. 151 f.
[130]Compare plate 229 and 230.

needed to be replaced. He requested that a faculty be granted to him personally to restore the west front as he chose.[131] The main objection to this proposal was that Edmund Beckett was no architect.[132] The west facade featured a large window in the Perpendicular style which Beckett claimed to be "one of the ugliest in Britain", and that it never had "any business to be there at all".[133] He declared that most of the other windows in the church had been executed in the Decorated style and, consequently, he replaced the west window with a completely new one in 1879 according to his own design in this style. Beckett defended himself by saying that he only removed parts of genuine Gothic fabric which were unfit to last but he also claimed, for example, that the west front had "ceased to exist as architecture and became brick wall long ago".[134] To him it seemed no sacrilege to remove parts which were stylistically not part of the original pure design.

St Alban's is one of the extreme examples of the negative influence of patronage in England at this time. In the early 1870s John Evans was elected to various county committees in Hertfordshire and, therefore, was almost inevitably involved in the proposed restoration plans for the Abbey. He strongly opposed Beckett's plans for the restoration but could not convince the bishop. Fanny Phelps, his second wife, reported the events at St Alban's to Arthur Evans who was in the Balkans at this time.[135] Arthur sided with his father's position and in 1885 wrote to his father-in-law, E. A. Freeman stating how disgusted he was by Beckett's work. He described how he observed workers picking Roman tiles from the walls and replacing them with modern bricks.[136] Clearly, Arthur Evans and his father were both supporters of the conservation movement and were opposed to the restoration movement, as were their friends such as E A Freeman and John Lubbock.

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[131]Evans, 1943, p. 152.

[132]Jokilehto, 1986, p. 321 f.

[133]Stevenson, 1881, p. 187.

[134]Stevenson, 1881, p. 187. According to Schäfke, 1983, p. 267 he even modelled for the carving of a statue of an angel for the West Facade.

[135]Evans, 1943, p. 152 f.

[136]Ibid., p. 153.

1.3.3 Conservation at Archaeological Sites

The development of conservation at archaeological sites is not congruent with that of building conservation.[137] Schmidt argues that frequently the theoretical conception of conservation at archaeological sites was more advanced than for buildings.[138] Unlike living buildings, excavated ruins were no longer in use and did not need to comply with user's requirements.[139] The approach to conserving these structures was not encumbered by utilitarian considerations and, furthermore, the ruined sites in the landscape were appreciated because of their picturesque values. This idea of a picturesque ruin in a landscape had a long tradition, and artificial ruins were built in eighteenth and nineteenth century parks.[140] To conserve ruins in the landscape was commonly accepted practice.

Under the *Ancient Monuments Protection Act* General Pitt-Rivers became the first Inspector of Ancient Monuments in 1882. Pitt-Rivers, already cited as a pioneer in the practice of excavation, also laid the foundations for the integration of conservation measures into the excavation of archaeological sites.[141] The conservation work at his excavations at Cranborne Chase between 1887 and 1898 became the common standard. After Pitt-Rivers' death in 1900, the position of the Inspector lay vacant for ten years and was finally filled by Charles (later Sir Charles) Peers in 1910.[142] The conservation philosophies of these two men dominated the approach to conservation at archaeological sites in Britain at the time Evans excavated Knossos.

Peers' approach was to freeze the monuments in time. He regarded ruins as dead features in the landscape which have nothing added to their history. He chose to present one

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[137]For a detailed discussion of this topic see the forthcoming dissertation of Keith Emerick at the Department of Archaeology, University of York. I am grateful to Mr. Emerick for many conversations in which he explained the development of conservation and archaeology at this time in Britain.

[138]Schmidt, 1993, p. 11.

[139]See also: Peers in Reply to a paper by Forsyth in: Forsyth, 1914.

[140]See for example Schmidt, 1993, p. 47 ff for Germany and Thompson, 1981, p. 13 for Britain.

[141]Thompson, 1981, p. 21.

[142]Ibid.

significant period of the monument's history while suppressing others. This principle of telling only one storyline added to the legibility of the structure's plan. Even unskilled visitors were able to understand the historic structure. These standards, set by Peers and the Office of Public Works, were widely exported to the countries of the British Empire and frequently were more effective in those countries because private property rights were less developed than in Britain itself. [143]

However, a distinction must be drawn between the picturesque roofless ruins, which always were a feature of the British and other European landscapes, and sites in the Mediterranean which were completely new excavations. At Olympia or Pergamon, remains of ancient buildings were still visible on the surface and the location of the ancient city was never disputed but, at Troy and Knossos, no standing feature indicated the existence of ancient structures. Most of the excavations at these new sites exposed multiple strata of historic settlements which had constantly re-used earlier building material and foundations. Generally speaking, few extensive structures exhibiting picturesque qualities similar to the English ruined monasteries and castles were preserved.[144] Consequently, many of the early conservation ideas for excavations in the Mediterranean focussed on the artefacts rather than on the site itself. Petrie suggested an excavation method which would allow for the discovery of artefacts but which would rebury the site immediately after exposure:

> "But far the more economical and rapid work is that of turning over whenever practicable. If a site has not been often rebuilt upon, the way is to start by a long clearance at one edge; and then a line of men steadily cut from one side of the trench and throw back on the other, so that the trench moves across the whole site, and every pound of earth is turned over."[145]

Obviously, Petrie's concern was of an exclusively scientific nature. He conducted detailed work in order to discover the entire plan of the settlement and the artefacts in the earth.

[143]See Emerick, 1997, p.
[144]We will see later on in this thesis that the site of Knossos was distinctively different in this aspect.
[145]Petrie, 1904, p 43.

He was not concerned how the site looked after completion of the work. The display of the artistically important features was reserved for the museum environment. He suggested removing carved blocks and other architectural features from the site to the museum and reburying the site.[146]

Nonetheless, Petrie had in many aspects a good understanding of conservation issues. He stressed that not only artefacts which were regarded as beautiful pieces of art had to be preserved but that the intrinsic information value of all finds is important in order to understand the past. He criticised the way in which the information from archaeological sites was presented in contemporary museums:

> "Yet another all-important matter for the systematic archaeology of the future must be here mentioned, especially as it greatly affects the future schemes of field-work. The first requirement for systematic work of study is material sufficient to work on. And to provide this there must be both discovery and conservation. During the last century there has been a gradual growth of archaeological perception; and in place for only caring for beautiful and striking objects there has arisen some interest in whatever can throw light on the past civilisations. But unhappily the ideas of conservation have not kept pace with the work of discovery. The present system of museums is the most serious bar to the progress of archaeology. The building which is the mere modern shell, of no interest, and often no beauty, is the master of the collection which is restrained and crippled by such conditions that its use is impaired and its growth is stopped. The past is vanishing before our modern changes yearly and daily. There is ever less and less to preserve. And everything possible must be garnered before it has entirely vanished. The present has its most serious duty to history in saving the past for the benefit of the future."[147]

At the turn of the century most of the Mediterranean countries, including Egypt where Petrie worked, had monuments protection acts, and the period when antiquities could be taken for the benefit of museums in the excavator's home country such as in Berlin or London had passed.[148] However, newly excavated sites were not necessarily regarded as

[146]Petrie, 1904, p. 105. It must be noted that Petrie worked predominantly in Egypt where archaeological finds were displayed in the Cairo Museum and where the artefacts could not be taken abroad.

[147]Ibid., p. 130.

[148]Brown, 1905, p. 222, see p. 238 ff for Egypt.

monuments, and frequently after sites were exposed they were left without any protection while the movable finds had been transported to museums. Two reasons may help to explain this attitude. First, mass tourism had not yet been developed and many of the excavation sites were located in areas which were not easily accessible. A need to develop the site for visitors was not seen by the excavators. Second, at many of the Mediterranean excavation sites the remains of the structures which were exposed in the excavation process were quite durable. Timber beams and other degradable materials had rotted long before and the stone remains were in no danger of immediate collapse. Some consolidation work was executed, but comprehensive conservation of the excavated structures was not regarded as necessary.[149]

The Acropolis at Athens was one of the monuments which experienced comprehensive conservation treatment at the end of the nineteenth century, slightly before Arthur Evans' work at Knossos. This conservation work was discussed at the First International Congress of Archaeology in Athens in 1905 which was attended by Evans and, thus, it must be suspected that Evans was well informed about the work executed at the Acropolis and has seen it.[150] Therefore, the work at the Acropolis will be discussed as an example of slightly earlier comprehensive conservation work in an area close to Knossos.

1.3.4 Discourse: The Restoration of the Acropolis at Athens

Unlike Knossos the buildings at the Acropolis were not excavated but have been exposed ever since they were first constructed. The Parthenon, the main temple on the Acropolis hill, underwent a number of alterations. It was destroyed by fire, most likely in late Roman times, and converted into a Christian Church by the end of the fourth or beginning of the fifth century.[151] The Christian church covered only the area of the *naos*

[149]See Schmidt, 1993, p. 59 ff. He discusses conservation work at archaeological sites in Italy and Greece before 1900 which were in the tradition of picturesque ruins.

[150]Jokilehto, 1986, p. 420.

[151]Korres, 1994d, p. 140 - 141.

and left the *pteron* open to the sky. An apse was added at the *pronaos* (east side of the cella) and a square tower was added at the *opisthodomos* (western portico) while the *opistnaos* was converted to a *narthex*. A pitched roof with dormer windows was added[152]. Two years after the conquest of Greece by the Frankish troops of the Fourth Crusade in 1204 the Parthenon was converted by Papal Bull into the Catholic Church of Our Lady.

In 1456 the Turks besieged Athens, and the last Duke of Athens departed two years later. Subsequently the Parthenon was converted into a mosque in 1460. The church tower was reduced in height and a new minaret added[153]. Besides the roof, the basic structures survived until the second Venetian -Turkish war. Venetian troops attacked Athens and the Turkish troops retired to the Acropolis. After a bombardment of four days a grenade struck the Parthenon on the evening of 26 September 1687. The grenade ignited the

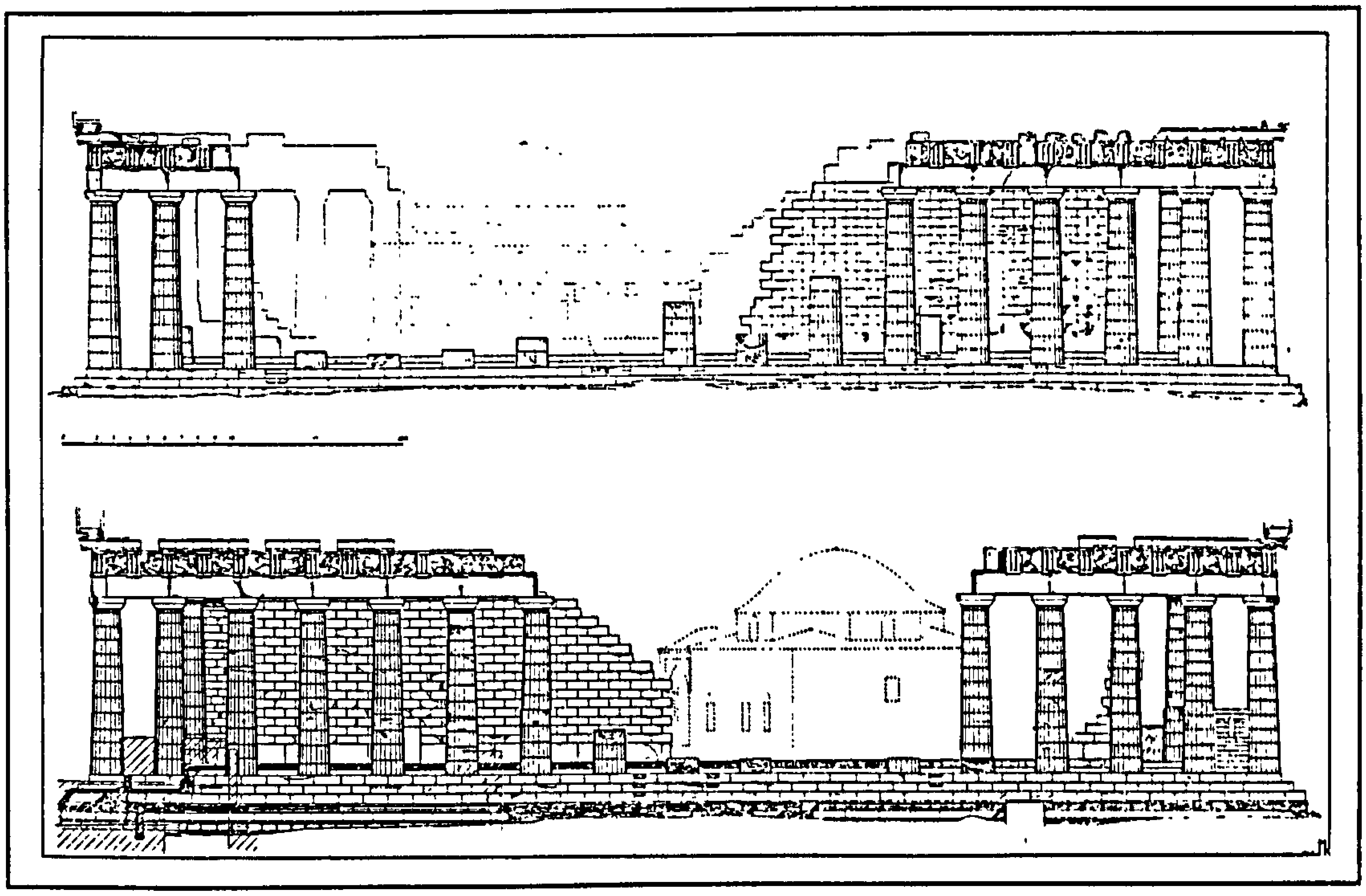

Figure 8 The Parthenon with the small new mosque in the *cella*. Drawing by M. Korres.

[152]Korres, 1994d, p. 146 - 147.
[153]Ibid., p. 150.

stored gun-powder in the building and the entire central part of the Parthenon exploded. A new, smaller mosque was built later at a unknown date in the ruins facing Mecca and, therefore, did not follow the east-west orientation of the ancient temple. In 1802 Lord Elgin removed the marble frieze of the *pediments* and, in this context, took off some two metres in height. Twenty years later more damage was done by Turkish troops besieged at the Acropolis in the Greek Liberation War which lasted from 1821-1829.[154]

In the early nineteenth century Greece saw three intellectual movements which found their focus in the Parthenon. In central Europe neo-Classicism in architecture started in 1793 with the Brandenburger Tor by Langhans in Berlin. William Inwood built St Pancras Church in London (1818 - 1822) replicating elements of the Erechtheion.[155] Leo von Klenze (1784-1864) was architect to the Bavarian King Ludwig I (1786-1868), 'an art lover and devotee of things Greek'[156], and later to Maximilian II (1811-1864). Maximilian's brother Otto (1815-1867) became King of Greece in 1832. Leo von Klenze became a leading architect in the Classicism movement in Bavaria and also executed work for Otto in Athens. On the banks of the Danube near Regensburg he built the Wallhalla (1830-1842), a memorial for great Germans of the past (Leibniz, Schiller, Gluck, Mozart [sic], etc.). While the name 'Walhalla' was derived from the Nordic legends[157], the form of the building is an almost exact copy of the Parthenon. Parallel to and interwoven with it, was a growing interest in the antique and archaeology as already outlined above. The third intellectual movement, focussing on the Parthenon, was the struggle of Greek nationhood culminating in the war of independence (1830-1842). After centuries under Ottoman rule and the suppression of all things Greek, the Greek people intellectually had to define their nationhood. The obvious focal point of such a new nationality found its expression in the Parthenon, representing in a matchless perfection the great classical past of Greece.

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[154]Korres, 1994d, p. 156.

[155]Middleton and Watkins, 1987, p.95.

[156]Kondaratos, 1994, p. 44.

[157]According to Norse Mythology, Walhalla is the place where the slain heroes celebrate their feasts. See: Middleton and Watkins, 1987, p. 102.

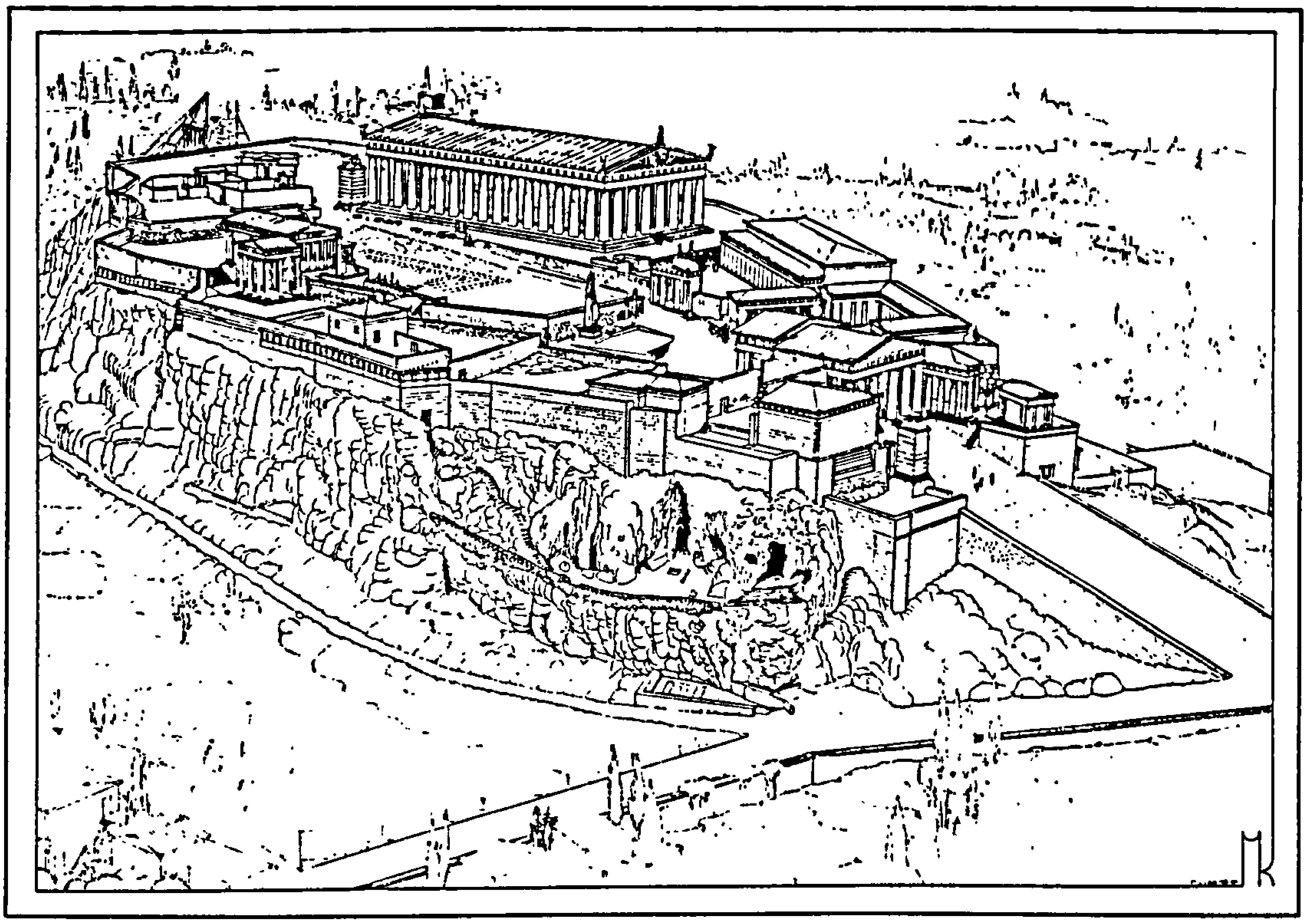

Figure 9 The Acropolis of Athens in Classical times. Reconstruction by M. Korres.

These three intellectual strings - the growing interest in classical architecture, the 'new' discipline of archaeology and the re-established Greek state found their focus in the increasing interest in the Acropolis and, especially, in the Parthenon.[158] Several minor repair and restoration works were undertaken between 1834 and 1872[159] but after the Earthquake in 1894 and the subsequent report by Josef Durm in 1895[160] major work was undertaken. In 1898 Nikolaos Balanos, who graduated as an engineer from the *École des Ponts et Chaussées* at Paris, started his restoration work at the Acropolis which continued for more than forty years.[161] Balanos coined the term *Anastylosis*, which later was adopted at the Athens Meeting in 1931, to describe his work. Antique fragments

[158]See also: Bouras, 1994, p. 324.

[159]See Tournikiotis, 1994, Appendix 1.

[160]Durm, 1895. Durm suggested some of the reconstructions later on executed by Balanos. Durm was besides the architect Francis Crammer Penrose (sometime director of the British School at Athens) and Lucien Magne member of the committee charged with the supervision of the restoration at the Acropolis.

[161]Schmidt, 1993, p. 81.

were collected and put back to their original locations and missing parts were replaced with new marble pieces. New elements were to be used only where necessary for structural reasons and it was agreed that they must be clearly labelled. Balanos executed the first phase of his reconstruction work at the western part of the Parthenon (1898-1902) according to this concept but already at the restoration work of the Erechtheion (1902-1909), he continued far beyond the limits outlined above.[162] Balanos continued working at various parts of the Acropolis until 1939.[163]

Balanos used the existing fragments from the site to reconstruct columns and architraves. Where parts were missing, newly carved marble pieces were fitted in the gaps. Naturally, this collection of original and replaced marble fragments was not fit to carry load and, consequently, Balanos inserted iron-beams in the structure and fixed the marble fragments to them. Modern criticism of Balanos's work focuses on two issues: first the recreation of a picturesque ruin and, second, the use of iron girders.[164] Much of the ancient building material of the Acropolis's structures were dislocated from their original context but survived nearby. Balanos employed this material to recreate the temples of the Acropolis in more or less their present form.[165] For example, only the eastern and western end of the Parthenon survived *in situ* up to Balanos's time. He reconstructed the northern and southern colonnades and recreated the complete *pteron*. Balanos's aesthetic perception of a classical ruin determined his approach to the reconstruction on site.[166] However, Schmidt argues that Balanos's interventions, set against the measures of their time, were acceptable because they did not go beyond the limits set by the availability of ancient material. Furthermore, there were few new parts and all were easily recognisable.[167]

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[162]Schmidt, 1993, p. 82 - 83.

[163]Mallouchou-Tufano, 1994, p. 81.

[164]See for example Mallouchou-Tufano, 1994, p. 78 ff and Schmidt, 1993, p. 77 ff.

[165]Mallouchou-Tufano, 1994, p. 82. The modern CCAM interventions have executed a considerable amount of work but have generally speaking refrained from changing the general appearance of the site.

[166]Ibid., p. 82.

[167]Schmidt, 1993, p. 87.

The technical execution of the work, assessed from a modern point of view was disastrous for the structure. Iron clamps were used to join stone blocks together and iron girders recreated the structural function of the architraves. This construction proved to be the Achilles-heel of the reconstruction work at the Acropolis.[168] The iron was originally sheltered from the direct influences of the weather by cement capping, but due to the gradual aging process and to temperature-related expansion and contraction, the cement capping on top of the architraves cracked in succeeding years. Water penetrated the structure and, consequently, the iron girders rusted and expanded, causing the marble fragments which they were intended to support, to split away from the structure. Furthermore, Balanos had the existing broken surface of ancient marble pieces reworked, chipping off large amounts of ancient material, so that the new pieces of Pentelithic marble could be fitted.[169]

There was little criticism while Balanos was executing the work at the Acropolis but it increased towards the end. One of the main criticisms was that Balanos used cement instead of marble for the reconstruction of the north colonnades between 1922 - 1930.[170] The earthquake damage of 1894 necessitated structural repairs to the ruins but this could be done without reconstruction of large parts of the site. Excavations at the Acropolis hill exposed original parts of the structures which were on site but not in their original context. These elements facilitated the comprehensive reconstruction work by Balanos and, replaced at their former position, they will last better than on the ground. However, the main reason for the reconstruction work was aesthetics and not conservation.

[168]Bouras, 1994, p. 324.

[169]Schmidt, 1993, p. 87.

[170]Schmidt, 1993, p. 86. However, the Athens conference in 1931 discussed the use of cement and concluded that its judicious use is appropriate. See page 431 ff.

1.3.5 Protective Shelters

Many archaeological finds are very fragile and need protection. Some of these finds were taken to museums where they were exhibited, but some of them, notably mosaics, were too big to be easily transported. Furthermore, by the end of the nineteenth century it was recognised that sites and their artefacts form a contextual unit which, if possible, should not be disturbed.[171] At several places in Germany, Switzerland and England shelters were erected to protect sensitive features at their original location.[172]

Roofs and protection buildings over archaeological sites are not as new as commonly believed. In Hüfingen, Germany, in 1821, a large protection building was constructed above the ruins of the baths of a Roman fort.[173] In 1831 a house was erected in classical style above remains of Roman mosaics in Zofingen, Switzerland; and in Orbe, Switzerland, two small houses were built to cover mosaics in 1841. In 1838 four houses were built to cover rooms with mosaics in Otrang, Germany.[174] The ruins of the Roman baths of Badenweiler, Germany, were excavated in 1784 and were covered immediately with a wooden roof resembling the local Black-Forest style.[175]

The German and Swiss examples are all similar in that they were constructed as individual houses surrounded by lawns and trees. They were not part of a wider excavated landscape and little or nothing of the ancient remains was seen outside the protective shelters. Furthermore, all these buildings were designed as structures with their own architectural merits. Classical detailing with colonnaded porches and pilasters were used at Zofingen and Orbe, while Hüfingen and Otrang use the vernacular style of the region. None of these shelters was intended to recreate the architecture of the excavated structure underneath.

[171] Schmidt, 1985, p. 21.

[172] For more information on the topic of protection shelters see Schmidt, 1988.

[173] Schmidt, 1988, 107.

[174] Schmidt, 1988, 109 ff.

[175] Filtzinger et al., 1986, p. 235.

Evans travelled in Europe in 1871 with his brother Lewis and studied in Göttingen in 1875.[176] There is no conclusive evidence that Evans knew any of the continental examples mentioned above, but he most probably knew a similar construction from 1820 covering the mosaics of a Roman farmstead in Bignor, Sussex. The houses at Bignor were constructed in a vernacular style with thatched roofs and do not replicate the original architecture.[177] In contrast to the continental examples, the walls of these buildings have been erected directly on the excavated walls but, similar to the continental examples, these protective shelters were also located in a designed landscape and not in a field of excavated ruins.

Examples of how to protect excavated buildings with protection shelters or houses existed at the time Evans started to excavate at Knossos. While he may have not known the continental examples he probably knew the example of Bignor. These shelters were probably a source of inspiration on how to protect the excavated structures at Knossos. At Bignor as at Knossos the walls of the protection buildings rested on the original excavated walls but the houses at Bignor were constructed in a vernacular style and were set in a green landscape while the reconstructions at Knossos recreated the original architecture and were set in an excavated ruined area.

1.3.6 Arthur Evans' Links to Conservation

The third part of this chapter showed that Arthur Evans had links to people who were involved in the development of modern conservation ideas. Arthur and his father were involved in the 'battle of the roofs' at St Alban's where they took sides for the conservation movement and opposed the restoration movement. It has been mentioned above that John Lubbock, a friend of Arthur's father, was one of the founders of the S.P.A.B. in 1877 and Arthur's father-in-law, Augustus Edward Freeman was a historian

[176]Harden, 1983, p. 16 f. and Brown 1993, p. 13 ff.

[177]See plate 217.

and writer on conservation issues. Besides these close contacts with his wider family he also corresponded with many people involved in conservation such as Sir Charles Peers.[178] It can be assumed safely that Arthur Evans, when the excavations at Knossos started in 1900, was fully aware of the ongoing discussions on conservation principles and ethics at this time in England.

1.4 Conclusions

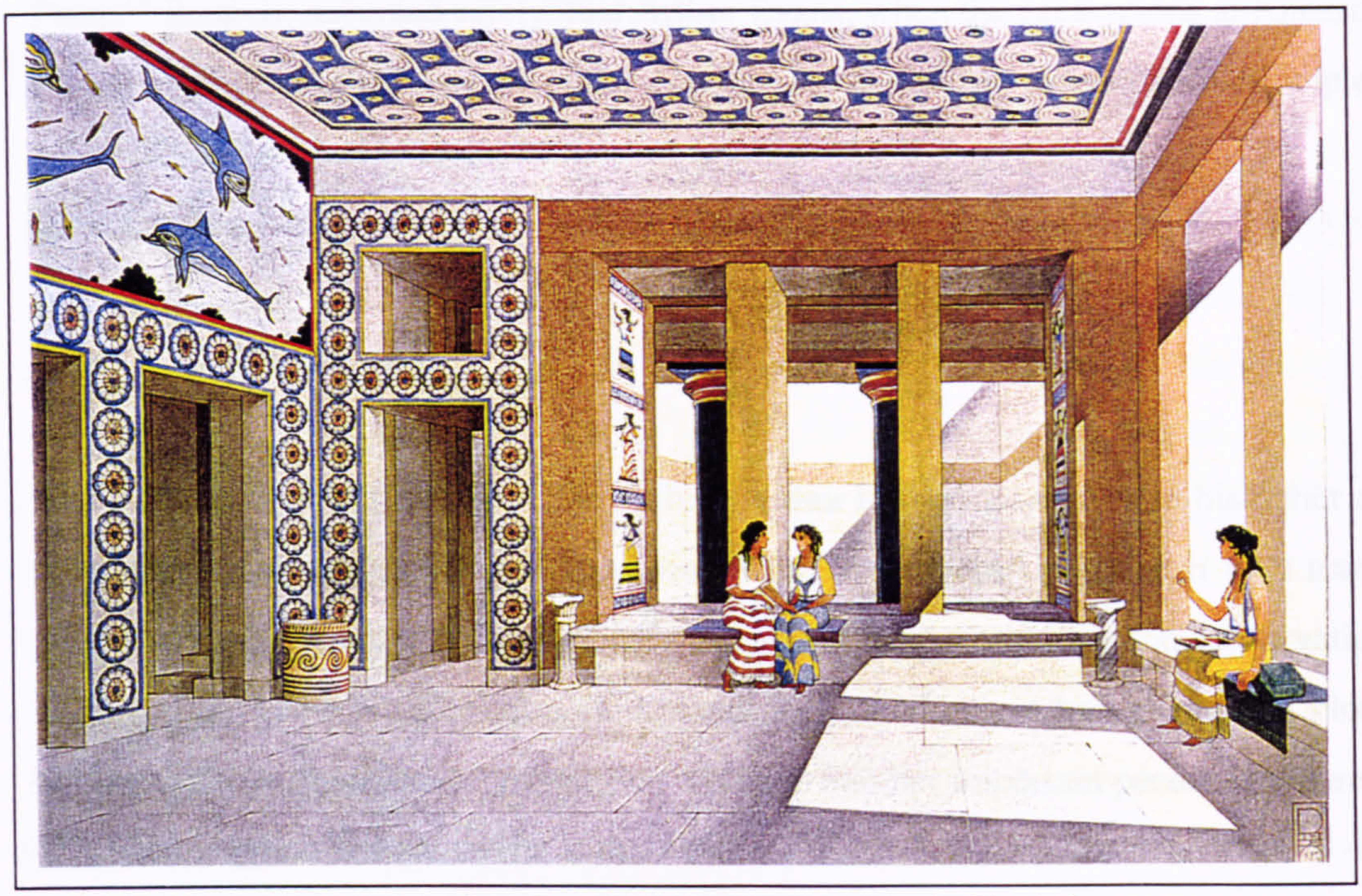
The three parts of this chapter illustrate how Arthur Evans inherited from his father an interest in all things ancient and how, via his father, he came into contact with many people who were leading the discussions in antiquarianism, archaeology and conservation at this time in Britain. Furthermore, his marriage to Margaret brought him in close contact with the historian E. A. Freeman who was another important person in the area of archaeology and conservation at this time.

Both archaeology and conservation were rather young disciplines at the time when Arthur Evans began digging at Knossos. All important principles of archaeology, such as stratigraphy and comparative chronology through pottery-types, were developed by 1900. The general principles of conservation, such as understanding the historic structures as documents and preserving their authenticity as a historic source, had been established by then. When he embarked on the excavation of the palace at Knossos Arthur Evans could draw upon the most modern philosophical and theoretical understanding of archaeology and conservation. It cannot be argued that conservation and reconstruction work at Knossos was executed in a particular way because Evans was ignorant about the theoretical concepts of these disciplines. He either knowingly ignored certain aspects or he must have had particular reasons to execute work which did not comply with the common standard.

[178] Oxford Archive, XVIII / viii / 1.a-3. I am indebted to Keith Emerick who informed me about this letter.

Chapter 2

The Palace at Knossos, its Construction, Destruction and Excavation



Reconstruction of the Queen's Megaron. Watercolour by Piet de Jong

Ruins which retain in position their huge blocks of granite or porphyry, poros or Pentelic marble solidly pinned together or with travertine and baked brick held together by roman cement, such ruins can wait for our attention without excessive damage.
(Pernier, 1933, p. 267; translation by Keith Parker)

Chapter 2

The Palace at Knossos, its Construction, Destruction and Excavation

2.0 Introduction

It is beyond the scope of this thesis to explore the entirety of Minoan history. Other works have been written on this topic and I will largely rely on them, such as Sinclair Hood's *The Aegean before the Greeks.*[1] I am aware that the discussion about Minoan history is ongoing and that in recent years many of the dates, which had been generally accepted, have been questioned.[2] Since Arthur Evans published his *Palace of Minos* between 1921 and 1936 numerous small books and articles have been written on Knossos. Some of them were initiated by Evans himself,[3] but most of them were written after his death. Some of these books, such as Castleden's, *The Knossos Labyrinth* and Wunderlich's, *The Secret of Crete*, offer completely new interpretations of the entire palace but most of the recent publications discuss only specific areas or aspects.[4] These publications either show that Evans' interpretation was wrong or right in a specific detail aspect, but generally accept the main framework as established by him. Re-interpretations of certain parts of the palace have been proposed and other scholars have responded to

[1]In addition to Hood's book, I have used the first three chapters of Gerald Cadogan's *Places of Minoan Crete*, Dickinson's *The Aegean Bronze Age*, *The discovery of the Greek Bronze Age* by Fitton and Pendlebury's *The Archaeology of Crete.* Many more books were written on Minoan archaeology offering less conservative interpretations such as Wunderlich's *The Secret of Crete* and Castleden's *The Knossos Labyrinth.* See also the literature review in the Introduction.

[2]For example: Peter Ian Kuniholm's dendrochronology project for the Aegean shakes the conventional dating of the Minoan phases. See: Nature, 381, 27 June 1996, p 780 - 783.

[3]For example: Pendlebury, 1954.

[4]For example: Driessen, 1990; Evely, 1993, Mirié, 1979, Raison, 1988 and 1993.

them.[5] However, no recent comprehensive work has been written discussing the architecture of the Palace of Minos as a whole and an architectural history of Minoan structures is also missing.

Since my thesis aims to understand the decision making process at the time of excavation and reconstruction it will rely to a large extent on the writings of Arthur Evans and contemporary writers. It was this contemporary knowledge, available to Arthur Evans and his architects that influenced the decisions on site. Certainly our knowledge of the Minoan Bronze Age has improved since and this new knowledge will allow us, in the last chapter of this thesis, to assess the success of the reconstruction and conservation work. However, it is pointless to analyse the reconstruction and conservation work solely from a modern point of view. The conservation and reconstruction work at Knossos must be seen in the light of the knowledge and skills available to the excavators at Knossos.

It is of major importance to understand that much of the present criticism of the reconstruction work is based on a simple fact: we have little information on how the Palace of Minos exactly looked in the past. The research done by Arthur Evans was undoubtedly very careful, but the question remains whether this knowledge of the Minoan past was sufficient to reconstruct ruins in a permanent, literally 'concrete', way. However, this question is based on the assumption that the sole purpose of the work at Knossos was to recreate the Minoan past; it does not assess the quality of the reconstructions in relation to their design brief and it does not consider the relationship between conservation and reconstruction on site.

Conservation work aims to preserve historic structures and we have seen in the previous chapter that various values are attached to these structures. The general goal of conservation work is to slow down the process of decay which destroys the structures and, thus, the values attached to them. The deterioration factors may be split into two

[5]See for example: Jan Driessen, 1990: "An Early Destruction in the Mycenaean Palace at Knossos: A New Interpretation of the Excavation Field-Notes of the South-East Area of the West Wing." and the review of this book by Peter Warren in the Classical Review, Vol XLII, No. 1, 1992.

groups: the problems generated by man and decay generated by the environment. Manmade deterioration factors might be:

- use and wear
- alteration
- man made disaster
- tourism
- smog and other environmental pollution

Environmental factors include:

- wind
- water (rain, raising damp)
- temperature (expansion and contraction)
- plant growth
- natural disaster
- animal disturbance

All structures, buildings and archaeological sites, are exposed to these factors to some extent but archaeological sites experience additional threats. Buildings are designed to withstand the deteriorating factors, for example, the roof protects the structure from rain and this roof is designed to be exposed to the environment. Building traditions were traded from one generation to the next and improvements helped to optimise them. If the design rules were followed, buildings withstand climate and weather and they require little maintenance to upkeep the structure. However, ruins and excavation sites are no longer complete buildings. The roof that once protected the structure from rain has vanished and features such as wall tops are exposed to the rain though they were not designed to be this way. Frescoes or mosaics which were designed as interior features also do not withstand the forces of the environment. The conservator attempts to maintain maximum authenticity by intervening as little as possible. At complete buildings regular maintenance ensures the survival of the structure but at archaeological sites an intervention is necessary that brings the excavated structure into a state which can resist the deterioration factors named above. This intervention can be roofing of the entire area or restoring parts of the structure. Naturally, this intervention will be more comprehensive than the regular maintenance of complete buildings.

Both complete buildings and excavated structures feature conservation problems which origin in the original building material and construction technique. For example, a rubble masonry wall whether it is part of an excavated structure or part of a standing building, has typical conservation problems such as the dissection of the wall faces from the core. However, excavated structures have undergone a series of states that additionally affect their state of preservation. These structures fell into disrepair or were destroyed, they were buried and finally excavated. These processes of decay, burial and excavation and the original building design determine the conservation problems at archaeological sites. They require specific attention in this research and, therefore, the following chapter will discuss three areas:

- The original building structure
- The destruction and burial process
- The excavation process

It is obvious that whether a building was made of stone or timber, whether it was destroyed by fire or earthquake and wether it was excavated in a hasty rescue operation or in a careful scholarly dig makes a great difference. These three issues determine the state of preservation of a structure. In order to assess whether the work at Knossos was an adequate response to the conservation problems on site we have to analyse these issues.

2.1 The Original Building Structure

2.1.0 Introduction

The construction of the building is chronologically the first element that determines the later conservation work at archaeological sites and, therefore, it will be the first issue to be examined. Generally speaking, building work uses specific methods or skills to form walls, ceilings and roofs with the materials available in order to create a space for specific purposes. Commonly, the building methods and skills are passed on from one generation to the next and developed gradually from basic ideas to complex craftsmanship of specialised trades. They developed by utilizing the materials available and responding to the building requirements. The choice for materials and construction methods for the building work was determined by a number of factors, such as:

- availability of materials
- the ability to produce, exploit or work the materials
- durability of the structure
- design brief

Obviously every culture developed building skills, which were adapted best to the material that was available in its area.[6] For example timber was the common building material in the wooded countries of Scandinavia and woodworking is a highly developed trade. It has only been in the last few decades that transport - at least in Europe and North America - has become affordable and regional availability is no longer a major determining factor.[7] The next factor to consider after availability was the capacity to work them. The builder needed to be able to exploit the building materials at their sources, for example quarrying stone. Improved toolmaking skills and new materials for

[6]See also Dickinson, 1994, p. 23 who stresses the importance to consider the influence of environment and natural resources on the structures.

[7]In the past specific valued building materials were transported over a long distance for exceptionally important buildings such as the pyramids at Gizeh or the Gothic cathedrals. But most of the standard structures relied on sources close to the building site.

the tools (copper, bronze, iron, etc.) extended the range of possible exploitable and workable building materials.

The aim of good building design is to create a structure that responds well to daily wear, weather and also to expected disasters. The Minoans lived in an area which, as least as far as our records go, is regularly struck by a major earthquake.[8] Excavations proved that earthquakes have happened in the Minoan past and we can assume the Minoans knew about their existence.[9] Although it cannot be predicted when exactly the next earthquake will occur, its occurrence in a certain area, sooner or later, is predictable. The Minoans reacted to this threat in their building work.[10] As we will see, the Minoan builders developed construction methods which limited the damage of earthquake.

Finally, the construction of a building is determined by design ideas and the intended use of the structure. Cultural, social and, sometimes, religious aspects influenced the design of the space and the choice of material for specific buildings. In fact, archaeology tries to reverse this design process by analysing the finished product in order to understand better the social and cultural environment in which it was produced. However, since this thesis concentrates on the preservation of the fabric rather than its interpretation, these issues will not be discussed further.

The following section describes the building materials and the construction techniques which were employed at the Palace of Minos. Don Evely and Joseph Shaw have done excellent research on the original materials and techniques and, to a large extent, this thesis will rely on their publications but will also present my own observations.[11] Branigan suggested that it would be difficult to assess the original constructions because not only were new reconstructions executed on site but even the original walls were

[8]Compare PM II, 312 ff.

[9]PM II p. 286 ff, Pendlebury 1963, p. 3 and Driessen, 1987, p. 171 ff.

[10]Evans also suggested that the Minoans reacted to the earthquake threat in their philosophical-religious system. According to him, the Snake Goddess represent underground powers and is linked to the seismic forces of the earthquakes. He also suggested that the Chthonic Goddess as Lady of the Underworld was worshipped in the sunken Lustral Basins. PM IV, p. 186 ff.

[11]See Evely, 1993 and Shaw, 1973.

taken down and rebuilt.[12] However, a careful investigation of the structures allows to distinguish between the original materials and techniques employed by the Minoan builders and modern conservation work.

2.1.1 Stonework

Stone is regarded as one of the most important building materials of the past. This to a certain extent is due to the simple fact that stone is the most durable building material and remains at excavation sites when other materials have vanished. We tend to give disproportionate importance to the stonework as it visibly remains. Perishable materials might have played an important role in the original structures but since we have only scanty archaeological evidence of these materials most reconstruction work is highly speculative.

The stone work in Knossos falls in three categories. First, there are the ashlar walls which feature a dressed stone surface as at the North Entrance Passage or in the light wells of the Domestic Quarter. Second, there are rubble walls which were constructed with randomly collected undressed stones and were frequently used in combination with a timber framework which will be discussed below. These walls were commonly plastered or covered with gypsum dado slabs. Finally, stone was employed because of its fine surface as paving material, as dado fixed to the wall or as decorative column bases.[13]

The Palace of Knossos was constructed in the Bronze Age. The introduction of bronze instead of copper in MM I had a great influence on the architecture of Crete.[14] The new and harder bronze made it possible to work stone in a better way than had been possible with the previous copper tools, but bronze, compared to iron, is still relatively soft and

[12]Branigan, 1970, p. 211.
[13]Compare Evely, 1993, p. 208 ff and Shaw, 1973, p. 75 ff.
[14]Pendlebury, 1963, 283

working hard stone with it is still cumbersome.[15] Consequently, Minoan builders preferred relatively soft stone which was available locally.[16] At Knossos the Minoan builders predominantly employed Gypsum which was available at the Gypsades Hill to the south of the palace[17] and limestone available at a quarry at Hagia Aaron, two miles to its north.[18] Shaw has discussed the limestone and proved that the Minoan builders distinguished between a very soft limestone (*koúskouras*), which was used as rubble infill, a soft limestone (*porós* or *porólithos*) which was generally employed for less exposed building work and a relatively hard grey-blueish limestone called ironstone (*sidherópetra* or *asbestólithos*) for its qualities to make good lime.[19] The latter was used for exposed features such as thresholds. This distinctive use of the different types of limestone clearly shows the level of sophistication in the Minoan building tradition.[20]

Of course, this does not imply, that Bronze Age people were unable to work hard stone. The Pyramids of the IV. Dynasty in Egypt[21] were built with hard stones such as granite and basalt.[22] The Minoans used hard stones for several purposes but predominantly in three circumstances. The most prominent type of hard stone was schist, a greenish - blue type of slate which lasted well. It was employed for paving in large parts of the Palace, specifically in areas which were not covered with a roof but also sometimes for corridors.[23] Schist could be split easily along the natural bedding planes, and thus thin large slabs could be prepared. Randomly collected hard stones were included in rubble masonry walls where it was not necessary to work them at all or, only to dress them

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[15]Shaw, 1973, p. 12. See also Korres, 1994a, p. 21 f who explains the effect metallurgical techniques for the production of tools had on the execution of the Acropolis.

[16]Evely, 1993, p. 207. He proves that some building material, including stone, was transported by ship over considerable distances. However, the vast majority of the building material was obtained locally.

[17]Shaw, 1973, p. 43 and PM III, p. 192 f.

[18]Shaw, 1973, p. 38 ff and PM I, p. 532.

[19]Shaw, 1973, pp. 12.

[20]Theodore Fyfe noted the different qualities of limestone and gypsum used for different purposes in the palace and the outlying buildings as early as 1900. See Evans, 1900, p. 53 ff. See also Pernier's contribution to the Athens conference: Pernier, 1933, p. 267.

[21]I owe gratitude to Dr. Rolf Snethlage, Munich, who, in a personal talk, illustrated the use of hard stone types in Bronze Age Egypt.

[22]Lloyd and Müller, 1987, p 94.

[23]Shaw, 1973, p 24.

roughly to achieve the desired size. Finally, the Minoans employed hard stones in a limited way for decorative purposes as in the base of a column[24] or friezes.[25] Besides these architectural uses, hard stones were employed for rhytons, vessels and seals. This proves that the Minoans were ultimately able to work hard stones but obviously this work was limited to small decorative objects.

Ashlar masonry was employed predominantly at two places: the walls of the light wells and orthostats at the exterior walls.[26] What appears to be good ashlar masonry in the palace is in reality a very problematic construction. The stone blocks were dressed only at the front in order to achieve a smooth rectangular surface but were not dressed at the rear. Thus, the irregular wedge shaped blocks form no firm grip with other ashlar blocks and had to be supported with a rubble and clay infill. This technique provided a pleasant appearance which had some functional advantages: it was comparatively easy to produce, it was relatively waterproof and it was more resistant against wear than a plastered surface.[27] However, the technique had considerable structural weaknesses. The wedge shape of the blocks not only failed to provide a proper base for other blocks to rest on but also tended to push the stone out of its bond in the wall. Therefore, it was necessary to prevent them from tumbling over by tieing the inner and the outer face together. The Minoan builders employed timber braces which were dovetailed at either end and fitted into sockets carved into the block's surfaces.[28] A similar construction (*opus revinctum*) was employed in the fourth century BC for the fortifications at Mtsketa (25 km west of Tbilisi, Georgia). According to Sekhniashvili, this construction technique was employed because it was believed to be earthquake resistant.[29]

[24]Shaw, 1973, pp 27.
[25]Sakellarakis, 1994, p. 44.
[26]Shaw, 1973, p. 101.
[27]Ibid., p. 92 f.
[28]PM I, p. 128 and Shaw, 1973, p. 88 and p. 157 f. See figure 10.
[29]Sekhniashvili, 1988, 396.

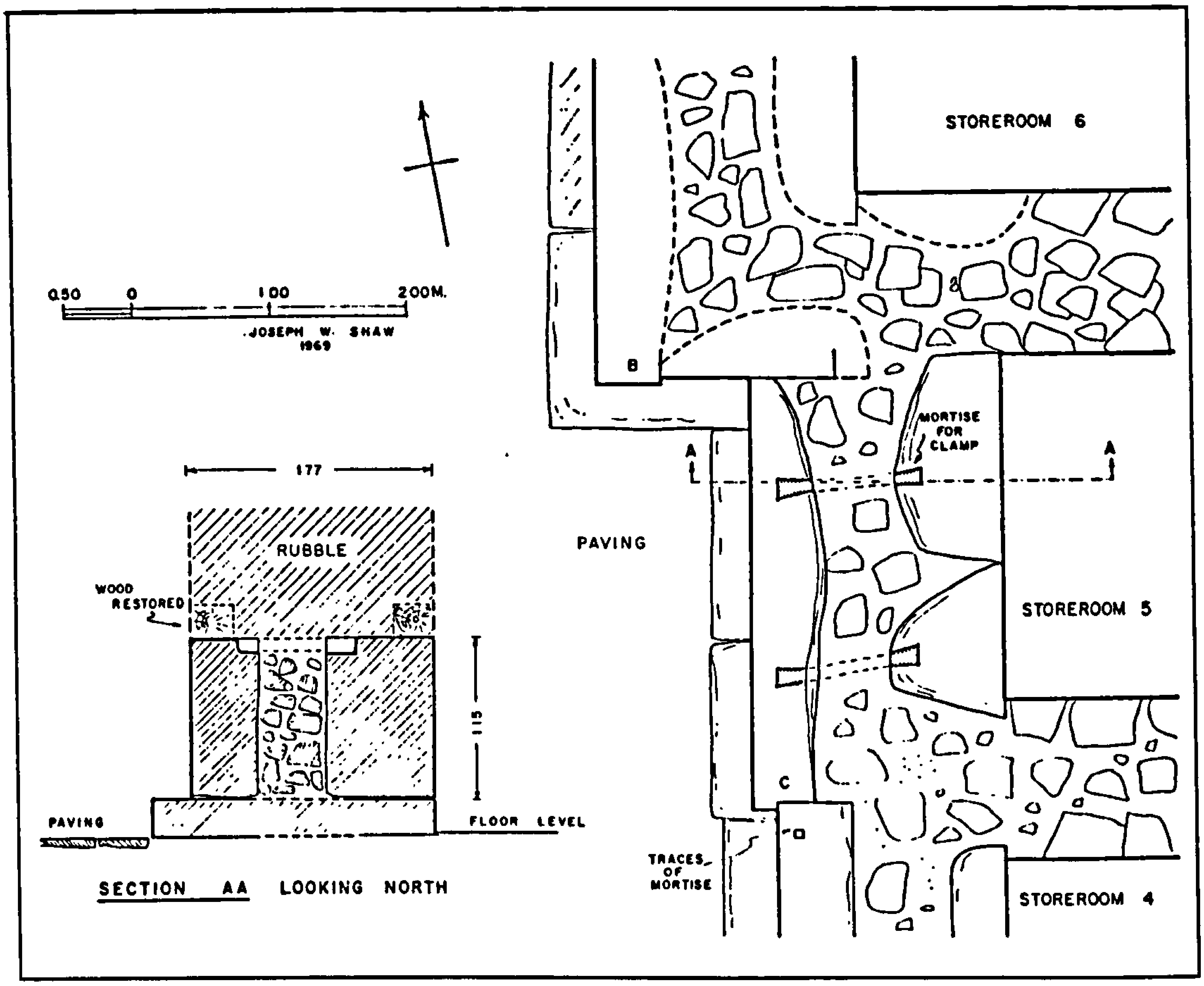

Figure 10 Plan and section of the West Wall showing the wedge shaped blocks and the mortices for the wooden clamps. Drawing by J. Shaw.

A course of fine gypsum orthostats faces the West Court, which was formerly held together with the dove tailed wooden wedges described above. Shaw could identify only one, significantly eroded dowel hole on top of these orthostats.[30] This led Arthur Evans to anticipate a superstructure of more perishable material instead of ashlar blocks. He suggested a timber framework with clay and rubble masonry infill similar to the ones from within the palace.[31] According to this idea, Fyfe suggested a reconstructed elevation of the wall in 1902 which showed the above mentioned timber framework.[32] Later, Piet de Jong reconstructed parts of the West Wall in cement rendered masonry replicating a

[30]Shaw, 1973, p 88.

[31]Evans, 1900, p. 10.

[32]Fyfe, 1902, p. 114 f. See figure 11

horizontal timber beam and ashlar masonry above.[33] This was frequently seen by later scholars as an indication that the reconstructions as a whole are unreliable and wrong.[34]

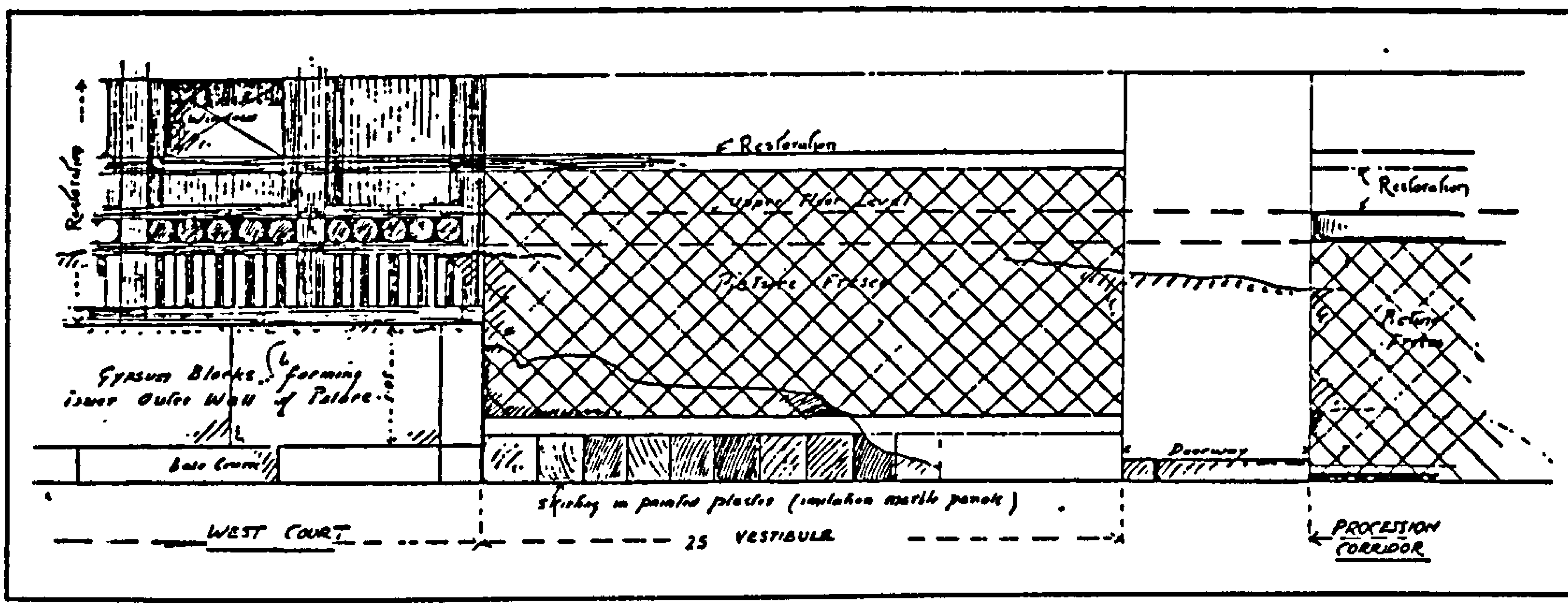

Figure 11 Reconstruction of the elevation of West Wall and Corridor of Procession. Drawing by Theodore Fyfe, 1902.

However, most of the walls in the Palace of Minos at Knossos were built as rubble masonry walls. Stones, collected from the surrounding areas, needed only a minimal dressing in order to be used in the wall constructions. Sometimes dressed stones from earlier structures were re-used in the new walls. The stones were bonded together with earth, mud or clay mortars and commonly plastered or covered with a gypsum dado.[35] The coating improved the visual appearance of the walls but was also necessary to prevent rain penetrating the wall and washing out the soft mortar.[36] The internal strength of these walls is limited and to allow for higher loads the thickness of the walls had to be considerable.[37] The Minoan builders frequently employed a technique where rubble masonry walls were reinforced with timber beams which allowed them to build thinner walls and limited the impact of earthquakes.[38] Rubble walls were employed for internal walls and, probably, for the exterior walls in the upper storeys.[39]

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[33]Compare Evans's explanations in PM II, p. 349.

[34]Compare page 416.

[35]Shaw, 1973, p. 77 ff.

[36]Compare Evely, 1993, p. 208.

[37]For structural behaviour of stone masonry see: Binda and Anzani, 1997, p 113 ff.

[38]This construction method will be discussed in the section on timber.

[39]It is not clear if there were rubble walls without timber reinforcement beams of any considerable height in the palace. Since the reinforcement began only at a certain height above the floor level and many walls are preserved only to a lower height it cannot be decided if they formerly featured reinforcement beams.

Modern conservation faces two problems rooted in the Minoan construction technique for stone walls. Firstly, the comparatively soft bronze tools led the Minoans to prefer comparatively soft types of stone such as gypsum and limestone at Knossos and Phaistos and sandstone at Mallia and Zakro.[40] Of these stones, gypsum is especially vulnerable to deterioration by water. Limestone and sandstone also deteriorate fast compared to the marble structures of the classical period.[41] The second difficulty is caused by the specific construction techniques employing timber in the stone walls. Ashlar masonry was tied together with timber braces and the rubble walls were reinforced with a timber framework, all of which has vanished. The problems generated by this method will be discussed in the next section on timber.

2.1.2 Timber

Hardly any material used in the Palace of Minos was as controversial and disputed as timber. Evans repeatedly reports the survival of charcoaled timber remains which indicated the use of timber for several purposes in the palace such as columns, ceiling and reinforcement beams.[42] However, unlike extremely dry climates, timber in Knossos is hardly ever preserved in its original dimensions and most of the fragments found in the Palace were carbonised, rotted and were outside their original context.[43] They had fallen into courtyards and rooms and it was not possible to establish their original position. Many of these larger timber elements were mentioned in Mackenzie's diaries and Evans' Notebooks and some of them were recorded by Theodore Fyfe. In fact, one of them was

[40] Evely, 1993, p. 207.

[41] Generally speaking, igneous rocks such as basalt and granite are formed from magma either by eruption or gradual cooling. They are crystalline and hard to work, but they last long. Sedimentary rocks such as limestone, gypsum and sandstone are formed from erosion produce under high pressure. Their strength depends on the binding agent. They are easy to work but less durable. Marble is a limestone which was reheated by the magma core of the earth and formed larger crystals within its structure. See Ashurst and Dimes, 1989, p. 19 ff.

[42] For example: Evans, 1900, p. 38, PM I, p. 343 f.

[43] Shaw, 1973, p 136.

photographed by Fyfe.[44] However, few remains have survived today and, thus, it is difficult to asses their quality and function.[45]

Evans had the excavated timber remains analysed, all of which were cypress which led him to state that cypress was the predominant type of timber used for construction work at Knossos.[46] In 1934 Fritz Netolitzky analysed several pieces of timber from various Minoan excavation sites for Spyridon Marinatos, then curator at the Museum at Herakleion. He identified one sample taken from architectural timber members from Knossos as spruce and three samples from architectural members from Knossos, Amnissos and Phaistos as fir. None of the samples were cypress or cedar (*Cedrus libani*).[47] However, cedar was used along with fir for the handles of axes and oak was used for an altar.[48] The uniform appearance of coniferous trees and the state of preservation of the individual charcoaled remains made it impossible to distinguish within a species and Netolitzky did not identified a single piece of cypress used for architectural purposes.[49] Thus, it must be concluded that a variety of timber species were employed as construction timber at Knossos of which cypress was, perhaps, the predominant species.

Frequently, enough matter survived to prove the existence of a timber member at certain positions such as at the column sockets in the Throne Room.[50] This allowed Evans and Fyfe to establish the general structure of the building and to determine the layout of the timber framework but the exact dimensions of the members were frequently lost. Only occasionally after rotting had timber members left an impression in the surrounding debris

[44]See plate 212.

[45]PM I, 343, especially Footnote 2. Josef Durm, 1910, p. 60, mentioned that some timber remains have been preserved in the Museum in Herakleion but it seems that they have disappeared since.

[46]PM I, p. 344. Evans, in fact, suggested the species *cypressus sempervirens*. However, Netolitzky stated that the general similarity of coniferous timbers and the state of preservation prohibit such a detailed statement. 1934, p. 176.

[47]Netolitzky, 1934, p. 176 f.

[48]Ibid., p. 177 f and Shaw, 1973, p. 136.

[49]Netolitzky, 1934, p. 176. Modern methods allow for a more detailed analysis of the individual species but, as far as I know, no one has researched the ancient timber remains of Knossos to date.

[50]Evans, 1900, p. 38.

which enabled them to estimate their former dimensions.[51] At other places, sockets in the walls indicated the woodwork of the ceiling construction.[52] Thus, the architects could establish the general layout of the timber structures but not the exact dimensions of the individual members. This problem is best illustrated by two reconstruction proposals for the Grand Staircase, both of which were executed by Christian Doll. The section of the first reconstruction proposal showed massive timber beams for ceiling construction, architraves and wall-reinforcement beams (Figure 12a). The second and probably later proposal showed reinforcement beams of much thinner dimensions (Figure 12b).[53]

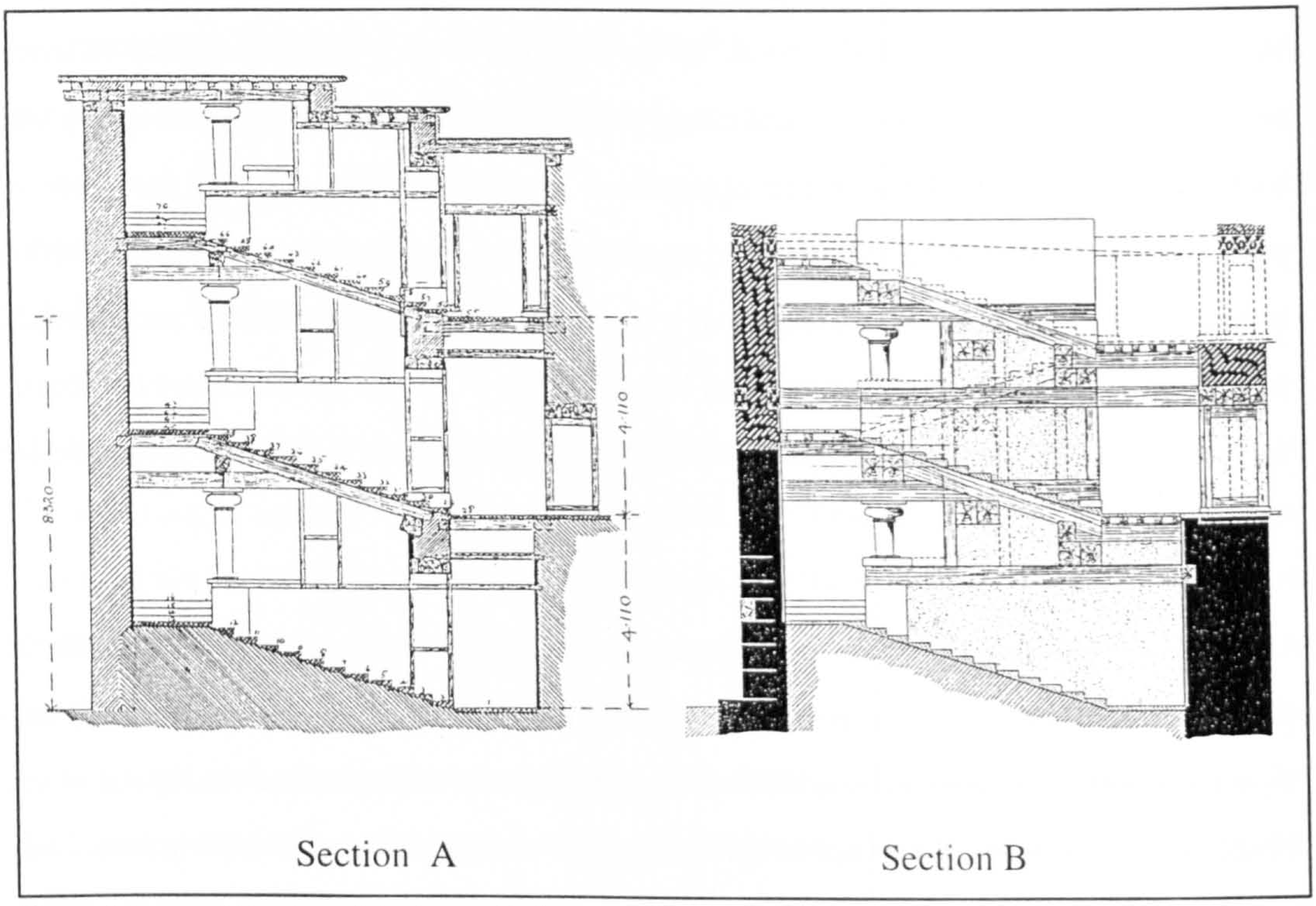

Figure 12 a.) Section of the Grand Staircase. C. Doll
b.) Section of the Grand Staircase. Probably C. Doll.

[51]Shaw, 1973, p. 134. The fluted columns at the balustrade of the Lustral Basin in the Little Palace left impressions of their shape in the clay mortar of a later wall which blocked the balustrade. PM I, p. 344, PM II, p. 521 and PM III, p. 323. Another example is the rotted throne canopy in the Hall of the Double Axes, PM III, p. 336.

[52]PM II, p. 408.

[53]See fig 12. Both plans are unpublished and not dated. Figure 12b is signed by Christian Doll but figure 12a is not signed at all. However, the drawing style suggests an execution by Christian Doll. Both plans are from the Evans' Archive, Ashmolean Museum, Oxford.

For an analysis of the timber member's structural qualities the detail of how the individual timber members were joined is even more important than their dimensions. Some constructive joints such as dovetail tenons or lap joints can transmit compression as well as tension, while other joints such as simple tenons only transmit compression. No direct archaeological evidence for these details has survived and the only information on timber joints has been obtained from frescoes. Fyfe suggested that the black u-shaped pieces in the depiction of the *cella* walls in the Miniature Fresco's's temple represent mortised cross beams. This would indicate a mortise and tenon detail.[54] Besides Fyfe, none of the other architects who worked on site commented on the joints of timber beams. In all his reconstruction drawings, Christian Doll never depicted a joint detail - the beams simply met and it was left to the viewer to imagine how they had been joined.

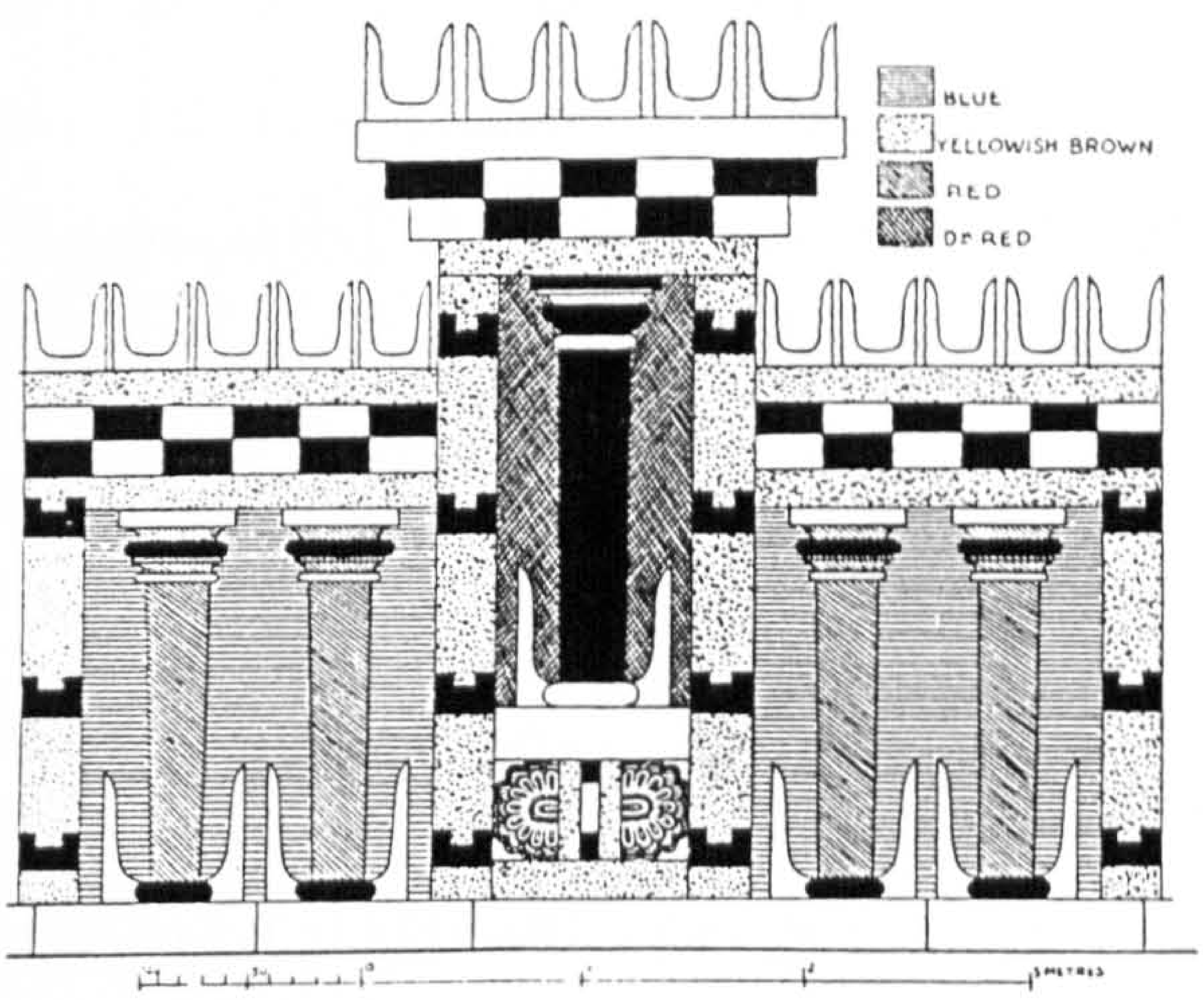

Figure 13 Restored elevation of the Columnar Shrine in the Central Court. Probably Theodore Fyfe.

Timber was used for many purposes in Minoan architecture. The jambs and lintels of both doors and windows, the ceilings and wall reinforcement beams were made of timber. It must be anticipated that beyond its use as structural timbers, wood was used for doors, windows and furniture. In fact, the gypsum throne in the Throne Room is supposed to be a copy of a wooden original and charcoaled remains in the Hall of the Double Axes and the Anteroom suggests that wooden chairs or thrones were used.[55]

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[54]Fyfe, 1902, 114. See figure 13. See also Nörling, 1995, p. 51 f.

[55]PM IV, p. 918 f. In fact, Evans had several wooden copies of the Throne made, one of which is now on display in the Ashmolean Museum and another is placed in the Anteroom.

The most important use of timber in the palace was to provide a reinforcement framework for the masonry walls. This Minoan timber reinforcement framework is not a timber framed building in the European sense. In medieval and modern European timber framing, the thickness of the beams was equal to the thickness of the walls. A timber frame skeleton was erected and the panels were later filled with windows, doors or walling materials such as stone, brick or wattle and daub.[56] The structural loads, both vertical and horizontal, were transmitted through the timber framework. The panels' function was not structural, it only formed the space. By contrast, the Minoan architecture was a stone structure and the timber beams' function was limited to reinforcing the structure against horizontal forces. Too little of the upper parts of the palace have survived in order to formulate any theory about different construction techniques in the upper stories.[57]

Horizontal timber reinforcement beams were used in rubble masonry walls as early as EM II, and it seems that the use of vertical timber members was a late development.[58] After MM IIIa the use of timber decreased and the dimension of the timber members was reduced. Evans suggested that this indicated a general shortage of timber in Crete.[59] However, timber reinforcement beams were commonly employed in conjunction with rubble masonry and rarely with ashlar.[60] Only in a few places, such as the North Entrance Portico, was ashlar masonry combined with vertical posts. Normally the use of timber was limited to horizontal members in ashlar unless they formed door or window frames. Frequently, a horizontal reinforcement beam would also form the lintel for doors and windows.[61] Shaw suggested that timber was hardly ever used in exterior walls. Few exterior walls have survived above the height where the lowest horizontal timber member

[56]Harris, 1993, p. 20 and Gerner, 1994, p. 107 ff.

[57]This is based on the archaeological evidence of the ground floor and some first floor features which have been excavated so far. It is possible that upper storeys of the palaces of Crete were constructed in a timber frame work in the European sense with mud brick infill. However, the archaeological evidence for this theory is not sufficient. Compare Shaw, 1973, p. 189.

[58]Shaw, 1973, p. 139 f and PM I, p. 72.

[59]PM II, p. 565.

[60]Shaw, 1973, p. 148.

[61]Compare figure 14.

might be expected and at Knossos timber was used in exterior walls such as the North Entrance Portico, the West Wall, the light well of the Hall of the Double Axes and the Court of Distaffs. Thus, Shaw's theory cannot be supported.

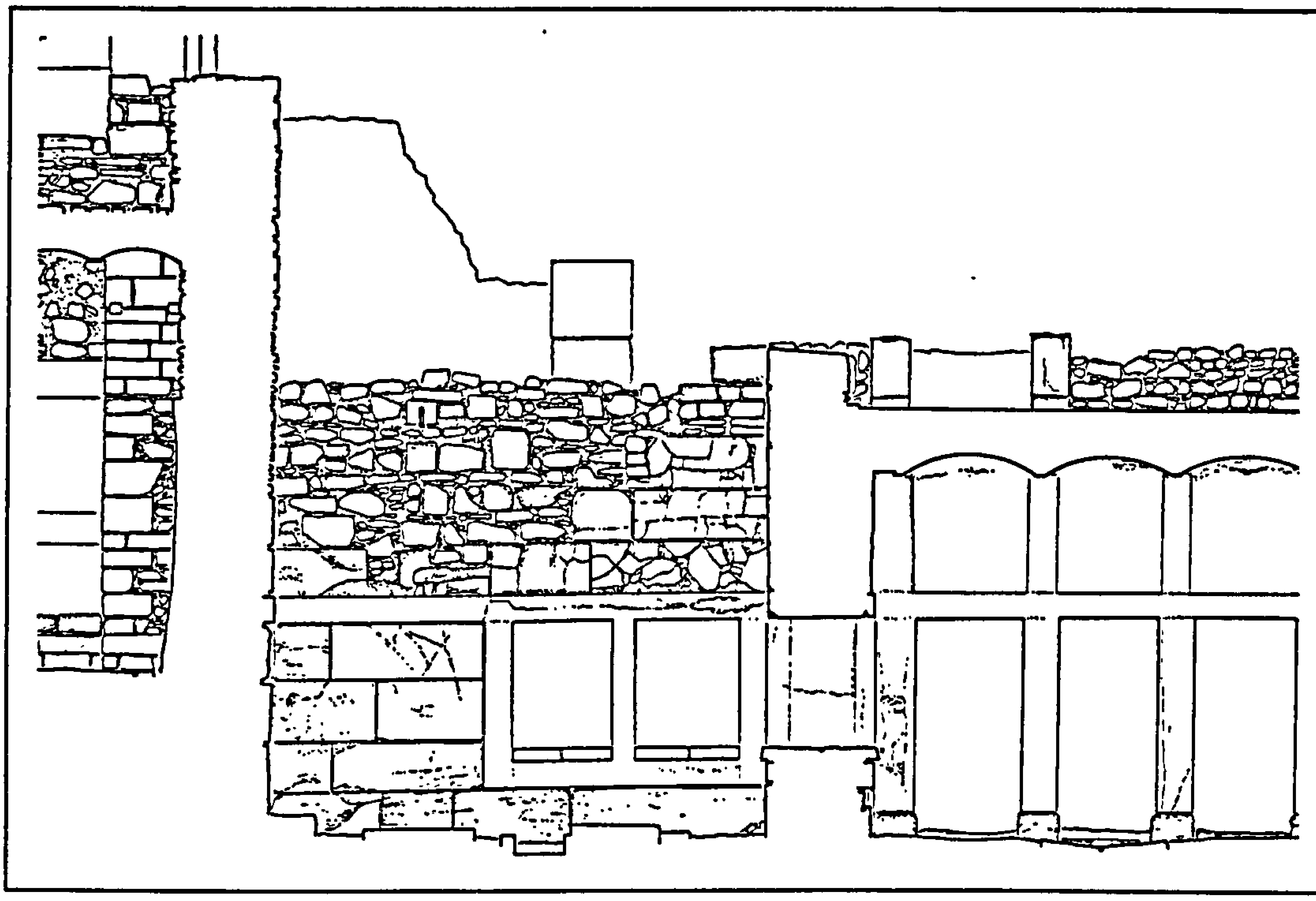

Figure 14 East wall Court of the Distaffs.

The horizontal reinforcement frames commonly consisted of two timber beams which were laid at the outer edges of the walls connected with short traverse beams at the same level and formed a ladder like structure.[62] The cavities left in the ashlar facade of the eastern light well of the Hall of the Double Axe provide evidence for this system.[63] It has been mentioned earlier that no evidence for timber joints has survived, but this horizontal timber frame was structurally effective only when the traverse beams were joined to the main beams with a joint detail that responded to tension. Only then did the frame tie the two faces of the walls together and provide the necessary strength to resist the horizontal forces such as those occurring during earthquakes, and prevent the wall faces from

[62]See figure 15.

[63]See plate 137 and 138 The chip infill in this cavity was necessary to prevent the collapse of the masonry above.

separating. Wooden dowels fixed these timber beams to the masonry structures below. Many dowel holes were found at the top courses of masonry structures and Shaw believes that they almost exclusively indicate that wooden features were connected to the masonry. He dismissed the idea that wooden dowels might have connected stone blocks as did bronze clamps in the Classical period.[64] The dowel holes were commonly square which indicates that they were chiselled rather than drilled.[65]

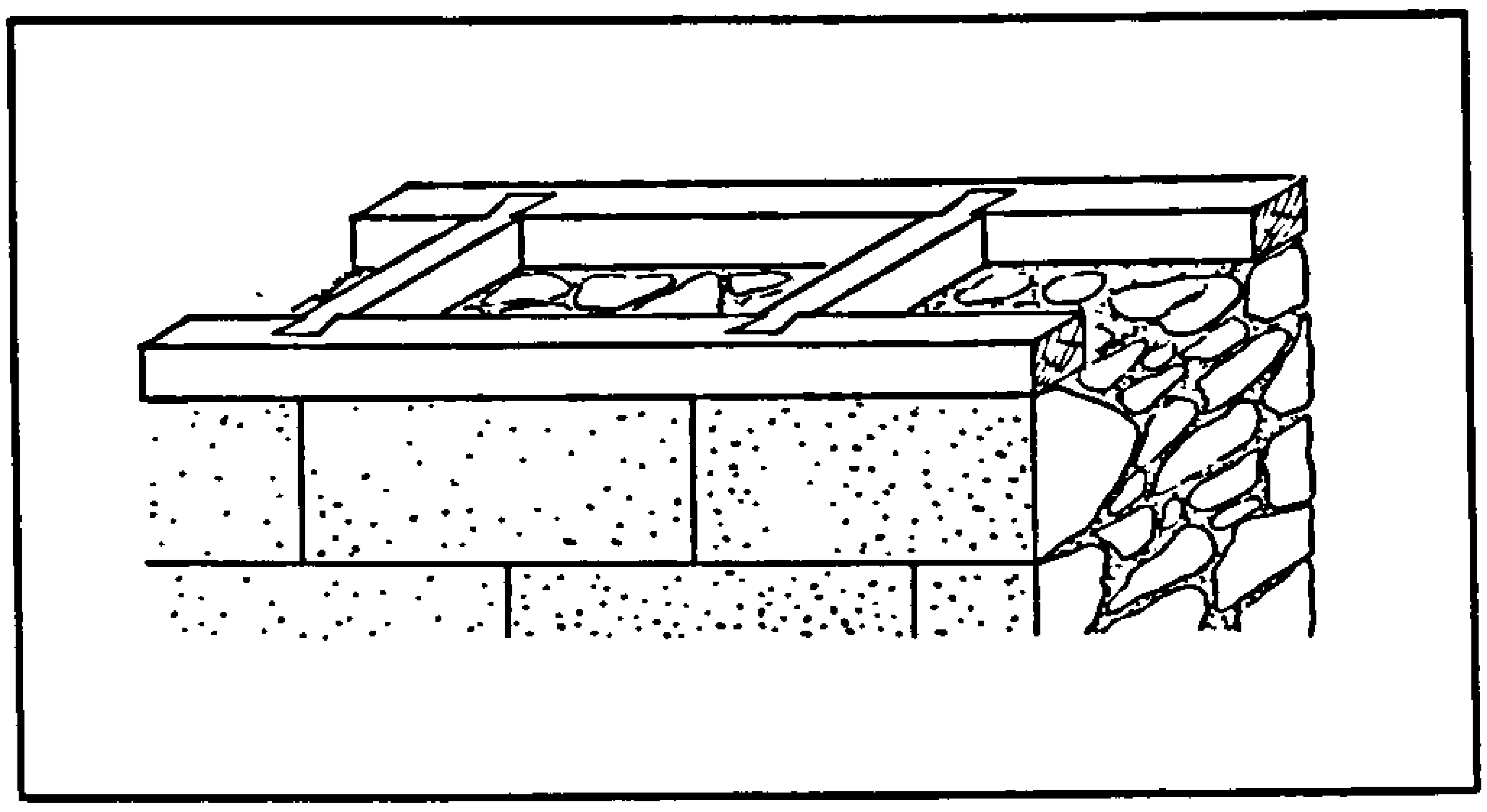

Figure 15 Horizontal reinforcements structures. The dovetail joint is based on structural considerations not on archaeological evidence. Drawing by the author.

The second type of timber reinforcement was a timber structure which not only employed horizontal members but also vertical posts. These posts commonly rested on stone slabs at some height above floor level so that rising damp could not affect the post's ends.[66] The lowest horizontal member was installed at considerable height above ground. This reinforcement beam was commonly also the lintel for doors and windows.[67] Shaw explains that in the later Minoan periods there was an increase in the number of vertical timbers which were used as props and which were supposed to relieve the lower walls from the weight of the upper storeys. He also noted an increase of piers and pillars in Minoan architecture and a reduced use of transversal binders.[68] However, the dimensions of the timbers, as far as they can be established, were too small to carry the load of the upper storeys by themselves. Some of the load was still carried by the rubble masonry between the timber members.[69]

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[64]Shaw, 1973, p. 167. Compare for example, Korres, 1994b, p. 23.

[65]Shaw, 1973, p. 161 ff.

[66]See plate 132 centre right.

[67]Fyfe, 1902, p. 110.

[68]Shaw, 1973, p. 144.

[69]It is difficult to quantify this statement because it was not possible to assure the exact dimensions for all timber members and to calculate the exact weight of the upper storeys. However, 60 to 80 centimetre thick mud ceilings at two or three storeys were too heavy to be carried solely by the thin timber framework.

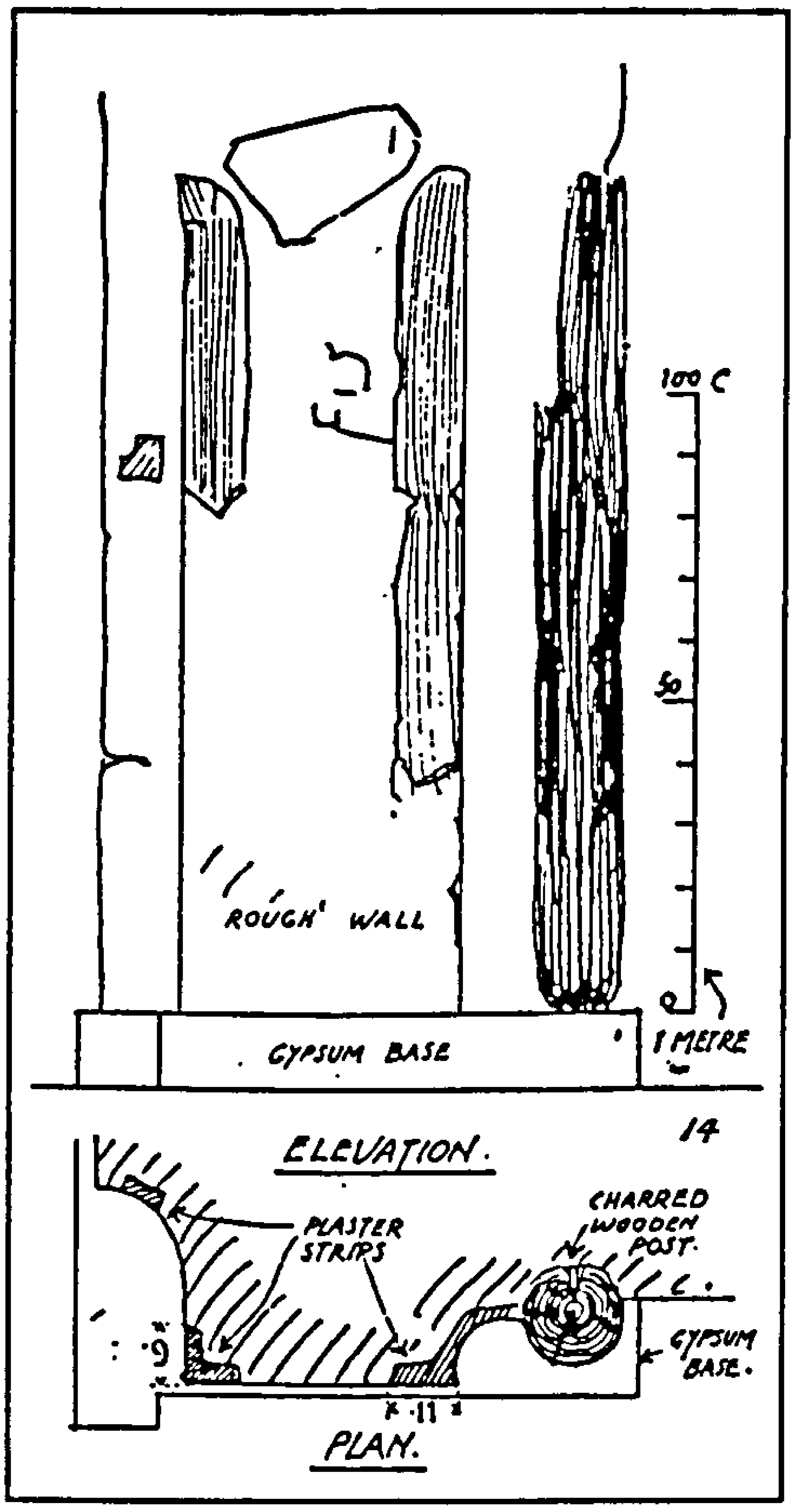

Figure 16 Plan and elevation of a door jamb. Drawing by Theodore Fyfe.

Most of the jambs and lintels of doors and windows in the palace were executed in a timber framed construction in both rubble and ashlar masonry. The vertical jamb construction of doors rested on the very distinct L-shaped or U-shaped stone bases, thus forming a frame that stretches the thickness of the wall. There is no conclusive evidence how the timber construction was fixed to the gypsum and limestone jambs. Shaw identified a few dowel holes at Mallia[70] but at Knossos, the jamb blocks have deteriorated too much to identify holes. Some have also been covered by later reconstructions. However, the reveal of the jambs was made of alternating strips of plaster and vertical posts. Evidence for this construction was presented by Fyfe in 1902.[71] The later reconstructions, as they were executed by Christian Doll featured a horizontal transversal beam at the lower and upper end of the reveal. The reconstruction of the transversal beams seems - for structural reasons - logical but evidence for sill-beams, in which the vertical posts were socketed or an upper transversal beam on which the lintel beams rested was not found on site.[72]

An important structural fact must be noted. It seems that the timber frames of the ground floor were not connected with the timber framing of the upper storeys aside from a few areas such as the Grand Staircase. The discovery of the jamb blocks of the upper Hall of Double Axes at their original position indicates that the timber framing of the lower Hall

[70]Shaw, 1973, p. 162.

[71]See figure 16.

[72]They were not mentioned in Mackenzie's diaries and were not recorded by Fyfe.

of the Double Axes was completed at ceiling level. A new frame was begun on top of the jamb blocks for the next storey.[73] This theory is further supported by the fact that the vertical reinforcement posts in the north wall of the northern portico of the Hall of Colonnades also rested on stone slabs and were not connected with the frames of the ground floor.[74]

The use of slender timber reinforcement beams in masonry or brick constructions is quite common in many earthquake-prone areas around the world and is an ancient technology used to reduce damage. This method proved to be highly successful in places such as Kashmir,[75] Macedonia,[76] Pompeii and Herculaneum,[77] and Hissarlik.[78] Langenbach discussed the use of slender 'timber reinforcement beams' to strengthen brick or rubble masonry walls in Kashmir and he discovered a number of important features: (1) the *taq* system consists not of complete frames but predominantly of 'runners' (horizontal beams), (2) the beams are thin, (3) the use of mortar of negligible strength, (4) the lack of bonding between the panels and the posts, and (5) the frequent use of heavy earthen roofs.[79] The system employed by the Minoan builders can be described in almost the same way and likewise probably were intended to counteract the forces of earthquakes. An important detail of these earthquake resistant timber constructions are the joints between the timber members which, unfortunately, have not survived at Knossos.[80] However, it can be assumed that the timber reinforcement structures at Knossos were initially designed to limit potential earthquake damage.[81]

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[73]See plate 136.

[74]See plate 98 centre and Doll's folder No. 8, plate 102.

[75]Langenbach 1989, p. 35.

[76]Šumanov 1989, p. 324. He refers to the Republic of Macedonia, a part of the former Yugoslavia.

[77]Maisonneuve 1989, p. 402.

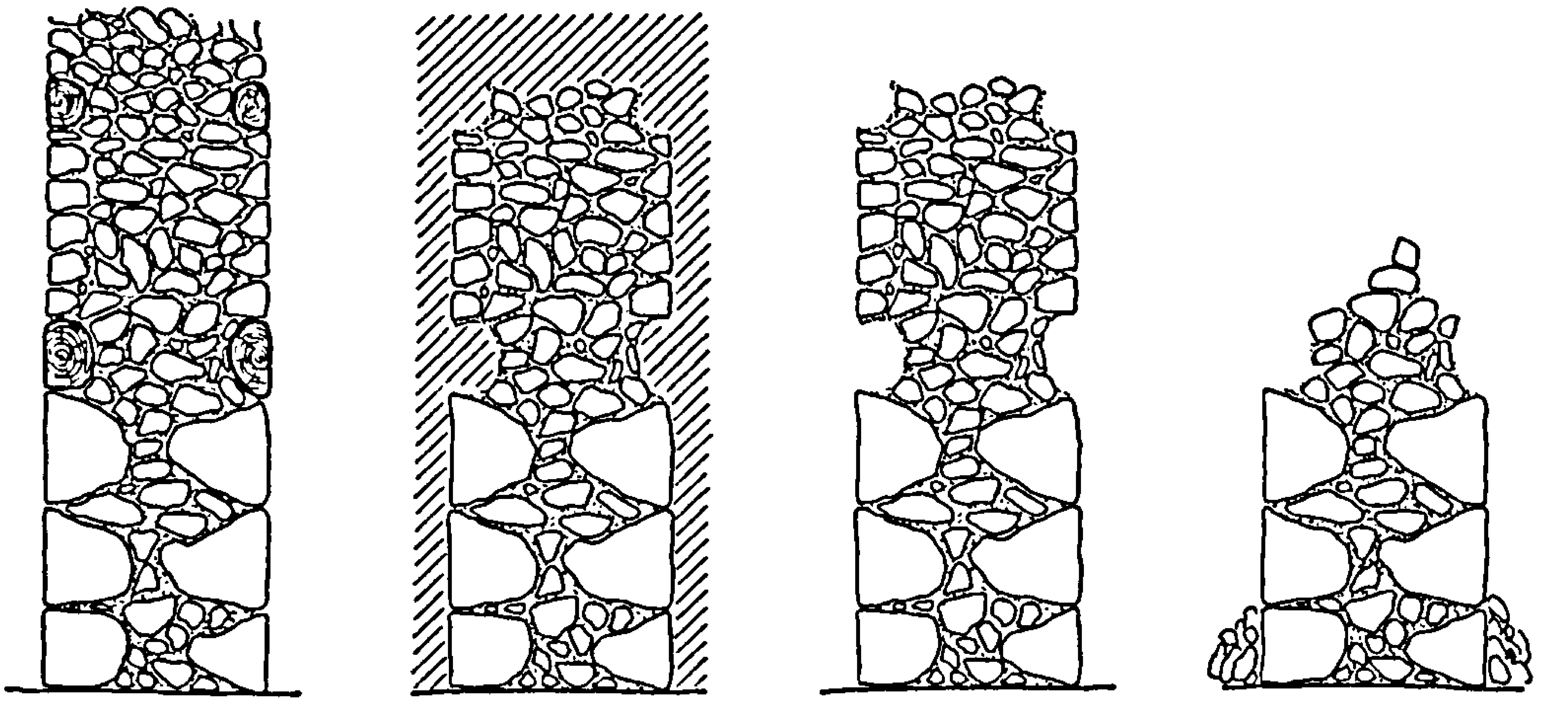
[78]Durm 1910, p. 37. In fact, Wilhelm Dörpfeld who excavated at Hissarlik (Troy) visited Knossos on 7 May 1900 and suggested that the horizontal cavities at the Lustral Basin were left by rotted reinforcement beams. Until then Evans and Mackenzie believed that the cavities were remains of water pipes which provided water for the Lustral Basin. See Evans Notebook, 7 May 1900, p. 64. I am grateful to Vasso Fotou who brought this detail to my attention.

[79]Langenbach, 1989, p. 35 f.

[80]Langenbach, 1989, p. 36 and Šumanov, 1990b, p. 203. Both authors discuss the importance of joint details for earthquake resistant structures.

[81]Cadogan 1980, p. 54.

The particular difficulty for conservation is caused predominantly by two elements. First, placing the horizontal members at the same height at either side of the wall narrowed the section of the wall considerably at this level. The rubble walls consisted of carefully executed outer skins on either side and a less careful infill consisting of mud and stone. In the Magazines and in parts of the Domestic Quarter debris filled the rooms prior to



a.) Original wall b.) Before excavation c.) After excavation d.) After collapse

Figure 17 The decay process of the a rubble wall with two horizontal timber members at the same height. Drawing by the Author.

the deterioration of the timbers in the walls. This debris kept the upper parts of the walls in position even after the timbers deteriorated until they were excavated. Now, the upper parts of the wall were left without support and were exposed to the forces of the environment. This led to the collapse of the upper parts and only the lower part of the wall survived to the height where once the first horizontal timber had been placed.[82]

Another peculiarity of Minoan timber work was that members used by the Minoan builders were not squared or brought into regular shape.[83] Only the front of the timbers was adzed, while the other sides were not treated at all and were set in mud or a mud-

[82]See figure 17.

[83]See figures 16 and 18.

lime mortar.[84] The impressions left by the deteriorated members in this matter are still visible at some places such as in the Throne Room area.[85] Christian Doll has measured the cavities left by the sill beams of the window between the East-West Corridor and the light well of the Hall of the Double Axes.[86] The depth of the cavity at the corridor side

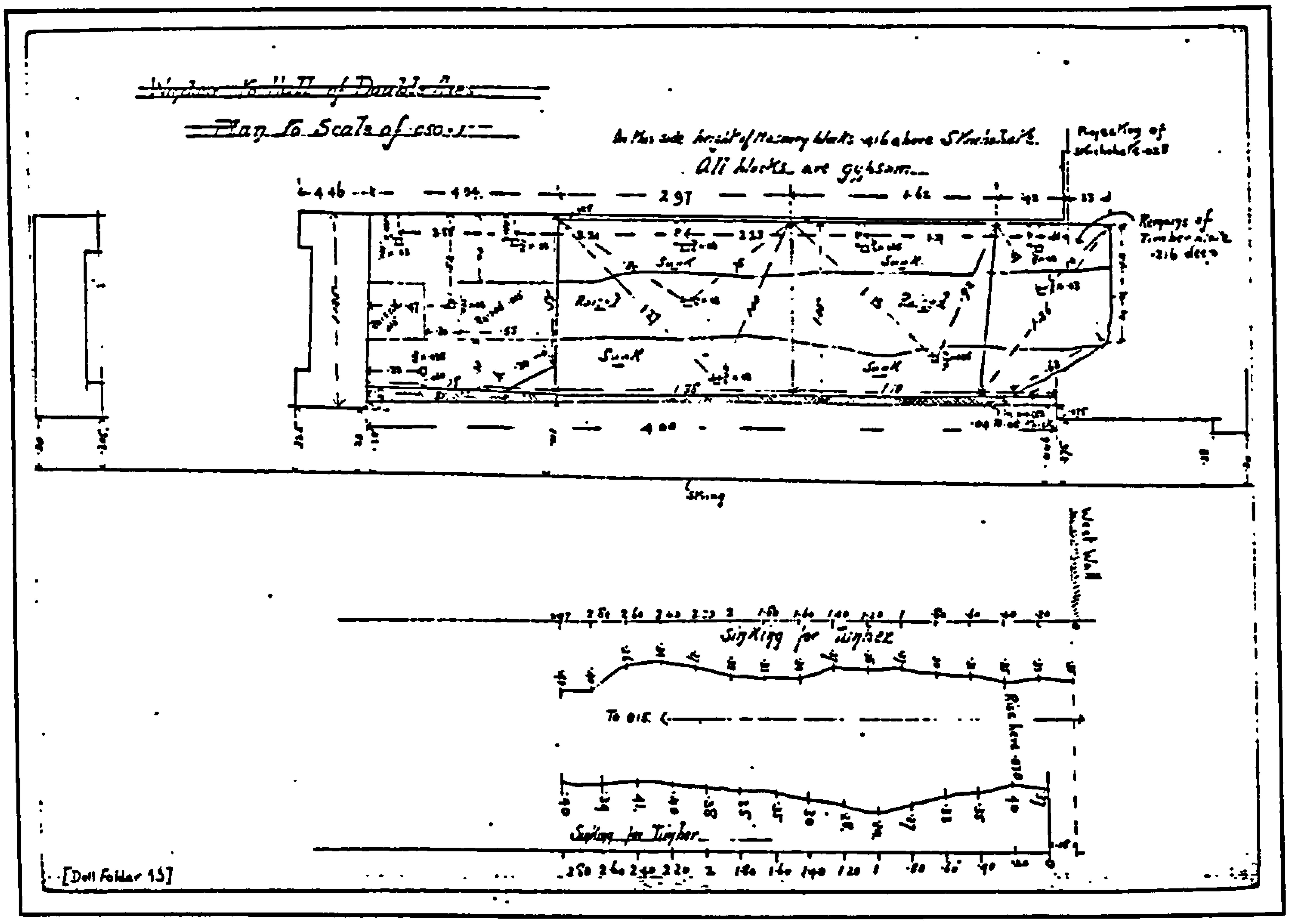


Figure 18 Window between the Hall of the Double Axes and the Lower East-West Corridor. Recording of the cavity left by the decayed timber beams. Christian Doll, undated (probably 1908).

(bottom) varies between 24 and 41 centimetres, while at the light well side it varies between 26 and 40 centimetres. The height of the masonry in the middle between the two reinforcement beams varies between 30 centimetres at the east side (right) and 15 centimetres at the west side (left). Doll's drawing also shows the place of the former transversal beam and the square dowel holes. The cavities left in the masonry after the irregular timbers rotted became even more twisted by pressure through superincumbent

[84]Shaw 1973, p. 144. Obviously the quality of craftsmanship varies within the palace, and some timbers were treated better than others.

[85]See Section C-C, Drawing 4.

[86]See figure 18.

earth. These timbers were members of the original structure. For the conservation of the structure it became necessary to fill the cavities with a load bearing material that could be fitted in these irregular spaces.

2.1.3 Mud Ceilings and Mud Brick

Earth and mud are amongst the most ancient building materials and are still in use in many parts of the world. The obvious advantage of these materials is that they are readily available and cheap and, furthermore, do not require sophisticated tools or knowledge to work them. At Knossos various types of earth were used for mud brick walls, for plaster and for ceilings or, as fired clay, for the construction of water and sewage pipes.[87] Fired clay is a very durable material and remains of both pottery and architectural terracotta were found at the Palace of Minos but, it seems that no fired bricks were used.[88] However, they are of little importance for the architectural conservation of the site and, therefore, will not be discussed here.

Unlike the structures in Mesopotamia and the Middle East, the mud brick walls of Minoan architecture were rather thin. Frequently they consisted of only a single row of stretchers or were combined with a timber framework. Shaw suggested that the walls were not load bearing and, frequently, they were later additions.[89] It is quite possible that upper parts of walls and larger parts of the upper storeys were constructed with mud brick.[90] However, there is little archaeological evidence for this theory aside from the fact that a considerable amount of clay debris, which might come from dissolved mud brick walls, was found at the lower levels. Shaw proposed that mud bricks were produced in moulds and that he could establish regular sizes for the different Minoan Palaces.[91] However, mud brick was frequently used at Mallia, while only limited evidence has been

[87] Shaw, 1973, p. 198.
[88] Ibid., p. 188.
[89] Ibid., p. 188 f.
[90] Evans, 1905, p. 3.
[91] Shaw, 1973, p. 187.

found at Knossos, mostly at the Little Palace. Most of these earthen remains have disappeared completely by now.[92]

The most important use of mud was probably the construction of mud ceilings. Again, no direct archaeological evidence for the ceiling construction survived but Evans argued that no other roofing material, such as tiles survived and that the pictographic evidence from house tablets and frescoes indicated that the palace had flat roofs.[93] Furthermore, Evans refers to flat roof construction which was still used in Crete at the turn of the century.[94] This analogy has been commonly accepted by modern scholars of Aegean prehistory.[95]

The construction technique for flat mud roofs was common for vernacular buildings in large parts of the Mediterranean. It provides a good use of the space underneath, it is well adapted to the climate, requires only small amounts of timber, is simple to construct but it does require close attention and regular maintenance. This construction technique was common for vernacular buildings in the mountain areas of Crete. The basic form of these houses is a single room. An internal support must be provided for larger structures in order to prevent the joists from sagging. This support could be either wooden posts (*státis* or *kéntis*) supporting a main beam (*messodóki*) or it could be an arch (*kamára*) in which case the houses are called *kamaróspito*. The space between the outer walls and the arches or the main beams were covered with comparatively short and, frequently, poorly grown timber joists. The next layer was made of branches (*skíses*), on top of which twigs and parts of bushes (*astyvídes* or *spákes*) were placed in a thin but densely packed layer. They were covered with a ten to fifteen centimetre thick layer of mud (*piloródoma*) on top of which a layer of impermeable and insolating clay (*lepída*) was placed. The top coat of mud was sometimes enriched with lime to provide a more water resistant outer skin, but, nonetheless, these flat mud ceilings must undergo an annual

[92]Shaw, 1973, p. 197. Most evidence refers to the Little Palace.

[93]See page 415 ff.

[94]PM I, p. 327.

[95]See for example: Evely, 1993, p. 210 and Nörling, 1995, p. 17 and Warren, 1972, p. 303 ff.

repair cycle. Every year before the rainy season starts a new layer of mud must be added and rolled in with heavy stone drums, otherwise the roof will leak within a few years.[96]

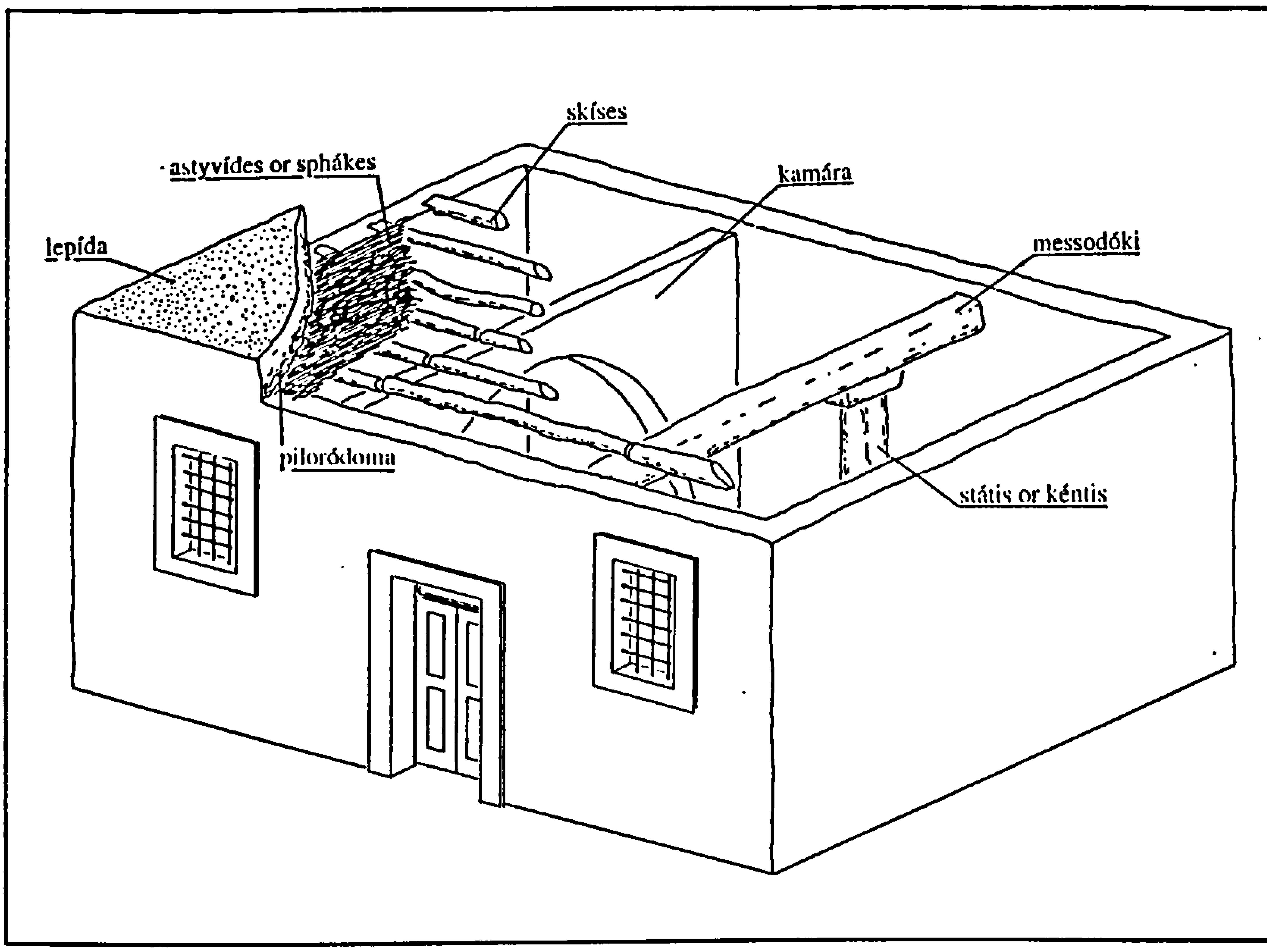


Figure 19 Schematic drawing of ceiling construction for a vernacular Cretan house.

Jordanian flat mud roofs have almost identical construction methods, employed by the local builders in the eighteenth and the nineteenth centuries.[97] Jordan has comparable climatic conditions to Crete and as a result the houses show a similar process of decay due to neglect of the annual repair cycle. We have to presume that the Minoan roof construction - if not identical - was at least very similar to the construction described above. Therefore, the Minoan roofs, as soon as they were neglected, began to decay within a short time.[98] An earlier study in Jordan showed that the roof sagged in the middle and created a puddle which held water for a longer time than usual. Within a few

[96]Compare Bosineki-Didoni, 1985, p. 59 f.

[97]Kienzle, 1995, pp 35 - 39.

[98]The time spans given here are taken from an earlier study carried out by the author in Jordan but will be very similar in Crete.

years the roofs started leaking. After approximately five years the central parts of the roof collapsed and piled up in the middle of the ground floor. The parts of the roof which were above supporting main beams and the walls, remained intact for a longer time but, after a period of about ten years, they collapsed as well. Then the vulnerable wall tops were exposed to the weather.

Mud is a material with very distinct conservation problems. A fact made even more true because the remains have been buried for three millennia. The unbaked or, in case of fire as the cause of its destruction, only partly baked mud dissolved rapidly and formed a clay matter that could not be identified as either a ceiling or mud bricks.[99] Together with the mud plaster at the walls and lime plaster coatings it formed a substance that was described by Duncan Mackenzie as:

> ...a deposit that, owing to the hard concrete like character had so stubbornly resisted all but the most determined attacks of the pick axe.[100]

Naturally, this debris was removed in the process of excavation and nothing of it has survived for study. Thus, our information on the mud features is limited.

2.1.4 Decoration

The rooms of the Palace at Knossos were decorated internally with a wide variety of materials and techniques available to the Minoan builders. Some of these decorations survived *in situ* but many of them were detached from their original position. Gypsum dado is the most common decorative feature surviving in situ or in a position which allowed to reconstruct its original place. The dado was made of decorative gypsum which could be easily sawn with toothless or toothed bronze saws.[101] The slabs had a

[99]Shaw, 1973, p. 191.
[100]DM 6 April 1905, p. 42.
[101]Evely, 1993, p. 210 and Shaw, 1973, p. 59 ff.

considerable size (e.g. 1.96 m x 1.80 m) but were only between 2.5 cm and 7 cm thick.[102] These gypsum slabs were attached to the lower parts of the walls with clay mortar and held in position by floor slabs.[103] Basically the dados, made of gypsum, are exposed to the same threat as gypsum stone described earlier but in addition the dados face two more problems. First, in the absence of a protective roof water penetrated behind the slabs and dissolved the clay mortar thus disconnecting the slab from the wall. Second, owing to the thinness of the slabs and the bedding structure of the original sedimentation the soaked dado slabs warped like timber.[104]

Generally speaking, only the limestone ashlar masonry walls were exposed in Minoan times. All other walls, if not covered with gypsum dado, were plastered.[105] The surface of the rubble walls was uneven; therefore, the Minoan builder employed a comparatively thick layer of mud plaster to level the walls.[106] This plaster coat contained little if any lime as a binding agent. A fine lime plaster coat was applied onto this surface as a base for further decoration - especially in frescoes.[107] The exact technique and composition of the wall plaster varies depending on the progressive sophistication of the building technique and the function of the rooms where the plaster is applied. The composition of the plaster changed from a rather low calcium carbonate content (30% - 40 %) in earlier periods to higher contents in MM I (70% - 90 %). Shaw argues that in the earlier periods, plaster was applied for strengthening the walls while in the later periods the decorative system became more important.[108] This cannot be left without comment. Plaster cannot carry any structural load but it functions as a protective coat which prevents the mud mortar of the rubble walls from being affected by water. Water penetration would inevitably lead to a

[102]Shaw, 1973, p. 20.

[103]Evely, 1993, p.210.

[104]See plate 173.

[105]Shaw, 1973, p. 108.

[106]Fyfe, 1902, p. 108 and Cameron, 1968, p. 3.

[107]PM I, p. 530 and Shaw, 1973, p. 207. The base material for plaster was burned calcium carbonate and not gypsum, as was assumed by Fyfe, 1902, p. 108. The term 'fresco' has been widely used to describe the murals in the Palace of Knossos, despite the fact that not all of them were executed in the real method '*buon fresco*', Cameron 1968, p. 3. Many of them were simply murals.

[108]Shaw, 1973, p. 211 - 212.

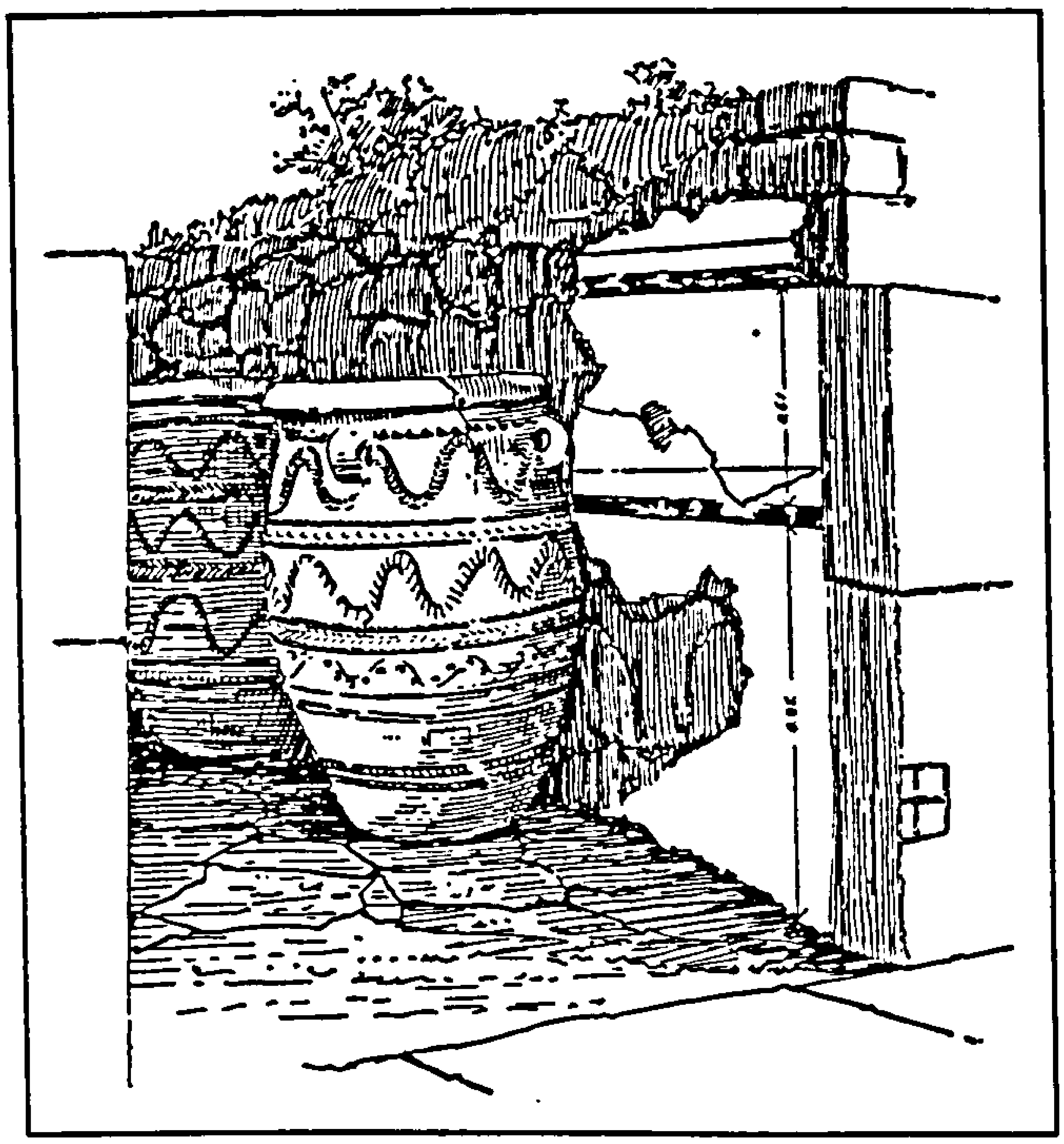


Figure 20 Plaster decoration in Magazine XII. Drawing by Theodore Fyfe.

collapse of the wall. However, Shaw correctly discovered that finer plaster was employed in later periods in order to provide a plain surface for the sophisticated murals. This development culminated in the technique described by Cameron for the MM IIIb 'House of the Frescoes'.[109] Here, a layer of lime plaster was applied on the levelling mud plaster. The outline of the frescoes were sketched on this coat with orange paint and then covered with a very fine opaque slip of lime plaster on which the actual fresco was executed. Principally, all plastered walls were finished in colour with either humble designs with lines or friezes in the magazines or a elaborate design with frescoes in the more important rooms.[110]

Stucco was another decorative form used in the palace by the Minoan artists in the palace. Moulded and pre-cast plaster elements were incorporated in the wall plaster or in ceilings. Architectural elements, rosettes and spirals were found at various places of the Palace and Fyfe reconstructed the ceiling of the Queen's Megaron on the basis of the remains.[111] Besides these moulded and pre-cast work the Minoan artists modelled semi-relief plaster figures. The Charging Bull Relief in the West Portico of the Northern Entrance[112] or the Prince of the Lilies may serve as examples for this technique. Figures were modelled on the otherwise plain plaster, which was later decorated with a mural,

[109] Cameron, 1968, p. 3.

[110] See figure 20. See also Fyfe, 1902, p. 111 and PM I, p. 530.

[111] Fyfe, 1902, p. 116 ff. See also: PM III, p. 30 - 31.

[112] PM III, p. 158 ff and PM IV, p. 1 ff.

thus enhancing the natural appearance of the depiction. Furthermore, the timber ceilings seemed to have been plastered and various painted stucco fragments were attributed to ceiling decorations.[113]

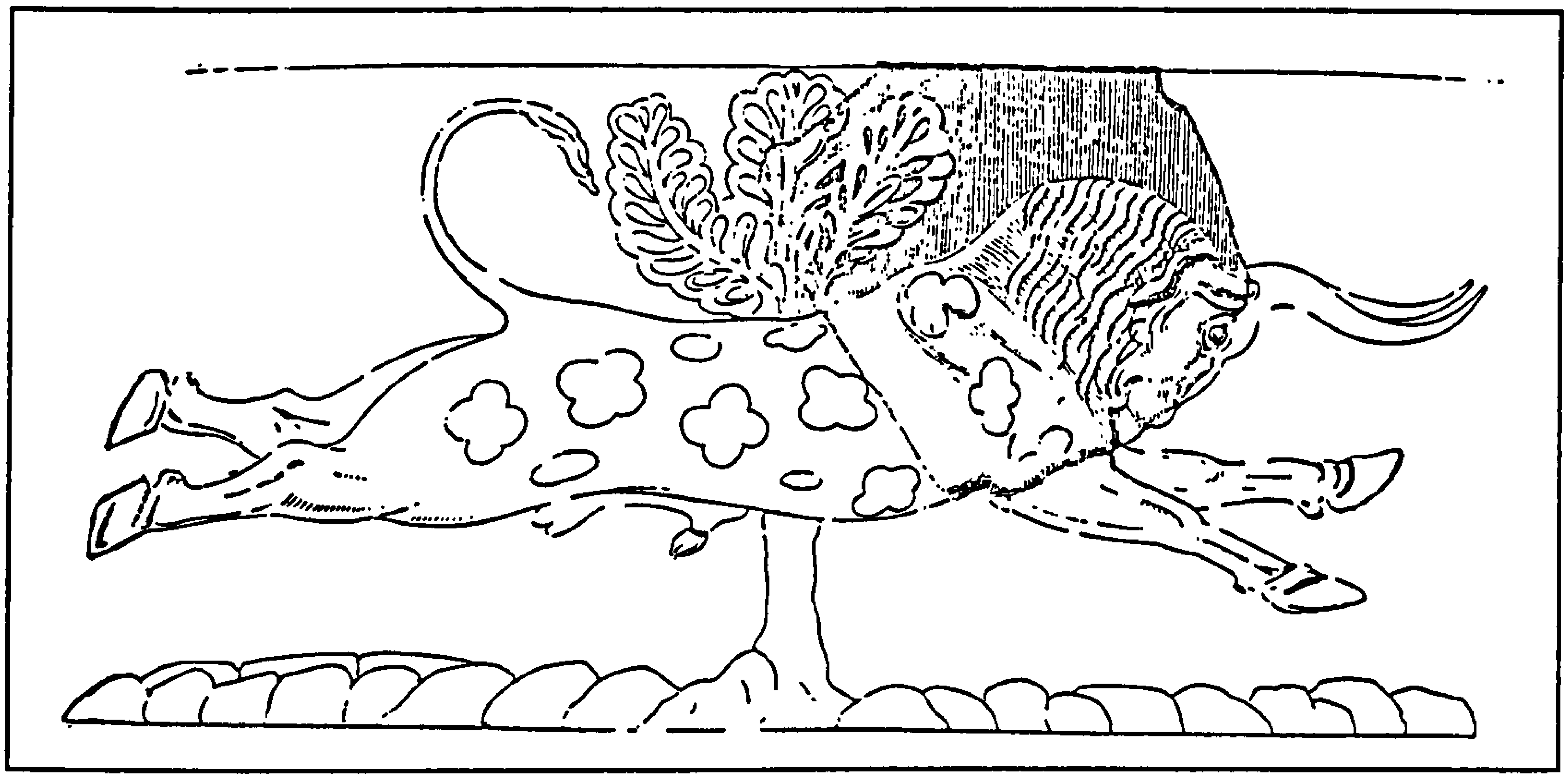


Figure 21 The Charging Bull Relief from the North Entrance Passage. The reconstruction is based on the depiction of a charging bull on a gypsum slab found at Mycenae.

Some parts of the wall decorations were found in their original position[114] but many of the well known frescoes were found in a fallen position within the destruction debris above the floor.[115] In the latter cases, the original wall to which the fresco once might have been attached was missing completely. It will be discussed later how accurate was their replacement on the reconstructed walls. Many of the fresco elements still *in situ* were taken down and transferred to the Museum of Herakleion shortly after their excavation. This was considered necessary when the plaster could not be sheltered from the weather and water was able to penetrate behind the plaster, dissolve its mud plaster coat and detach the lime plaster coat from the wall. Besides the spiral fresco in the bath adjacent to the Queen's Megaron and plaster in the Lustral Basin of the Throne Room hardly any plaster has survived *in situ*.

[113]PM IV, p. 874 f and Fyfe, 1902, p. 119.

[114] For example in the Magazines, the Throne Room or the Bath adjacent to the Queen's Megaron. See Fyfe, 1902, p. 110.

[115]For example the Miniature Fresco, PM III, p. 29 f, the Charging Bull Fresco, PM III, p. 170 or the Dolphin Fresco in the Queen's Megaron, PM III, p. 378.

The gypsum dado slabs frequently covered the timber reinforcement beams in the wall to which they were attached. For example, in the Room with the Plaster Couch, the cavities of the original vertical posts are still visible behind the remains of the gypsum dado.[116] The plaster decoration often recreated the timber framework in its decorative pattern. Where timber beams were inserted in the wall, a band of spiral or circular patterns decorated the plaster as, for example, in the Bathroom adjacent to the Queen's Megaron.[117] Inevitably, cracks in the plaster occurred where timber beams were inserted in the walls due to the different physical properties of timber and masonry. The above mentioned decorative pattern would minimise the visual effects of these cracks.

2.1.5 Conclusions

The previous section described the various building materials and building techniques employed by the Minoan craftsmen at the Palace of Knossos. It is necessary to understand the Minoan constructions to appreciate the conservation problems the architects, Theodore Fyfe, Christian Doll and Piet de Jong, were facing. In Knossos specific building methods caused very specific conservation problems:

- the use of soft building materials such as gypsum, timber and mud
- construction methods which focussed on appearance rather than on quality
- use of timber reinforcements which, after rotting, left cavities
- use of mud mortar, plaster and ceilings which deteriorated quickly

Generally speaking, the palace was constructed with comparatively soft building materials which deteriorate quickly after the palace was destroyed and they were exposed to the forces of the environment. They survived well after their burial but began to deteriorate again after their excavation. To a large extent they are responsible for the need of reconstruction work.

[116] Compare Section A-A, Drawing 8.

[117] Compare plates 184 and 185.

2.2 The Destruction Process

2.2.0 Introduction

The second issue which had a major influence on the preservation of the site was the original destruction process at the end of the palace's life in Minoan times. Fire destroys a building in a manner different from that of earthquake and many buildings which were simply deserted also decayed in different ways. At Knossos various types of destruction occurred at different areas of the palace and were responsible for different states of preservation of the original fabric. It is very important to note that Arthur Evans himself recognised the occurrence of the three different main destruction causes at Knossos. It was left to the Architects to find practical solutions to respond to the problems.

The types of destruction which are commonly mentioned in connection with the Palace of Minos at Knossos are:

- Earthquake
- Fire
- Desertion
- The eruption of Santorini
- Robbing of stone
- Military raid

The issue of a military raid will not be discussed here because it is not in itself a physical way of destruction. It normally resulted in a destruction of the site by fire or by desertion. The other possible destruction causes will be discussed in the following section.

As Peter Warren points out, the date of the destruction of Knossos is of importance to the prehistoric archaeology in the Aegean.[118] The date of destruction is linked to the rise

[118] Warren, 1991, p. 33.

and fall of cultures and therefore is an important mark in the history of the region. In his paper Warren gives a short overview of the different positions held by researchers in the area.[119] While the date is disputed severely, hardly any of the researchers questions the event of a comprehensive destruction of the Palace at a certain time. In this thesis it will be of minor importance to establish the exact date, but it is still essential to establish how certain parts of the palace were destroyed and what influence this had on the necessary conservation work.

2.2.1 Earthquake

Knossos is located in an earthquake zone,[120] and some scholars believe that an earthquake destroyed the Palace.[121] Many earthquakes have been documented in the history of Crete and, with some gaps, lists can be made which stretch back centuries.[122] Marinatos anticipates at least three earthquakes of different magnitudes in each century

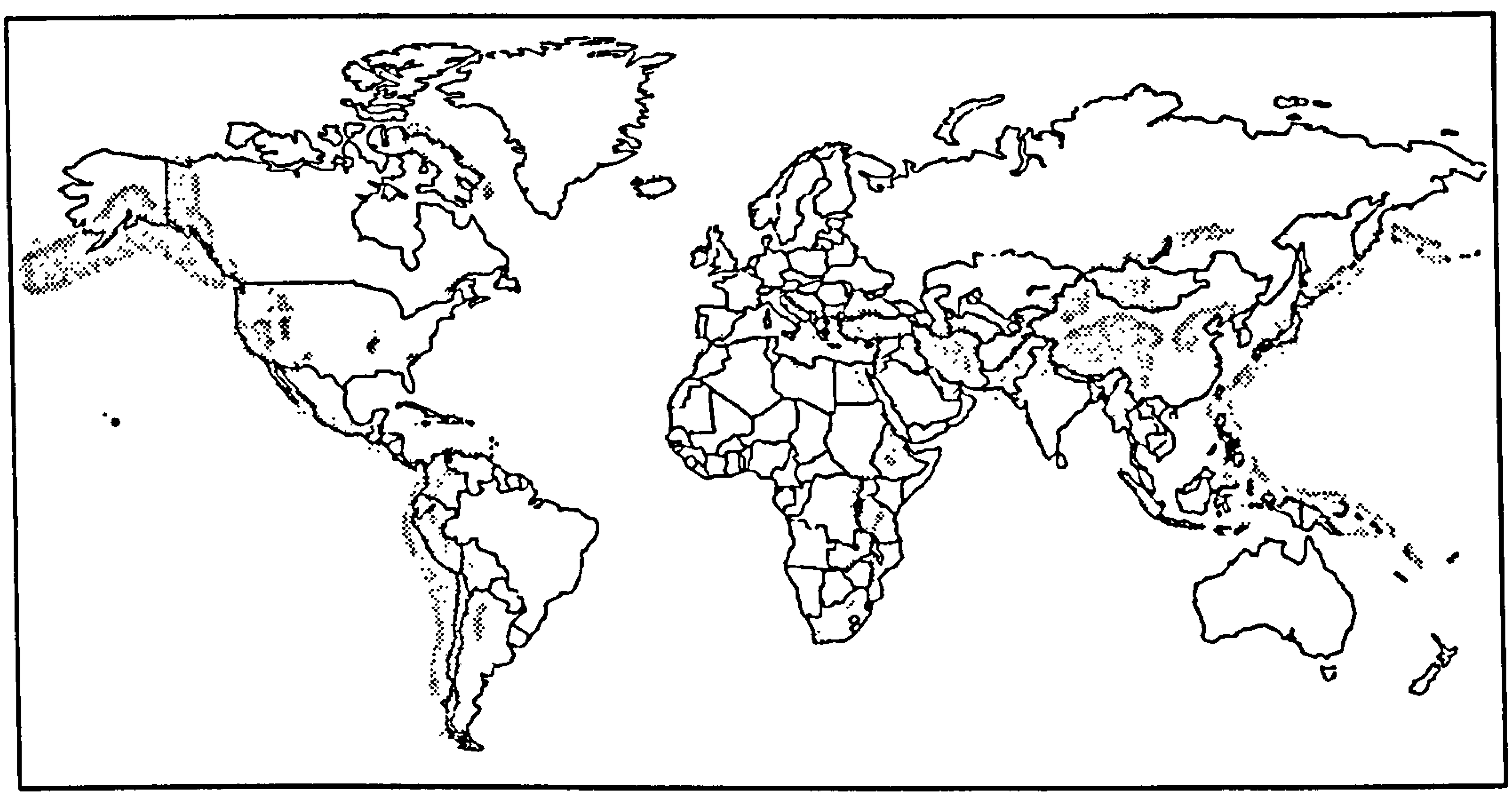


Figure 22 Earthquake-prone areas of the world.

[119] Warren, 1991. See also Warren, 1990.

[120] Reed, 1995, p. 4.

[121] See for example Warren, 1985, p. 84.

[122] PM II, p. 313.

and it is only reasonable to anticipate that similar earthquakes occurred in Minoan times.[123] Arthur Evans finally adopted the theory that an earthquake was the main reason behind the palace's destruction. In the last volume of his compendium *Palace of Minos* he writes:

> The end was sudden and the evidence once more points to an earthquake as the cause followed by a widespread conflagration and doubtless ensuing pillage of the ruins left. But on this occasion the catastrophe was final. Squatters, indeed, after a short interval of years, occupied the probably considerable shelter still offered by the remains of the fabric. [124]

Earthquake damage is generated by two types of waves: the body waves and the surface waves. S waves and P waves are body waves which move quickly through the body of the earth. P waves travel at approximately 24,000 km/h causing an up and down motion, while S-waves, travelling at 16,000 km/h, cause a side to side movement. Commonly, S-waves cause more damage to buildings than P-waves. Surface-waves are low frequency waves, travelling on the crust surface. They shake tall buildings.[125] Furthermore, close to the earthquake's epicentre and at tectonic faults the upper surface of the earth might be deformed causing parts of buildings to slip to a lower level, to buckle or to be twisted in their ground plan.[126]

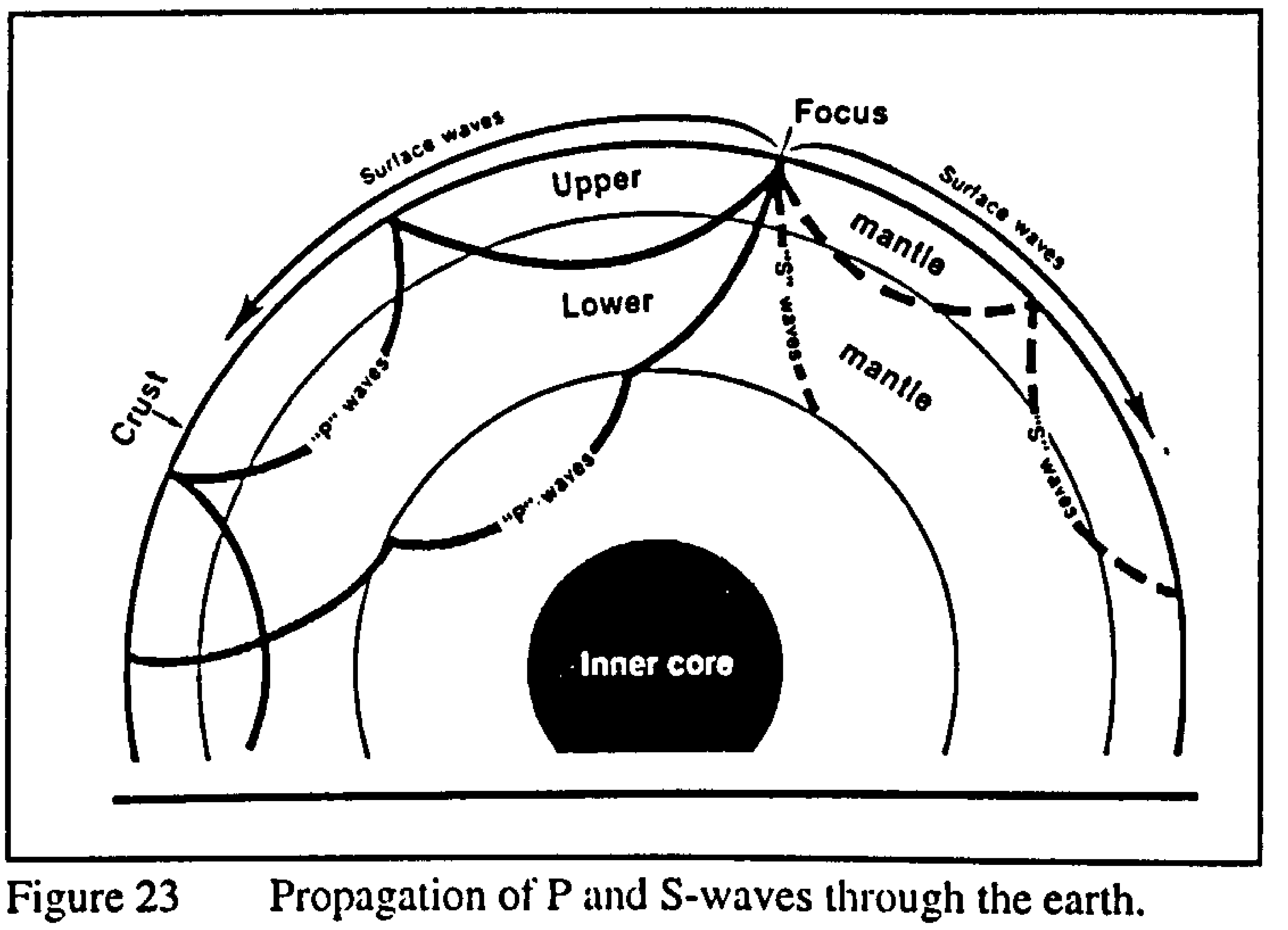


Figure 23 Propagation of P and S-waves through the earth.

[123]Marinatos, 1959, p. 13.
[124]PM IV, p. xxiii.
[125]Reed, 1995, p. 3.
[126]Stiros, 1996, p. 133

Normally, buildings are exposed to vertical loads while the horizontal forces are very limited (wind or moving people and animals). The normal vertical loads in a building are either static (weight of construction material) or change minimally and slowly (all goods and persons in the structure, snow or rain on the roof). In contrast the horizontal forces of an earthquake accelerate and slow down extremely quickly thus exposing the structure to extreme distress. The Minoans did not erect tall buildings at Knossos and, therefore, destruction through surface waves were less likely. P-waves generate an up and down movement of the structures but the Minoan structures were, as far as archaeological evidence permits us to assess, oversized and should have been able to carry the vertical stress. The majority of the damage must have been caused by the side to side movement of the S-waves.

While timber possesses a considerable tensile or ductile strength, masonry will break immediately upon being exposed to the stress caused by the S-waves. The horizontal timber-reinforcements reduced the earthquake damages at the palace.[127] They tied together the non-tensile rubble masonry structure. Generally, at archaeological sites, damage caused by earthquakes can be recognised by the horizontal dislocation of building material.[128] This, of course, presupposes that its former location is known.

The south-east angle of the palace, the House of the Fallen Blocks and the House of the Sacrificed Oxen show distinct marks of the earthquake damage at the close of Middle Minoan IIIb.[129] This area of the Palace was especially exposed because it was constructed on a subterranean quarry and a sloping hill.[130] Obviously, other parts of the palace were exposed to the same earthquake but the damage might not have been as severe as in the south-east angle which was abandoned after the destruction. The Domestic Quarter, north of this area was cut deeply into the neolithic strata, a fact which protected it quite well from the forces of the earthquake.[131] Other parts of the Palace have been affected

[127]Compare Stiros, 1996, p. 150 and Coburn et al. 1995, p. 46 and also Langenbach and Šumanov.
[128]See Stiros, 1996,
[129]PM II, p. 288.
[130]Ibid., p. 330 f.
[131]Ibid., p. 348.

by the earthquake but its traces have mostly vanished in the context of the consequent reconstruction called the 'Great Rebuilding' by Evans.[132]

It is more difficult to prove that an earthquake was responsible for the final destruction of the Palace of Knossos. Collapsed ceilings in themselves are no indication for earthquakes since almost all types of destruction result in collapsed ceilings. The distinctive marks of Earthquake damage - dislocated masonry - could only be proven for buildings which were abandoned in Middle Minoan IIIb before the final destruction of the Palace in Late Minoan I.[133]

The Minoans were used to earthquakes, something which can be seen in their provision of timber reinforcements to counteract the forces of earthquakes[134] and the quick reconstruction after the earthquake in Middle Minoan IIIb.[135] None of the excavated architectural features show definite signs of earthquake damage as a final cause of destruction but this damage would be most visible at the upper storeys which have long since disappeared. Evans suggested other indirect factors, such as incomplete work in the workshops or overturned vessels, but these factors indicate an unspecific disaster and not necessarily an earthquake. Fire or a military raid would have had the same effect. Nonetheless, an earthquake cannot be ruled out as a possibility for final destruction.

Typical conservation problems which occur after earthquakes are cracks in vaults, masonry and internal disintegration of the two faces of a masonry wall. Some of these cracks are big enough to cause the collapse of the entire structure. The conservation work which is commonly necessary after earthquakes, is the joining together of the disintegrated members. No excavated structure in the palace was affected by earthquake damage in a way that imposed on the architects particular conservation problems. Cracks might have opened in the wall but later rain probably liquefied the mud mortar and closed

[132]PM II, p. 365 ff.

[133]See, for example, the House of the Fallen Blocks. Some scholars offer other dates for the destruction of the Palace. See also Cadogan in Appendix 3.

[134]Compare page 132.

[135]Georgiou, 1979, p. 56.

the cracks again. One hundred years after the excavation and after several conservation treatments of the structures no typical cracks can be seen which indicate earthquake damage. Furthermore, the excavation diaries of Duncan Mackenzie and the Notebooks of Arthur Evans mention no typical earthquake damage besides the blocks in the House of the Fallen Blocks and the House of the Sacrificed Oxen.

2.2.2 Fire

Another source of destruction frequently mentioned in context with the Palace of Minos is fire.[136] The destruction of the West Wing and especially of the Magazines had been caused or at least contributed to by fire. Burn marks are visible at the West Facade:

> The present façade bears signs of the final destruction of the Palace. On one of the upright gypsum slabs you can see the mark where the end of a blazing beam rested, while all to the north is blackened by the wind driven smoke. Now violent south winds are commonest in late April to early May, and the Athenian tradition maintained that this was the time of the year when Theseus sailed for Knossos[137].

Several other parts of the Palace also show burn marks.[138] However, a blaze vast enough to destroy the massive timbers of the Palace must leave more detectable traces. Ashurst and Dimes identify four types of damage which commonly occur in structures affected by fire: blackening, shattering, decomposition and oxidation.[139] Limestone inevitably converts to lime above a certain temperature and sandstone changes its colour and sands off but these details are not present at the palace.

It can be argued that the walls were plastered with a mud plaster which protected the stones. However, the burn marks in the West Wing are visible on the surface of the stone,

[136]Castleden, 1990, p. 65.
[137]Pendlebury, 1954, p. 40.
[138]For example the Queen's Megaron, PM III, p. 374
[139]Compare Ashurst and Dimes, 1990, p. 165.

thus contradicting the existence of plaster at the time of the fire, unless, that is, one assumes that the first heat of the fire burned the plaster which fell off and exposed the stones underneath. Furthermore, in the Magazines the blackening of the wall starts a certain distance (60 - 100 cm) above the floor.[140] The lower parts of the walls in the Magazines were still plastered to a large extent when they were excavated in 1900. No blackening can be discovered on them in the photographs and also in the excavation diaries no blackening is mentioned. These details indicate that the mud ceiling has collapsed and filled the lower parts of the magazines, preserving the wall plaster in these areas. At a later time when the plaster of the upper parts of the surviving walls had disappeared, smaller fires were lighted such as those by local shepherds who used the ruins as shelters. The fires were not large or hot enough to start decomposition of the sandstone and limestone in the masonry.

Another fact frequently cited to prove the destruction of the Palace by fire are the burned clay tablets inscribed with the Minoan script, Linear A and B, and burned pottery. Sakellarakis suggests, that the Minoans used clay tablets to inscribe lists and other administrative documents. These lists were later transferred to perishable materials and, then, the tablets were reused. The clay tablets had survived accidentally, because they were burnt in the fire that finally destroyed the Palace.[141] Pottery can be affected by fire in various ways ranging from vitrification to liquification or from burning to cinders to being almost unaffected.[142] At Knossos much of the pottery is little affected but portions show clear marks of fire.

The last argument for a final destruction by fire are traces of charcoaled timber at various parts of the Palace. Evans commonly described the timber remains as carbonised but suggested that this was a result of chemical action.[143] He believed that this carbonisation was part of a deterioration process due to the exclusion of oxygen and was not

[140]See plate 21. Stefie Chlouveraki is currently investigating the theory that this blackening was actually not caused by fire (soot) but is the result of a fungi. Mrs Chlouveraki brought this to my attention.

[141]Sakellarakis, 1994, p. 47.

[142]Blegen in: Palmer 1963, p. 250.

[143]PM I, 327, PM IV, p. 944, Evans, 1927, p. 258.

necessarily the result of fire.[144] Though, thoroughly rotten timber can look as if it is charcoaled, the remains from Knossos which have survived to date definitely were charcoaled (combustion in an oxygen reduced atmosphere).[145] Peter Ian Kuniholm who is researching ancient timber from the Aegean area stated that the timber elements from Knossos which he has so far examined were definitely burned prior to their burial.[146] However, their number is few and it is not known from which part of the Palace these timbers originate. They cannot be used to prove that all parts or which particular parts of the Palace were destroyed by fire.

The common property of timber beams in a fire is that the surface of the beams burns after ignition but the carbonised outer layer insulates the inner sections and the timber member continues to carry load for a considerable time.[147] It is now commonly accepted by archaeologists that this has happened at Knossos.[148] Fire destruction has obviously taken place at the Palace of Minos but not enough evidence has survived to indicate whether fire was the only and comprehensive destructive force or if several small fires combined with other destructive forces occurred on site.

In the excavation process, almost all timber remains have been removed from the site and brought to the museum in Herakleion. They were not conserved on site and imposed no specific problems on the architects. Some blackening on stonework is still visible but this has had no impact on the conservation work. Particular conservation problems which had their origin in fire destruction could not be detected.

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[144]PM I, p. 325 and 327 f and PM III, p. 287. Boardman, 1963, p. 83 Note 2 challenges this view. He suggests that the timber members were charcoaled on the outside by a fire but remained sound internally. Thus they were still able to carry load from the upper storeys and the charcoaled layer protected them from rotting. This was the reason why Evans found timber remains on site.

[145]Shaw, 1973, p. 136 f and Peter Ian Kuniholm in an e-mail communication, 13 May 1996. Dr Kuniholm heads a dendrochronology research project at Cornell University, Ithaca, New York. He researches Bronze Age and Iron Age timber remains to establish an absolute dendrochronological sequence for the Aegean and Anatolia. See: Kuniholm et al., 1996 and Manning, 1990.

[146]Personal e-mail communication, 13 May 1996.

[147]Fire Protection Association, (n. d.), p. 25.

[148]See for example Boardman, 1963, p. 83.

2.2.3 Santorini Theory

The most disputed theory of destruction at Knossos is the explosion of the volcanic island of Santorini. All scholars agree that the explosion of the volcano happened in Minoan times but their interpretation on how much effect the eruption had on the Minoan culture varies.[149] Pumice and ash were found in stratigraphic layers dated to Minoan periods as well as at the ground of the Mediterranean. The Minoan settlement at Akrotitri, Thera, was found - like Pompeii and Herculaneum - buried under tephra of the volcano. It is important to understand that this was not a minor volcanic eruption such as might have happened several times throughout the Minoan period but was a total explosion of the volcano.

The explosion of Santorini was caused by a massive blocking of the volcano funnel. An enormous pressure gradually built up which led to the explosion of the entire volcano taking with it a large part of the island. The explosion of the volcano at Krakatau, Philippines, is frequently referred to as an example for the magnitude of such an explosion.[150] The circumstances which were observed and documented in the Philippines might serve as means to asses the explosion of Santorini. While the explosion of Krakatau was predated by several earthquakes, it seems that the explosion itself had not been accompanied by an earthquake. However, the explosion was probably accom-

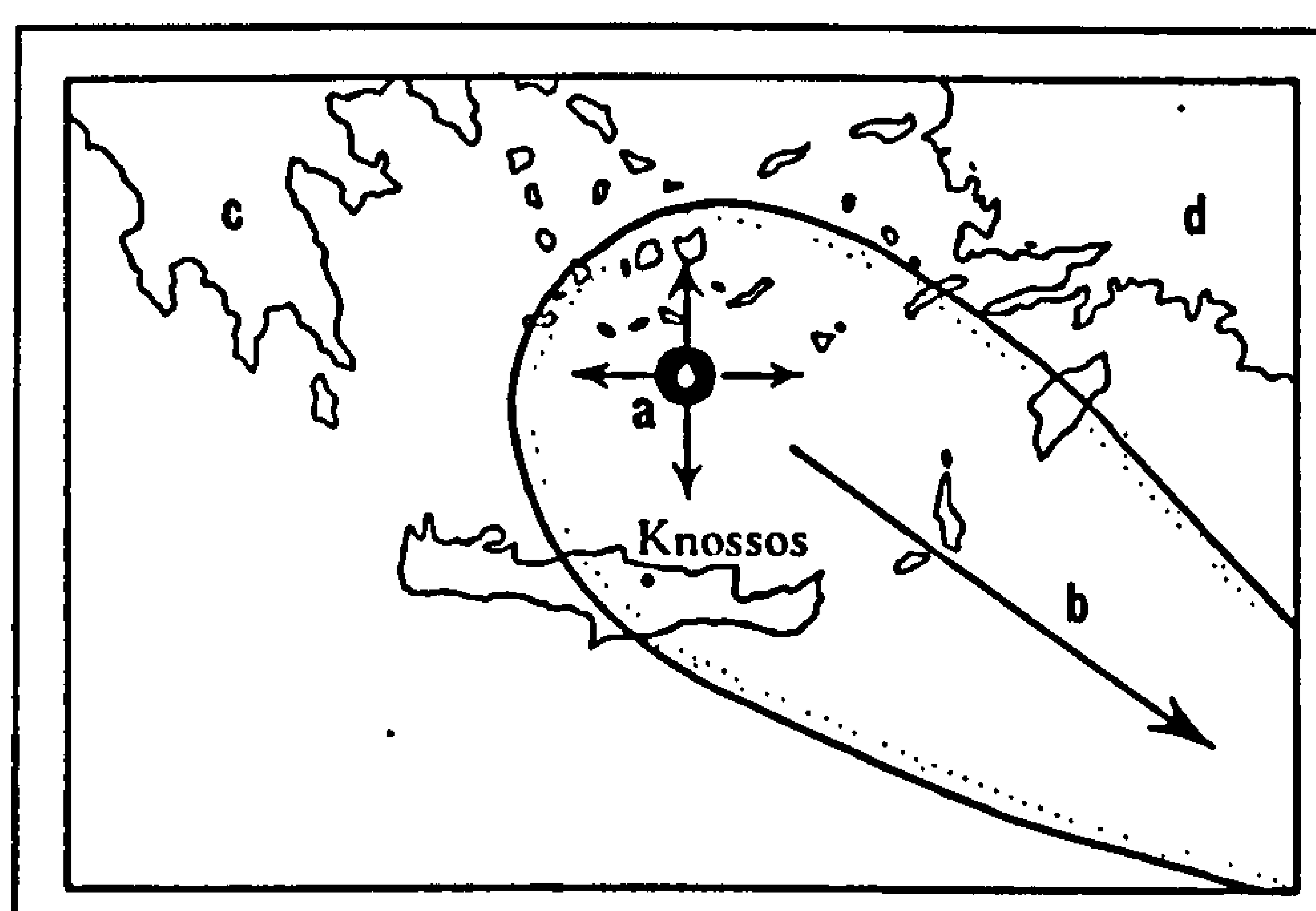

Figure 24 Area affected by the ashfall from the Thera eruption.

[149] For a discussion see the various papers in Hardy and Renfrew (eds.) *Thera and the Aegean World, Vol. III. Chronology*, especially Warren, 1990, p 26 ff and Manning, 1990, p. 29 ff. See also Graham, 1987, p. 11 f; Page, 1970; Marinatos, 1939, p. 425 ff and 1959, p. 14 f.

[150] For example Marinatos, 1939, p. 431 f.

panied by a gigantic flood wave (*tsunami)* which caused damage at the coastal areas of Crete.

Layers of volcanic ash sediments have been measured at various places of the Mediterranean. Subsequently, a map was drawn suggesting that a north-western wind carried the ash across the eastern part of Crete.[151] However, no evidence was found at the Palace of Knossos that indicated a destruction by either the *tsunami* or the volcanic eruption. The particular destructive pattern of *tsunamis* such as toppled walls or mud sediments are not be observed at Knossos.[152] Despite the above mentioned research at the ground of the Mediterranean, no reasonable amount of ash or pumice can be observed at Knossos and none of these materials is mentioned in the excavation reports. Thus, no evidence was found at the palace that definitely could be linked to a direct impact of the volcanic explosion nor to the subsequent *tsunami*. Some scholars suggest that earthquakes preceded, accompanied or followed the eruption of the volcano and that these earthquakes were actually responsible for the destruction of the palace.[153] For our purpose, this was discussed in the section on earthquake destruction.

2.2.4 Robbing of Stone

It was common practice in the past and into our century to reuse building materials from earlier structures in new building work. Structures which had been abandoned or which had been destroyed provide a good source of building materials, for example readily dressed stones in good sizes or seasoned and shaped timber beams. Obviously it is much simpler to re-use these building materials (*spoliae*) instead of producing new ones, especially when the old structure was close to the new building site. Commonly, only material which was easily accessible was reused, for example the upper layers of a

[151]See figure 24. See also Castleden, 1990a, p. 144 ff. The theory was first forwarded by Luce, 1969.

[152]See Coburn et al, 1995, p. 14 f and Marinatos, 1939, p. 431 ff. Marinatos suggested that a *tsunami* destroyed the coastal settlements of Minoan Crete such as Amnissos, Nirou Khani, Mallia, Gournia, Zakro but excludes Knossos which in his opinion declined later.

[153]Vallianou 1996, p. 153 ff and Page, 1970, p. 42.

collapsed building. The builders in search of material were normally reluctant to excavate structures to access material buried at a lower level or even to demolish vaulted structures because the sudden collapse of the arch would be dangerous. Frequently, the material was reshaped to fit the new purposes and, especially with stone, it is difficult to prove their origin unless clear distinct features are visible such as masons marks or specific dateable chisel marks.

In Knossos these *spoliae* were used by the Greeks, Romans and later by the Venetians and Turks to build their houses and fortifications. Some material might even have been reused several times in the past. For this reason, various parts of the palace were destroyed by the Greek and Roman builders looking for adequate material. Unfortunately, neither, is it known how much material was originally employed in the construction of the palace nor, where the material has gone. Therefore it is impossible to assess how much material was lost in this way. Even shortly before Evans arrived at Knossos, building material was taken from the palace by the Turkish landowners.[154]

The extraction of stone for the new building work can be established for several areas of the Palace, for example the South West Corner and the West Entrance.[155] However, it can be traced most clearly at the North Entrance Passage. The fragments of the Charging Bull Fresco, now restored in the Western Lobby of the North Entrance Passage, were dated by Arthur Evans to Middle Minoan III, but they were found in one strata between 0.5 and 1.5 metres above the Late Minoan IIIa road in the passage.[156] In 1930 Arthur Evans wrote:

> The whole deposit seems to mark a destruction of the upper fabric of the Portico, carried out at some particular time. As the stratum itself was on average quite a metre higher than that on which LM III a pottery rested, there is every reason for believing that this destruction took place not earlier, at least, than geometrical Age, the remains of which appear in the neighbouring area North of this.[157]

[154]PM II, p. 349 f.
[155]PM II, p. 350.
[156]PM III, p. 170. See figure 25.
[157]PM III, p. 171.

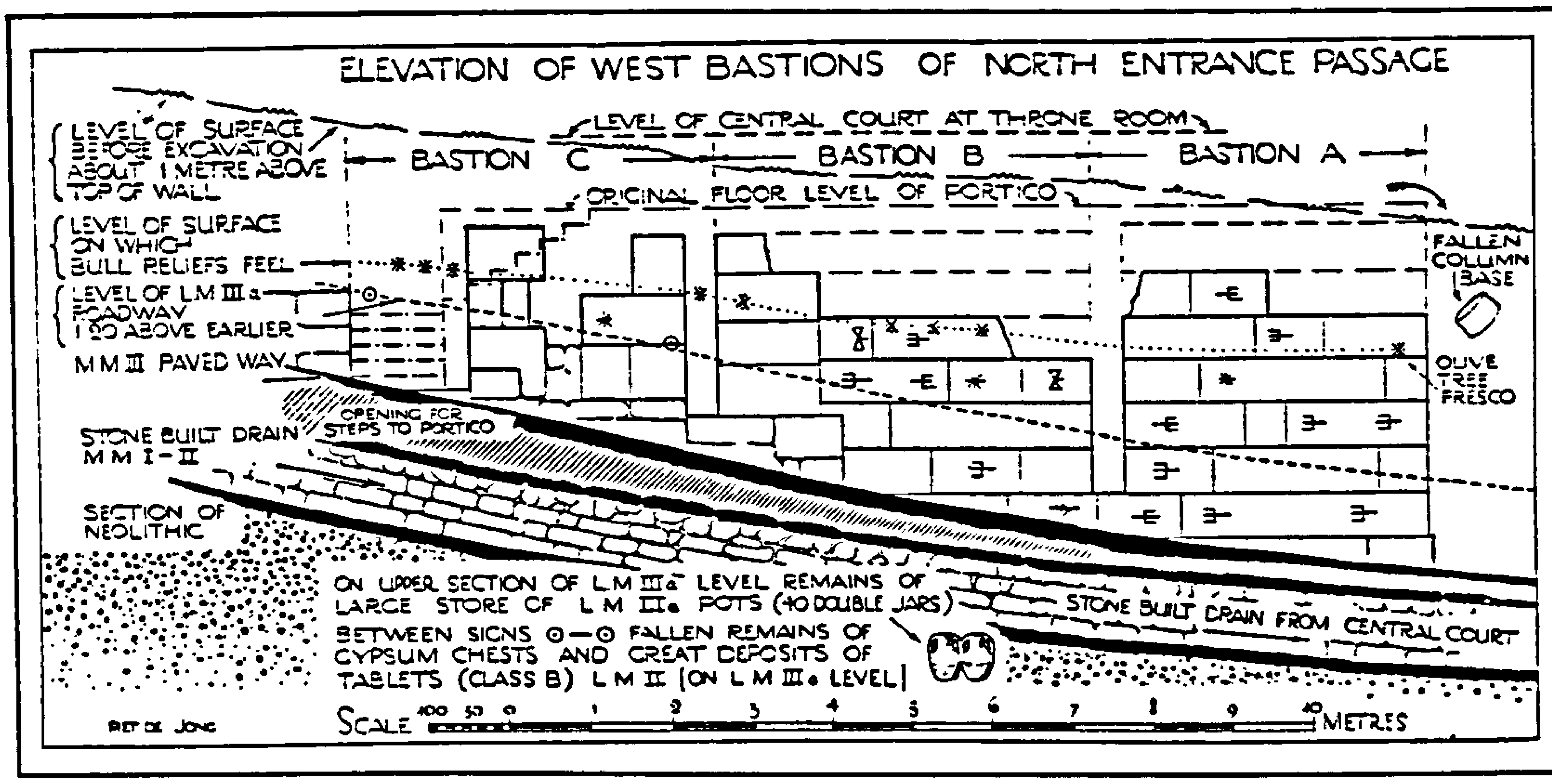

Figure 25 Elevation of West Bastion of North Entrance Passage with find levels of fragments of the fallen Bull Relief Fresco. Drawing by Piet de Jong.

It is questionable whether a deposit of a certain height indicates the amount of time that has passed. Nonetheless, it can be proved that the Western Loggia of the North Entrance Passage was destroyed at a point later than other palace structures. The Bull fresco was removed from the wall and thrown into the passage while the stones of the back wall of the Loggia were taken for re-use in the new structures. While it is not clear how much of the fabric of the Minoan Palace at Knossos was re-used in other buildings, it can certainly be proved that some parts of the Palace were deliberately destroyed by the builders of later generations in search of adequate building material.

For the area of the Little Palace, Evans documented clear evidence of looting of precious metals.[158] It must be anticipated that similar looting took part in the palace. However, Minoan architecture employed no metal clamps between ashlar blocks as it was common in classical architecture. Thus, the typical holes cut into classical ashlar walls to extract these metal clamps do not occur at Knossos.

[158] *The Times*, 27 August 1908, p. 6.

2.2.5 Other Factors

One of the most disturbing facts in the excavations of the Palace of Minos is the good preservation of remains of the upper storeys of the Domestic Quarter and, especially, Grand Staircase. Arthur Evans, himself puzzled, describes the excavation of this area in the following passage:

> In the 'Domestic Quarter' the maintenance of upper story remains , more or less at their original level, was no doubt helped by the fact that it was built into a great cutting in the hill-side and had received a good deal of lateral support. But this itself was far from explaining the at first sight miraculous evidence of upper story remains that we there encountered, which has made it possible to recover an almost perfect plan of the first floor.
>
> The problem is seen under its most striking aspect in the Hall of the Colonnades', where the balustrade on the North side was found as it were suspended almost at its original level, while the triple balustrade of the upper flight of stairs on the West side is seen to rest on a mass of clay and rubble, the supporting columns having been in both cases carbonised and disintegrated. It was necessary indeed to follow the downward course of the lower flight of stairs by means of a tunnel carried out with the aid of props and with all the precautions of mining operations.[159]

According to Evans, this clay and rubble mass were the materials of upper floors and storeys which collapsed and fell in the light well of the Grand Staircase.[160] In fact, this is the reason why Evans believed that the timber elements were not burned but were carbonised by chemical action. In his theory the timber elements had to carry the load of the upper storey until the space under the Grand Staircase and the Hall of the Colonnades was filled completely with debris. Only then could the timber elements deteriorate.

The process of how the flat mud roofs collapse was described in an earlier section.[161] In multi-storey buildings, only after the roof has collapsed, will the next lower ceiling be

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[159]Evans 1927, p. 259.
[160]PM I, p. 327 f.
[161]Compare page 137 f.

seriously affected. The ceiling will collapse faster than the roof because it has to carry the additional load of the collapsed roof structure. Thus, the flat mud ceilings collapse one after another and all debris piles up in the middle of the ground floor.

Both Fyfe's and Doll's proposals suggested that second and third floor of the Grand Staircase area has to be reconstructed in a manner similar to the one of the first floor. At least two floors and one ceiling must be anticipated above the Hall of Colonnades and at least another two flight of steps must be anticipated above the surviving ones. However, the ceilings of the Hall of Colonnades and the construction of the Grand Staircase survived well. It is unlikely that the remains of upper storeys fell down in the middle of the light well instead on top of the ceiling below or the stairs below. Furthermore, it is unlikely that this debris moved right under the first floor construction and the third flight of steps, supporting them and only then the timber began to deteriorate. Furthermore, the amount of debris necessary to fill the ground floor of the Grand Staircase can be estimated to be roughly 300 m^3. The average thickness of Minoan mud brick wall constructions and ceiling constructions is 0.5 metres. This would seem to indicate that approximately 600 m^2 of walls or ceilings have collapsed into the light well of the Grand Staircase but there is no reasonable reconstruction which could accommodate this amount of walls and ceilings close to the Grand Staircase area.

It seems rather likely that after an initial destruction through fire, earthquake or a combination of both, the palace was reoccupied by settlers. The timbers were affected by fire and the settlers considered them unsafe. Repairing or replacing the timbers of the ground floor structures which still carried heavy load might have appeared unpractical. Consequently they decided to fill the lower storeys, which already contained a considerable amount of debris from the initial destruction with further debris from upper storeys or other areas. Only the upper levels of the original structure were to be used.[162]

[162]This theory has not yet been tested and cross checked with archaeological data, especially the pottery sherds. It is based exclusively on architectural observations. However, Popham mentioned that joining sherds were found in two different rooms of the Domestic Quarter which supports the theory.

This process of deliberate filling of affected but still constructively stable structures ensured the preservation of upper features but also caused severe conservation problems. The debris was filled into the spaces before the timber members rotted and the structures collapsed. Thus, the infill was responsible for keeping walls upright which would have otherwise collapsed and for keeping the remains of upper stories at almost exactly there former position. In a common decay procedure the timber elements would have rotted long before the spaces were filled with earth by the wind. After the excavation of the infill, the walls were bereft of both the original support of the timber structures and the later support of the infill.

2.2.6 Conclusions

Various theories were brought forward on how the palace was originally destroyed.[163] For the aim of the thesis it was not of importance to learn when the palace ceased to be used and which of the favoured destruction theories is the correct approach. Traces can be found for both fire and earthquake but none of the typical conservation problems of fire or earthquake destruction could be found. It seems that, unlike Pompeii or Thera, the Palace of Minos at Knossos, as it is presented today, was not destroyed in a single event.

Obviously, the most important fact was that the site was reused by later settlers or squatters, as Evans liked to call them. The reoccupation and the deliberate infill was responsible for the survival of many remains but also for specific conservation problems. The levels above this deliberate infill seem to have deteriorated like many other excavation sites. After the site was abandoned it was used as quarry for later builders and, thus, the material was taken from the site. Besides these two facts, most of the remains presented no specific conservation problem caused by the original destruction, a fact which distinguishes Knossos from other excavation sites.

[163]Compare Popham, 1970, p. 94.

2.3 The Excavation Process

2.3.0 Introduction

The third major factor affecting conservation work at archaeological sites is the actual excavation process. Basically, excavating a site is the reversion of the burial process that happened hundreds or thousands of years ago. After their use, historic structures and artefacts underwent burial, either deliberately (e.g. graves or hidden treasures) or, after being destroyed or abandoned by a slow process of nature. Some materials decay in this new buried environment while others survive and, generally, the surrounding earth provides structural stability for the buried structures and artefacts. The buried environment under ground is a balanced system, in which all deterioration processes have slowed down; sometimes they are slowed down to such an extent that they are hardly detectable. Obviously, the methods employed to excavate the remains affect their integrity and the survival of the materials of which they were made.

Obviously the excavation process must be undertaken carefully, and the excavator must consider all possible reactions of structures and materials. In the process many decisions must be taken such as whether to remove or to leave certain elements, how to record them and how to conserve them. Their function, importance and conservation requirements must be recognised immediately after they have been exposed. Many of these details are obvious to the archaeologist after the entire area has been excavated but are frequently difficult to realize in the actual excavation process. It depends on the tools available, the number and quality of the workmen and the excavation methods to achieve good results.

2.3.1 The Workers at the Excavation

The excavations at Knossos started Friday 23 March 1900 with 32 men,[164] but the work on site proved to be more comprehensive than originally thought and soon Evans employed up to 180 workmen.[165] The method of employing up to 250[166] workers on the excavation site might disturb modern archaeologists, but this was common at the turn of the century. Alexander Conze and Wilhelm Dörpfeld employed more than 250 workers at the excavation at Olympia and Heinrich Schliemann, who visited the site of Knossos in 1886, suggested that he could excavate the palace - of which he only knew the West Wing - in one week with 100 labourers.[167]

The well documented employment figures for the year 1903 illustrate how an increasing number of workmen were employed as the excavation proceeded, culminating with a maximum of 165 workmen in early May. As one might expect, the numbers of workmen were reduced gradually towards the end of the campaign when no new trenches were opened and work at the existing trenches began to cease one by one. Few workmen were needed for clearing the site. Masons and carpenters were not needed at the beginning of the season but were successively employed when their skills were demanded. They were employed in relatively high numbers at the end of the campaigns - the natural time to execute conservation and reconstruction work.

Evans insisted on employing both Christian and Muslim workmen so that the excavation might be a paradigm for future cooperation between the creeds on the island.[168] Most workmen came from the nearby villages such as Makryteichos and Metochi (Knossos) but some workers came from further afield such as the foreman Gregori Antoniou.[169]

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[164]DM, 23 March 1900.
[165]Evans, 1900, p. 67.
[166]Evans, 1902, p. 1.
[167]Castleden, 1990, p. 25.
[168]Evans, 1943, p. 239 ff.
[169]Evans, 1943, p. 340.

Workforce employed at the excavations at Knossos
(According to the Day book 1903/2 by Duncan Mackenzie)

Date	Workmen	Masons	Carpenters
16 Feb. 1903	35		
23 Feb. 1903	50		
2 March 1903	64 - 87		
9 March 1903	87		
16 March 1903	113	6	1
23 March 1903	No information available		
30 March 1903	154	9	1
6 April 1903	161	9	1
18 April 1903	154	22	3
25 April 1903	159	23	3
2 May 1903	164	26	3
9 May 1903	165	32	4
16 May 1903	118	18	4
23 May 1903	79	23	4
30 May 1903	84	20	4
6 June 1903	88	16	4
10 June 1903	25	5	4

Table 2 Figures for workforce at the excavation at Knossos in 1903 (Diary Duncan Mackenzie)

Evans tried various systems of payment to achieve maximum productivity in his workers. For some areas such as the Minoan Viaduct and the Little Palace Evans paid his workers according to the 'wager system' in which groups of workmen compete against each other. Defined areas of the same size are staked out, each of which is excavated by a group of workmen. The group which first reaches a fixed level is awarded a prize. Evans claimed that he employed this system only if the upper remains were 'of a later date' which means they were unimportant to him.[170] The wager system considerably increased the excavation speed.[171] In most areas of the palace the Minoan remains were immediately under the surface. Here the traditional pay system was employed. The workmen received a basic wage per week and got extra for finding objects or for excellence. This was intended to ensure careful work.[172]

[170]PM II, p. 94 ff.

[171]Horwitz, 1981, p. 176.

[172]Brown, 1994, p. 22.

2.3.2. Supervision of the Workers

As already described, Arthur Evans was familiar with the modern excavation and conservation methods of the early twentieth century but was not an experienced excavator himself.[173] He realized that he would need the help of an expert excavator who had worked in the Mediterranean before and, therefore, he employed the archaeologist Duncan Mackenzie as his assistant.[174] Duncan Mackenzie, who was born in the Scottish Highlands, had gathered experience excavating at Phylokapi on the island of Melos from 1896 to 1899. He was responsible for the day to day management of the site and the supervision of the workmen. Furthermore, Mackenzie wrote the daily notes in the excavation diary which today form an important source for a critical assessment of the work on site.[175] Furthermore, he kept a pottery notebook where new found pottery was logged. Mackenzie was Evans's loyal assistant for almost the entire period of excavation work on site until be had to retire in 1929 due to ill health when he was replaced by John Pendlebury.[176]

Most scholars attribute the scientific techniques and accuracy of the excavation to Duncan Mackenzie rather than to Evans himself.[177] Mackenzie was permanently on site supervising the foreman and the workers while Evans frequently followed other business.[178] Arthur Evans relied heavily on Mackenzie's diaries when he wrote *The Palace of Minos* because his own notebooks provided only insufficient data. However, he frequently disagreed with Mackenzie's conclusions and the published results sometimes vary considerably from the notes taken by his assistant.

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[173]Compare page 68 ff.

[174]It seems that Duncan Mackenzie's role in the excavations at Knossos so far has been underestimated. Nicoletta Momigliano is currently working on a biography of Mackenzie and the publication of her study will provide new insight in his part of the excavation work.

[175]Brown, 1994, p. 19. The Diaries by Duncan Mackenzie are kept at the Evans' Archive at the Ashmolean Museum, Oxford.

[176]Waterhouse, 1986, p. 160.

[177]Farnoux, 1993, p. 41.

[178]For Example in 1904, Evans was in England until March (Evans, 1943, p. 347) while the excavation under the supervision of Mackenzie had already started on 15 February (Evans 1904, p. 3)

The workers were normally supervised by a foreman. The first foreman was dismissed after only one season in 1900 because he exceeded the 'permissible amount of peculation'.[179] The new foreman Gregori Antoniou had worked for Hogarth at his excavations at Knossos in 1900. He was a poacher turned gamekeeper. Gregori spent his youth in Cyprus robbing tombs but later worked for excavations for the British School at Cyprus and Crete.[180] Antoniou was succeeded by Manolis Akoumianakis, commonly called Manolaki. He was born at Yerakari, a small mountain village in the Amari district of Crete. He came to the excavation site as a young boy and Evans quickly recognised Manolaki's skills. He became House servant at the Villa Ariadne and foreman of the workers. Manolaki was killed by German troops in World War II.[181]

2.3.3. Architects and Support Staff

A short time after Evans began excavating at Knossos he realised that he would need the services of an architect to execute measured drawings of the excavated structures. Theodore Fyfe, then architect for the British School at Athens, was contracted to work at Knossos.[182] While Fyfe's tasks were initially limited to recording, he later also engaged in reconstruction work and support structures. After the need to have an architect on site had been established, Evans employed permanent architects for the recording of the excavated structures and the conservation and restoration work.[183] However, it must be understood that the architects were only contracted for the excavation period which usually lasted from February or March to July. The architects executed drawings for Evans' publication back in England but they must have had other jobs besides the work at Knossos. Fyfe worked for Evans for five seasons between 1900 and 1904.[184] In 1905 Christian Doll, who was then architectural student at the British

[179] Evans, 1943, p. 340.
[180] Brown, 1994, p. 15 f and Evans, 1943, p. 340.
[181] Powell, 1973, p. 142 ff.
[182] Evans, 1943, p. 333.
[183] Evans, 1943, p. 338.
[184] Evans, 1900, p. 5; 1901, p. 1; 1902, p. 3; 1903, p. 2; 1904, p. 3.

School at Rome succeeded Fyfe.[185] He worked for Evans until 1910. After World War I Piet de Jong worked as architect on site from 1922 to 1931. Their work will be discussed in detail later.

Besides architects, Evans employed numerous artists and other staff at Knossos for individual tasks. The Swiss artist Emile Gilliéron, who had previously worked for Heinrich Schliemann and the French School at Athens was employed as soon as the first fresco remains were exposed.[186] He was responsible for the restorations of the Griffins in the Throne Room and the reconstruction of the Grand Stand Fresco.[187] He was later succeeded by his son Edouard with whom Emile ran a workshop in Athens. Both Gilliéron *père* and *fils* were also responsible for the reproduction of faience figures, pottery and other artefacts for the Ashmolean Museum in Oxford while the original artefact remained at the Archaeological Museum at Herakleion.[188] Other artists employed included the Danish painter Halvor Bagge who worked for Evans in 1903 and 1904,[189] the fresco specialist Noel Heaton in 1910,[190] and the architect F G Newton, who passed Knossos on his way home from Tell-el Amarna, Egypt, in 1922.[191]

Evans employed many specialists on site. Some of them such as Mackenzie or the Architects worked for Evans for a long time, others came only for a few days. It has been discussed in the previous chapter that Evans also relied on the expert opinion of other excavators such as Dörpfeld. Evans paid for the excavation and published the results. By all means, it was his excavation but it seems that he actually relied to a large extent on the special knowledge of other experts.

[185]Evans, 1905, p. 25.

[186]Evans, 1943, p. 333.

[187]PM III, p. 66.

[188]This frequently gave rise to the theories that the two Gilliérons forged Minoan artefacts and sold them as original finds to visitors, museums and also to Evans himself.(Hitchcock, 1995)

[189]Evans, 1903, p. 2 and 1904, p. 3,

[190]*The Times*, Friday, 16 September 1910, p. 4.

[191]Evans, 1922, p. 319.

2.3.4 The Excavation Process

It was discussed in the previous chapter that stratigraphy was employed in archaeological excavations of this time but its principles had not yet reached the refined state of today. Nonetheless, these basic principles of stratigraphy were understood by Evans and Mackenzie and were applied at Knossos. The palace was excavated area by area and the pottery of the individual areas was collected and analysed. This finally resulted in Evans' system of Minoan chronology which he presented at the first International Congress of Archaeology at Athens in 1905.[192]

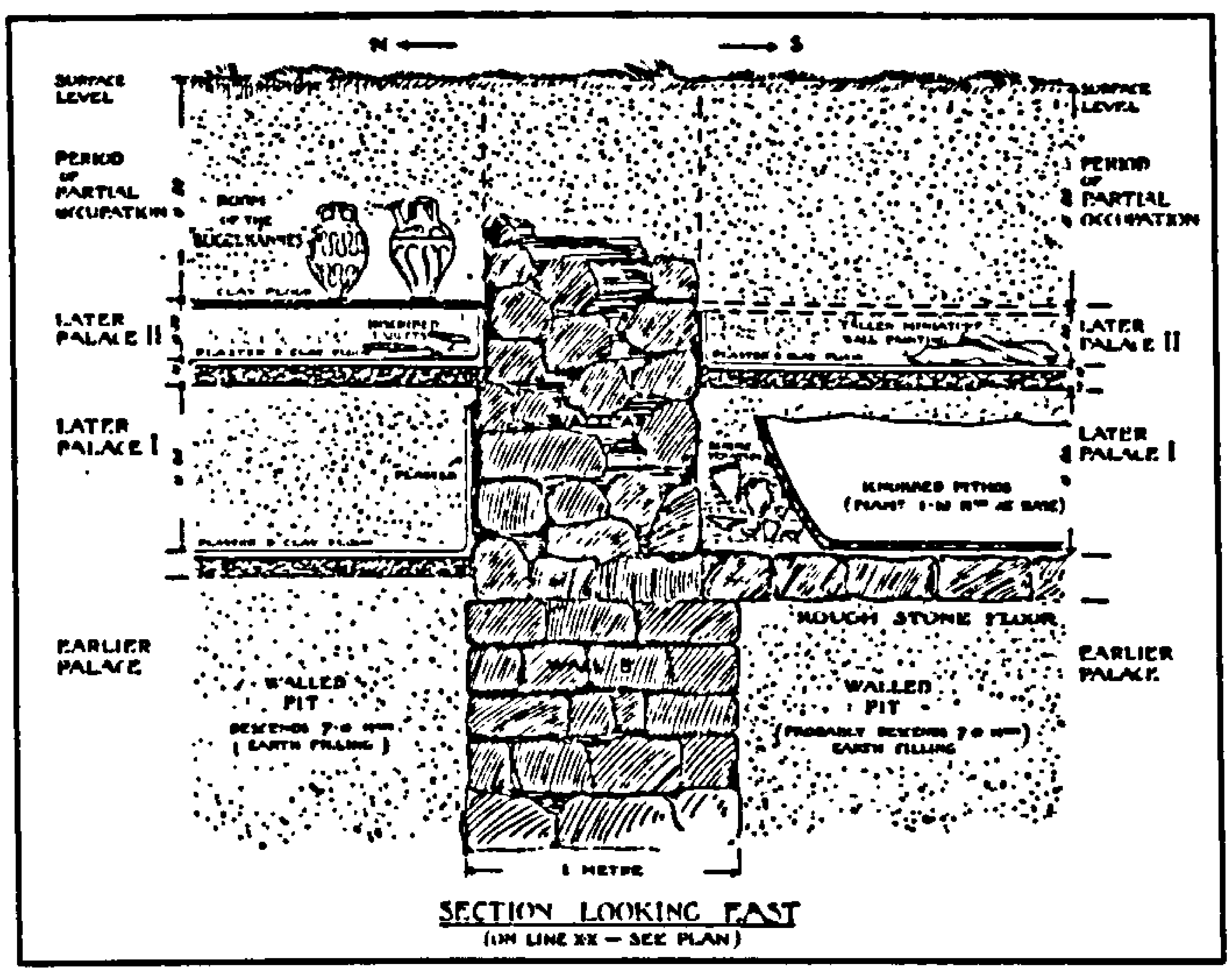


Figure 26 Illustration for stratigraphic layers in the North-West area of the Palace. Drawing by Theodore Fyfe

Excavation work is a destructive process. In order to excavate the remains of the palace some structures of later date had to be removed, notably the overlaying rectangular building in the southern part of the West Wing which was dated to the Hellenistic period.[193] Evans also had removed blockings from doors and walls which he considered a later addition of the reoccupation period.[194] Most of these activities are mentioned in the annual reports or at least noted in the diaries so that they can be retraced by scholars. Furthermore, some new doorways were broken into ancient walls to allow the communication between rooms such as the door between the Inner Sanctuary and the

[192] *The Times*, 12 April 1905, p. 4.

[193] Driessen, 1990, believes that the building was part of a later Palace period but Warren, 1992, in a review of Driessen's book objects to this theory. Since the building was removed by Evans, the only information available are diary notes which are obviously not sufficient to solve this problem definitively.

[194] For Example: Evans, 1901, p. 41.

North Service Wing in the Throne Room area. However, Evans refrained generally from removing ancient fabric and left visible as many excavated structures as possible. In some areas, such as the Stepped Portico south of the Throne Room, remains from different Minoan periods were exposed. They were never visible at the same time which today can cause some confusion with the visitors. Evans dug some trial pits under the level of the Central Court and the West Court and established that there had been a large Neolithic settlement under the palace; but he refrained from removing the palace remains in order to expose this settlement.[195]

The remains of the Palace of Minos and especially of the Domestic Quarter were in a unique state of preservation. Elements of upper stories survived at original levels or only slightly sunken. Wooden props and support frames were employed to keep them in their original position. In some areas tunnels were dug under the remains of upper levels so they did not have to be removed. These details illustrate a comprehensive understanding of conservation issues and excavation methods. It was obviously an advantage to have an architect on the site who could design support frames and similar structures and who could supervise structurally necessary work.

2.3.5 Conclusion

It has been discussed in the previous chapter that Arthur Evans was familiar with the latest advances in archaeology and conservation. The description of the excavation work on site shows that Evans employed this knowledge and excavated the palace according to state of art procedures at his time. The site was excavated according to stratigraphic principles and the pottery was sorted and some of it was stored for further reference. To employ 250 workmen and have them supervised by only one archaeologist is not acceptable practice today but was common procedure at Evans's time. Set against the measures of his time Evans' work at Knossos was certainly quite advanced.

[195]Compare PM I, p. 28

Besides Duncan Mackenzie Evans employed artists and architects on site to execute specialist jobs for him. By doing so he ensured the best possible treatment for the excavated pottery, the architectural remains and frescoes and small finds. The pottery was recorded and analysed by Mackenzie, the architectural remains were recorded and cared for by Theodore Fyfe and his successors and the frescoes and small finds were looked after by the Gilliérons and Halvor Bagge. Evans drew upon all sources that were available to him. The large workforce at Knossos had resulted in a fast pace at the excavation. This probably affected the exact recording of the find place of small finds and pottery and, thus, valuable archaeological information was lost but there is no indication that it affected the excavated architectural remains.

2.4 Conclusions

It has been described how various building materials and building techniques were employed at the palace and how they affected the conservation work at Knossos. The Minoans preferred soft materials such as gypsum, limestone and timber which could be easily shaped with bronze tools. Many walls were constructed in rubble masonry and were reinforced with timber beams. Finally, they employed mud ceilings which deteriorated quickly after regular maintenance had stopped. The particular Minoan habit of paying much more attention to the appearance of the construction than to stability and technically sound construction added further to the conservation problems.

Many different theories of how the palace was finally destroyed are being currently discussed in Aegean archaeology. For the purpose of this thesis it was discussed that evidence for fire, earthquake and the robbing of materials can be found on site. However, the most important factor is that large areas were reoccupied and the new settlers filled ground floor rooms with debris from other parts of the palace before the load bearing timber framework deteriorated.

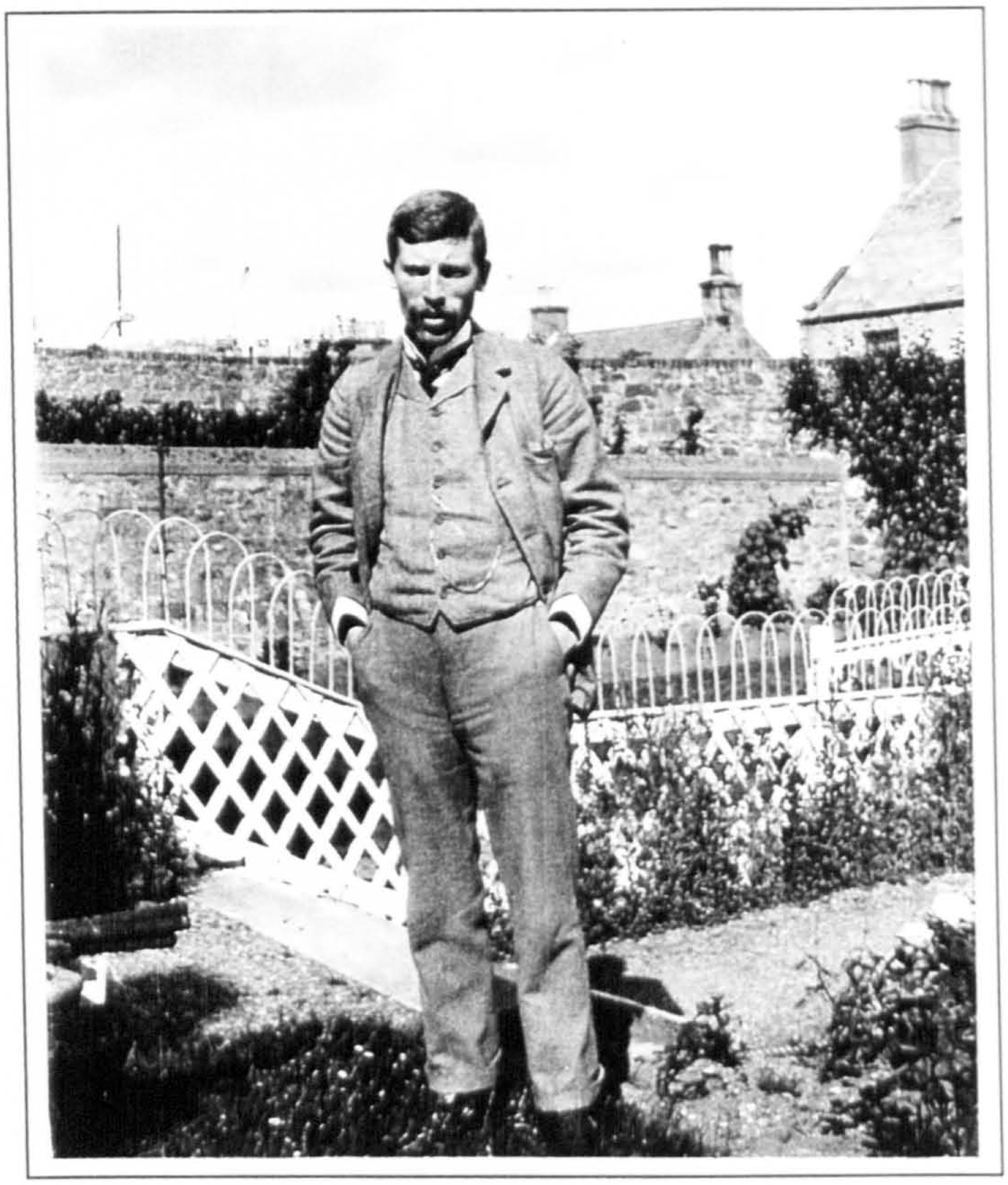
The excavation methods at Knossos complied with contemporary standards. The many workers had little damaging effect as far as the architectural remains were concerned. However, conservation architects were employed on site who, with their structural and constructive expertise ensured the survival of many architectural features which otherwise might have been removed from their context.

These different factors are part of a highly complex network which might be best illustrated with an example. Being aware of the dangers of earthquakes, the Minoan builders responded to this danger with a highly elaborate building construction. They employed flexible timber members placed into the rubble masonry walls to respond to the tensile forces of the earthquake. In the destruction of the Palace mud from the ceilings and deliberate infill filled ground floor rooms, thereby preventing the rubble walls and remains of upper storeys from collapsing, even after the timber reinforcement has vanished. This infill took over the structural support from the timbers. Thousands of years later the excavators removed the infill and, thus, the wall's support. To prevent the collapse, the excavation architects, notably Theodore Fyfe, constructed timber support frames.

This example might best show how the different factors of building construction, destruction and excavation interact. These factors vary within the Palace. In the next three chapters it will be necessary to describe the problems which the different architects were facing at different areas of the palace and to explain the solutions which they employed to solve their task.

Chapter 3

The Works by Theodore Fyfe 1900 to 1904



Theodore David Fyfe

To uncover a monument and to leave it to perish by exposure or by plundering, to destroy thus what has lasted for thousands of years and might last for thousands to come is a crime.
(Flinders Petrie, 1904, p. 178.)

Chapter 3

The Works by Theodore Fyfe 1900 to 1904

3.0 Introduction

Theodore Fyfe was the first architect to be employed by Arthur Evans at Knossos. He worked at Knossos for five seasons from 1900 to 1905. During this period, the main excavation work took place, and consequently almost all site plans were drawn or at least begun by Theodore Fyfe with some later alterations and additions being carried out by Christian Doll and Piet de Jong. In a similar way, Theodore Fyfe was on site when the majority of the excavation work was undertaken and consequently, it was his responsibility to design the first measures taken to support and to conserve the excavated structures as well as to execute the first reconstructions. Some of these reconstructions have subsequently been replaced by later reconstruction work or were incorporated into the work of the later architects. However, in most areas his work can still be clearly identified.

3.1 Before Knossos

Theodore Fyfe was born 3 November 1875 at Yloilo in the Philippine Islands, the second son of James Sloane Fyfe and Jane Charlotte Abercrombie Fyfe[1]. Theodore had two brothers and one sister. When he was still very young, both his parents died probably due to tropical fever. The children were brought back to Scotland to be looked after by

[1]Anon, 1930, p. 1121 (Who's Who).

relatives but, sadly, the family had to be broken up since none of the relatives were able to take them all on. Theodore was adopted by a maiden aunt who had only limited means. Though not unkind she was strict with him.[2]

Theodore Fyfe went to school at the Albany Academy in Glasgow, and from 1890 to 1896 was articled to the architect John Burnet[3] (later Sir John Burnet) in Glasgow who managed the office together with his father J. Burnet.[4] Thus he received his architectural training in a traditional office run by a family of architects. He later moved to London and worked in the offices of Beresford Pite and of Aston Webb and Ingress Bell.[5] In 1898 he won the Architectural Association Travel Studentship and travelled the Mediterranean area in 1898 and 1899. Records of his travel were published in the *Architectural Association Journal* in 1903. Immediately after completing the Architectural Association Studentship Fyfe became architectural student at the British School at Athens for the year 1899 to 1900 where he came into contact with Arthur Evans. In 1900 he became architect to the Cretan Exploration Fund, set up by Arthur Evans and David Hogarth in the same year to facilitate the research in Crete. Evans did not employ his architect from the first day of excavation but only after some areas have been uncovered.[6] However, from this point of time onwards Evans almost always had architects on site.

Evans mentioned Theodore Fyfe in the introductory paragraph of all the reports he wrote for the British School at Athens between 1900 and 1904. However, Fyfe is exclusively mentioned as the architect responsible for the plans, sections and drawings.[7] It is only in the introduction to the report for the year 1902 that Fyfe is linked to conservation work while the practical part of the work was still allocated to the Greek foreman Gregorios

[2]Based on personal memory of June Yorke who was married to Theodore Fyfe's eldest sone Robert. She send these informations to the author in a twelve [!] page personal letter March 1998.

[3]For more information on Sir John Burnet see: Gray, 1985, pp. 128 ff and Paterson, 1938, p. 893 f.

[4]Who's Who in Architecture, 1923, p. 97. Burnet restored Duart Castle, Mull, Scotland in 1911 - 1916. However, this was after Theodore Fyfe left the Office and, probably, has not had any influence on conservation work at Knossos.

[5]Anon, 1934, p. 124.

[6]Evans, 1943, p., 333.

[7]See: Evans, 1900, p. 5; Evans, 1901, p. 1; Evans, 1903, p. 2; Evans, 1904, p. 3.

Antoniou.[8] Thus, it is questionable whether all the building work on site in the named period was designed by him or if some of the work was actually designed by Arthur Evans himself and executed by Antoniou, thus, bypassing Fyfe. However, most of the conservation and reconstruction work of this time was sketched and drawn by Theodore Fyfe in his notebooks and can be attributed to him.[9] It is also most likely that the other work was executed by him as well, even if no definite proof survived, since it is rather unlikely that Evans would employ an architect over a period of years but design buildings himself. Furthermore, the work of the period from 1900 to 1904 features an uniform architectural design language which indicates a single architect. Consequently, we can assume that all work in the named period was planned and supervised by Theodore Fyfe while it was executed by local craftsmen under the leadership of Gregorios Antoniou under the determinative influence of Evans as employer and owner of the site.

3.2 Flat roof of the Throne Room in 1901

The remains of the Throne Room and the Anteroom, though only about two metres below the surface, were preserved remarkably well. Some parts of the walls were a mere 30 centimetres from the surface. Large pieces of frescoes remained *in situ* and other parts, still coherent, had slipped down the wall. Gypsum benches ran along the northern and western walls and also along the parapet to the Lustral Basin. Gypsum floor slabs covered the Throne Room, the Anteroom and the Lustral Basin where, in addition, the walls were shielded by a gypsum dado. Both frescoes and gypsum elements survived for three and a half millennia under ground with little damage to them. An altar, made predominantly of earth, was also found in the Inner Sanctuary, west of the Throne Room. The Throne Room and the Inner Sanctuary were excavated in 1900 but the rooms to the

[8] Evans, 1902a, p. 3.

[9] See Theodore Fyfe's notebooks at the Evans' Archive, Ashmolean Museum, Oxford. No notebook survived for the 1900 season. There are notebooks for 1901 and 1902 and two volumes for 1903 (v. i. and v. ii.). These identification marks and the page numbering are a later addition by staff of the Ashmolean Museum. In fact, volume two is the first volume of 1903 and volume 1, pages 120 - 151 contains the second part of 1903, written upside down starting from the back. Pages 1 - 73 of 1903 v. ii. Are in fact the notes taken in 1904.

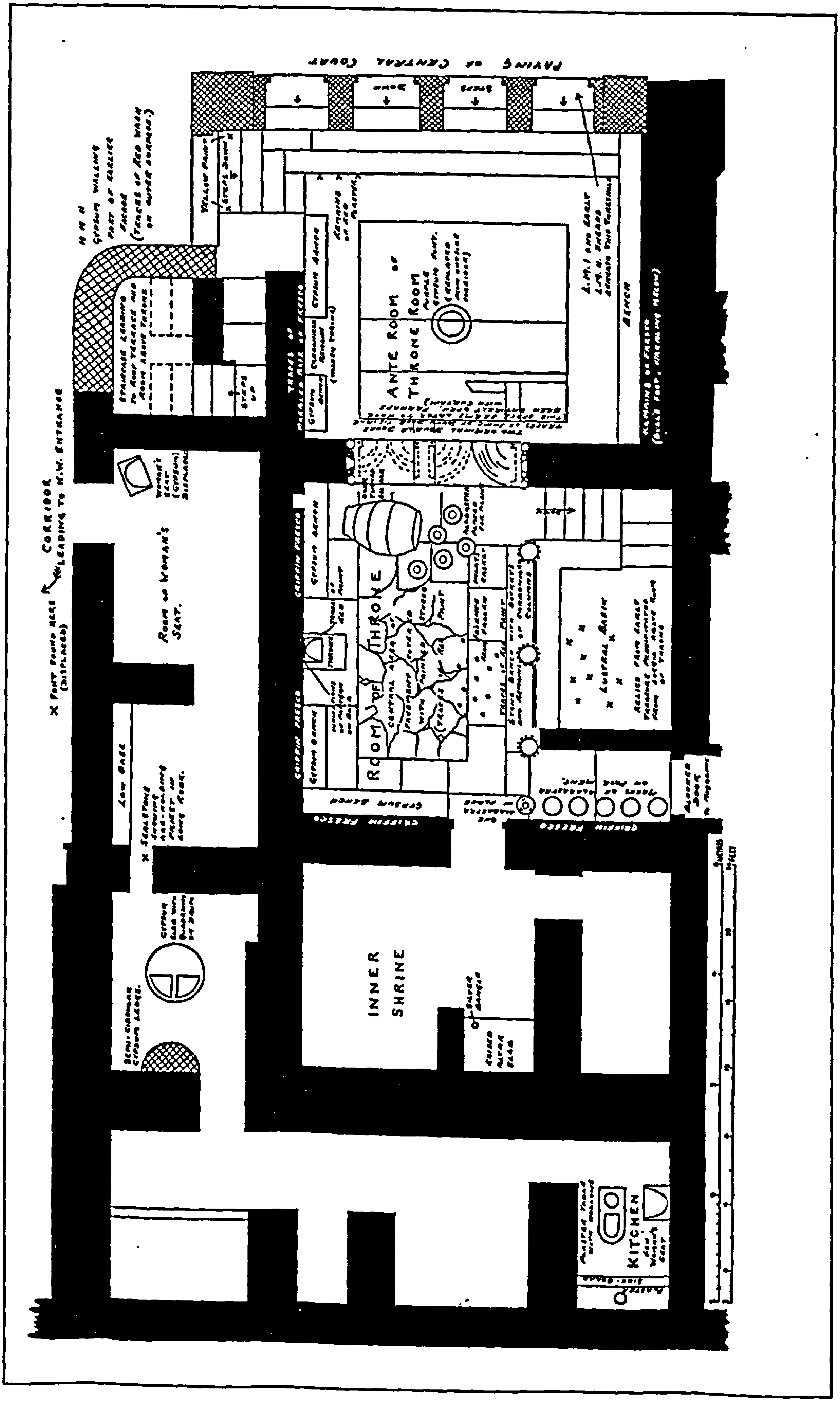


Figure 27 Ground plan of Throne Room area.

north - the Room of the Stone Drum, the Room of the Stone Bench and the Room of the Lady's Seat - and the rooms to the west - the Service Section - were excavated only in 1901.[10] These rooms also featured many sensitive features such as plaster floors and painted wall plaster.

However, it became obvious that some sort of permanent shelter must be found for the Throne Room area in order to protect these sensitive features. Whether this became clear by the end of the first campaign in 1900 as Ann Brown suggests,[11] or only arose after the winter 1900/1901 is debatable. In 1901, Theodore Fyfe was commissioned by Arthur Evans to erect a protective shelter to cover the sensitive features of the Throne Room. This roof covers only the area of the Throne Room and the Inner Sanctuary, not the rooms to the north and west which were excavated in the same year. It seems that the

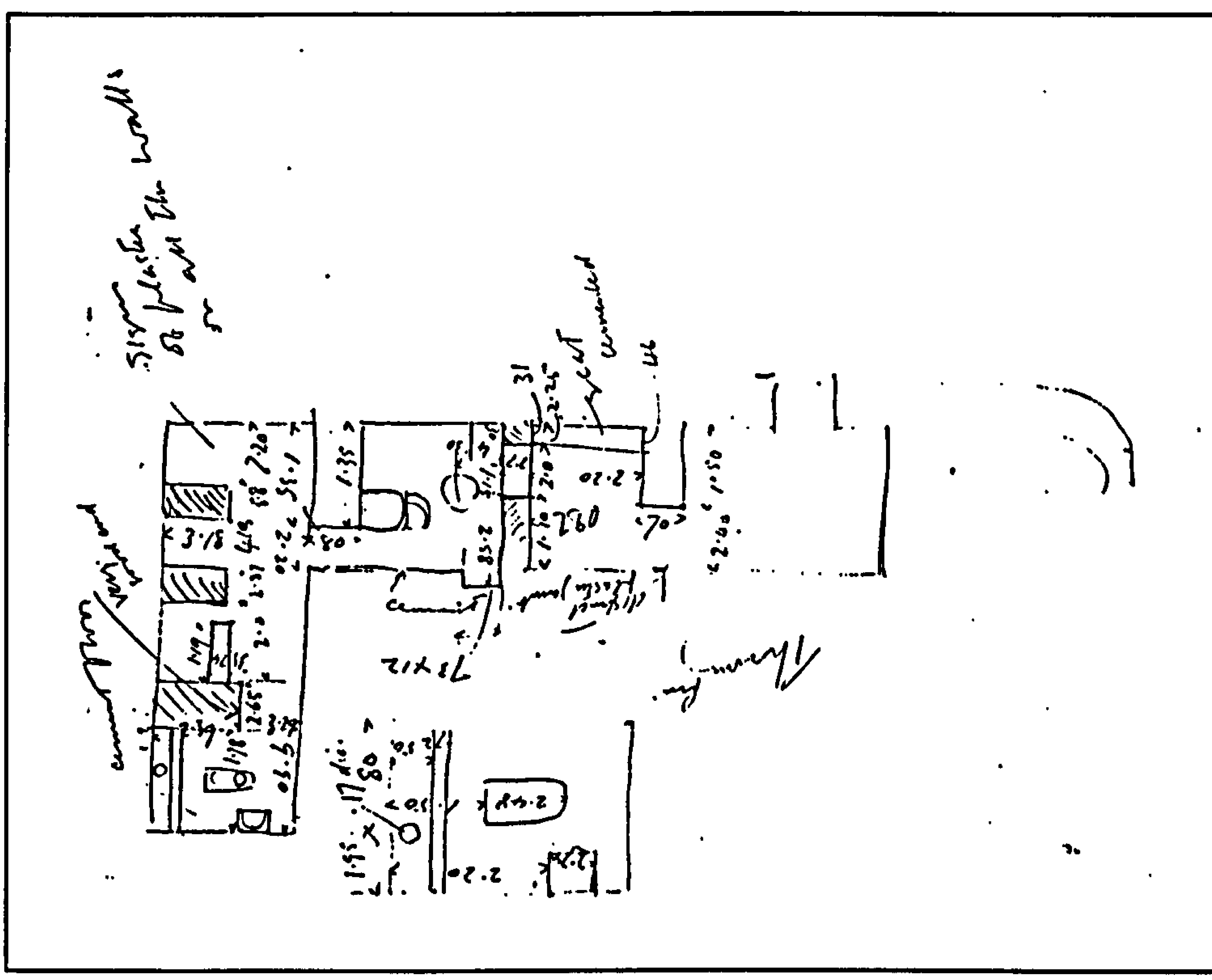


Figure 28 Sketch plan of the rooms to the north and west of the Throne Room. Notebook of Theodore Fyfe, 1901.

[10]Evans, 1901, p. 31 ff. See figure 28 and plate 7.

[11]Brown, 1994, p. 41.

decision to cover the area was taken before the sensitive features of the additional rooms were discovered because the roof was limited to the rooms discovered in 1900. In his letter to Arthur Evans of 19 June 1901, Fyfe reports the roof as being nearly finished. Evans writes in his annual report on the progress of the excavations in the Annuals of the British School at Athens:

> "Of the works of conservation undertaken the most important was the enclosing and roofing-in of the Throne Room - a work rendered urgent by the effect which exposure to the weather was already beginning to produce both on the throne itself and the seats and parapet. In order to support the roof it was necessary to place some kind of pillars in the position formerly occupied by the Mycenaean columns, the burnt remains of which were found fixed in the sockets of the stone bench opposite the throne. This necessity and the desire to avoid the introduction of any incongruous elements amid such surroundings determined me to reproduce the form of the original Mycenaean columns. An exact model both for the shape and colouring was happily at hand in the small fresco of the temple façade, and the work was successfully executed under Mr. Fyfe's superintendence."[12]

Clearly, Evans refers to the reproduction of the form of the columns in the Throne Room but not to the reproduction of the original material. While excavating, Evans identified timber as the original material for the three columns next to the Lustral Basin, charcoaled remains of which were still in situ. However, as can be seen in Plate 47, the columns were reconstructed in limestone drums for the shaft and a plastered timber lath construction for the capitals. It had been Arthur Evans's primary

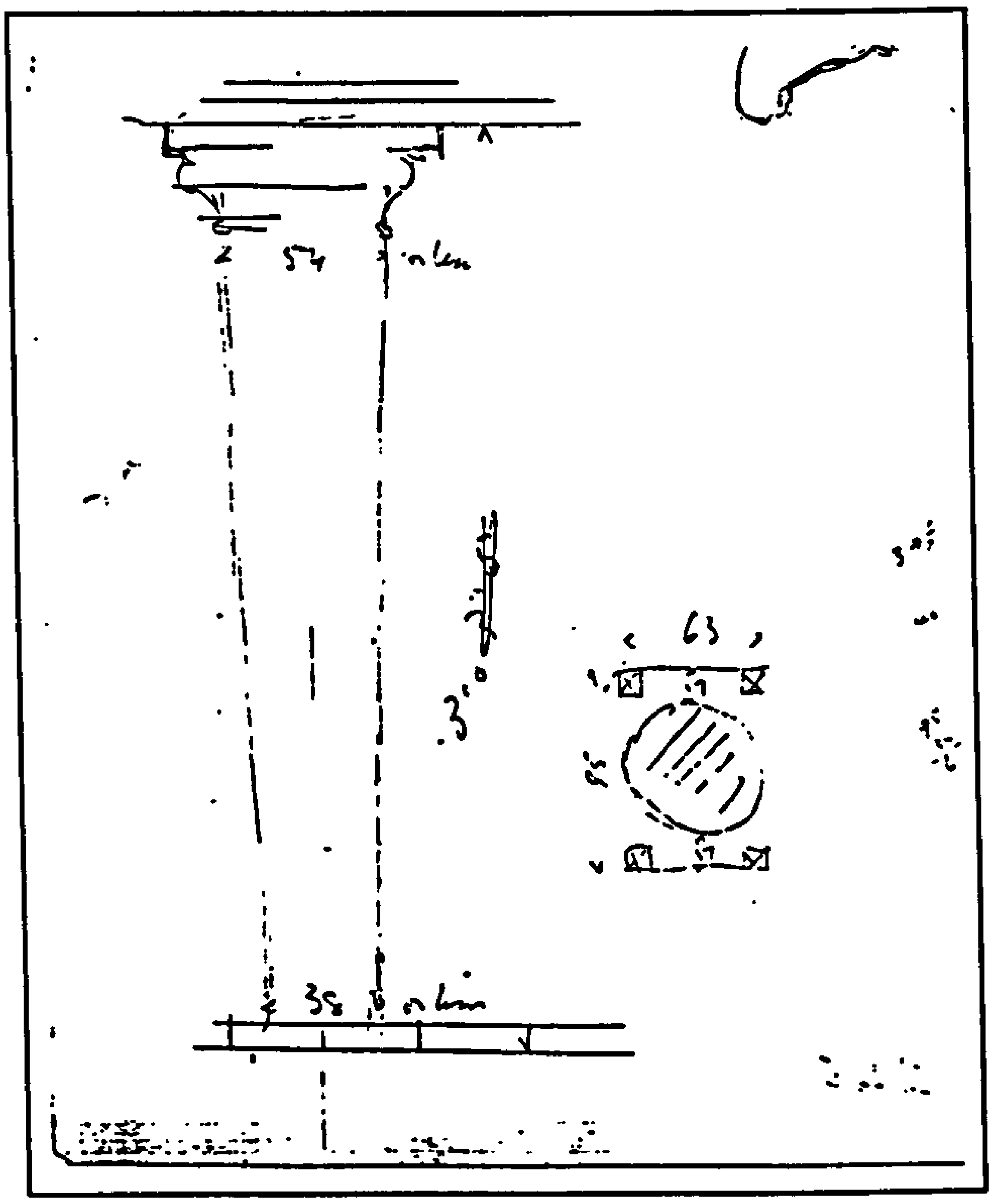


Figure 29 Sketch of reconstructed column in the Throne Room. Theodore Fyfe, Notebook 1901, p. 77.

[12] Evans, 1901, p. 2.

intention to reconstruct the lost timber columns in their original material but it was not possible due to the fact that timber of the required dimension was not available. In his notebook for 1901 Arthur Evans wrote, in his typical telegraphic form, an undated note:

> "Timber. The great difficulty in finding wood of large diameter. Practically impossible is get wood for columns of Throne Room.[13]"

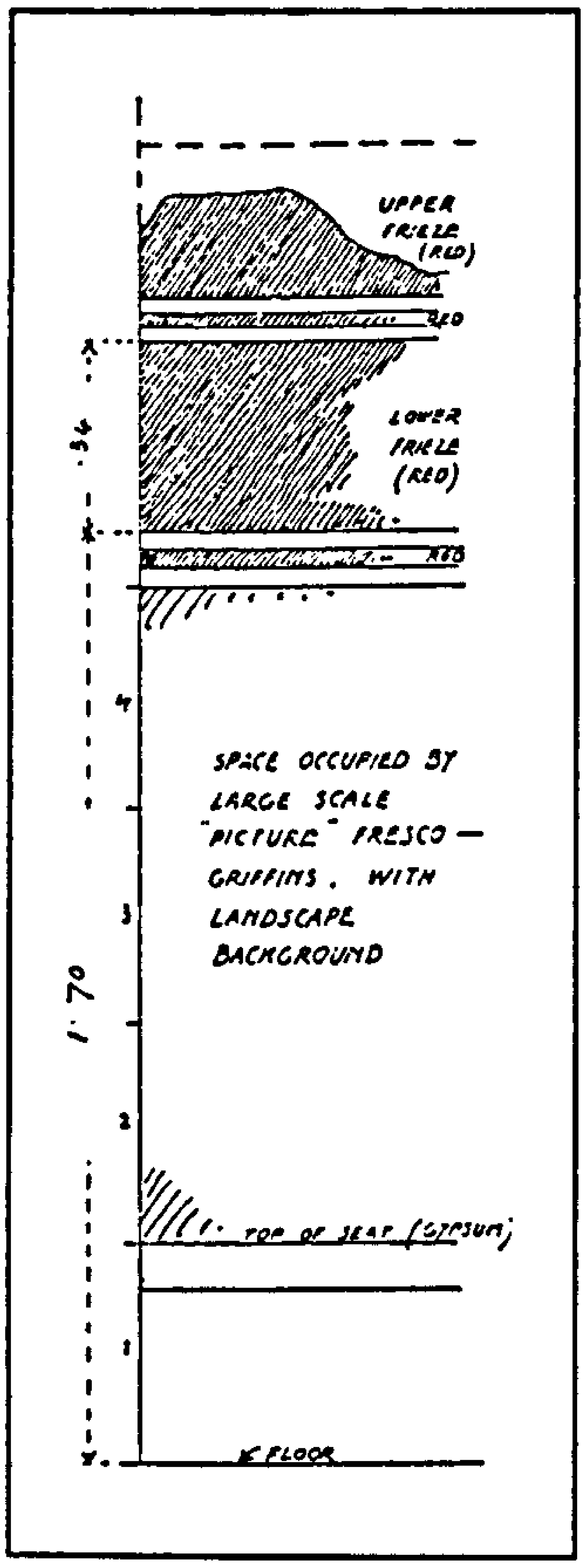


Figure 30 The Fresco remains in the Throne Room

Brick pillars were erected partially outside the rooms and partially resting on the excavated walls. Some of these pillars are still visible at the South wall of the Throne Room.[14] These pillars were covered with a limestone coping stone[15] and a flat wooden framework construction was placed on them and on the reconstructed columns. As can be seen in plates 49 and 55 the timber beams rest on the circular limestone drums, while the lath and plaster capitals attached to them rest at a slightly lower level, thus leaving a gap between the load bearing structure and the purely ornamental capital. Surviving fragments of frescoes in the Throne Room indicated the height of the ceiling at least two and a half metres above the floor level.[16] In the excavation process the remains of the Throne Room area were found immediately under the surface and the upper parts of it, including its original ceiling construction were not preserved. Nonetheless, the ceiling of the Throne Room was reconstructed at two and a half metres but it could have been much higher than reconstructed. Attached to the main roof

[13]The note mentioned is written on Page 31 which lies between the last previous dated entry from March 15 and the next dated entry from 8 May. But we do not have any reason to believe that all entries are in a chronological sequence. However, dating this note to April makes perfectly sense in respect to a completion date of the roof in June 1901.

[14]See Ground Plan, Drawing 1.

[15]See plate 46 and 49.

[16]Evans, 1900, p. 40.

above the Throne Room which was reconstructed as a levelled flat roof, was a slightly pitched roof covering the Inner Sanctuary to the west of it.[17] This pitched roof was not supported by brick pillars but by simple timber posts. The outline of this pitched roof can still be seen at the subdividing wall between the northern and the southern room of the Inner Sanctuary.[18] It seems that it was decided to cover these rooms only after work at the main roof had already begun. The wooden framework of the ceiling was covered with timber joists and boards.[19] The actual rainproof covering of the roof seems to be a tarpaulin, which appears very light - almost white in colour - in the photographs.[20]

The space between the top of the excavated Minoan walls and the new roof was filled in with rubble masonry which, on the inside, was plastered and painted in red with a white double line according to the remains found. It is important to note that the reconstructed plasterwork covered only the reconstructed upper parts of the wall while the original walls underneath were left exposed.[21] The fresco remains found in the Throne Room *in situ* have been removed from the walls and brought to the Museum.

An interesting fact is that it seems there was no protection whatsoever to prevent water penetrating through the skylight in the roof above the Lustral Basin. This is due to the early interpretations of the Lustral Basin by Arthur Evans. Having no other Minoan excavation site for comparison he suggested a similarity between the excavated Lustral Basin and an *impluvium*, the water basin in a Roman courtyard.[22] He continues with an interpretation which seemed to be very logical to him at this stage:

> "There was no visible outlet to this stone basin and there can be little doubt that it served as a tank rather than a bath. Tanks with fish and bordered by flowering water-plants are frequent features of

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[17]See plate 53 and 54

[18]See Section A-A, Drawing 3.

[19]See plate 55.

[20]Compare plate 54. This was a common construction method for roofs of railway coaches at this time: The wooden boards were covered with cloth which was painted thickly with a lead paint.

[21]See plates 48 and 55.

[22]Evans Notebook 1900, p. 40. He suggested that the pillars carried a pitched roof which drained the rain water in the basin. See also Evans, 1900, p. 38.

> Egyptian houses and palaces, and the frescoes that adorned the Throne Room, in which both this features occur, fully harmonize with this idea. The eels of the stream below - the ancient Kairatos - are renowned, and the delineation of a fish of this kind on the opposite wall suggests that the tank may have served as a vivarium not unconnected with culinary purposes."[23]

Both interpretations, *impluvium* or *vivarium*, actually implied that the basin was open to the sky; consequently, the reconstructed roof features this opening above the Lustral Basin. It recreated what Evans believed, at this point of time, to be the original atmosphere. Nonetheless, it is surprising that on the one hand it was realised that gypsum suffers severely if exposed to the weather[24], but on the other hand the rain-water was allowed to enter the Lustral Basin through the skylight in the roof. Channelling rain water into the Lustral Basin results in major damage since there is no way for the water to flow out and, being roofed over, the sun cannot help to dry out the room. There is no evidence for any assumption of a removable lid, which could be fixed for the rainy winter period. Thus the new roof of the Throne Room protected the sensitive gypsum throne and the benches but not the Lustral Basin.

The 1901 report in the Annuals of the British School at Athens continues:

> "In order to protect the room from wanton damage we were further reluctantly obliged to place a substantial iron railing and door across the entrance. For this, unfortunately, no Knossian model was forthcoming and the best that could be done was to get a native smith of Candia to make a scroll-work railing of wrought iron of the kind that is usual here to place before Mahometan shrines, the spiral designs of which at least are curiously in harmony with Mycenaean patterns. About the middle of the opening in order to give support to this barrier a stone pillar was set up in a socket of the pavement where a wooden one once stood."[25]

Clearly, it was necessary to protect the room from people entering it, so a gate was installed. It is interesting to note how much consideration Evans gave to the design of the gate. The stone pillar which was set between the gates also was made for technical

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[23]Evans, 1900, p. 39.
[24]See quotation page 176.
[25]Evans, 1901, p. 2.

reasons of a material different from the original. A timber construction of the height required could not be anchored firmly in the socket in the pavement unless the original jamb was altered. A stone pillar, due to its own weight, fulfilled the requirements much better. It is remarkable that Evans considered it worthwhile to mention in his report that he employed a material different from the original. Thus, we sense that great importance was attached to the use of original materials.

The new building work of the Throne Room shelter falls into two parts: the one which reconstructs the lost Minoan original and the other which is necessary for structural reasons but obviously new. The columns and the elevated walls reconstruct Minoan elements and, thus, were excepted in a way not easily distinguished from the Minoan original. On the other hand, the brick pillars and the flat roof were clearly new elements and did not recreate Minoan features. They were constructed in materials, such as fired brick, which were not used in Minoan times.

3.3 Work in the Domestic Quarter

Today, the Domestic Quarter is dominated by the reconstructions of the later architects Christian Doll and, especially, Piet de Jong. Thus, the amount of work executed by Theodore Fyfe in this area of the palace is frequently underestimated. With the aid of photographs in the Evans's Archive of the Ashmolean Museum the work of Theodore Fyfe in the Domestic Quarter may be re-established. Much of his work was of a preliminary nature and some of it was never intended to last long. Other work, especially masonry reconstructions, has been incorporated by the later architects into their work.

The specific problem of the Domestic Quarter was that its remains were preserved to more than two storeys height including some of the upper floor elements. This required the engineering solution to keep the already excavated parts in position while allowing the excavation work to proceed up to eight metres below the level of the Central Court. Thus, support work was introduced at early stages and readjusted with the progress of the excavation work. Some of the scaffolding was left in position after the excavation work finished, for example at the Grand Staircase, other framework was replaced with a more permanent solution, for example in the Hall of the Double Axe.

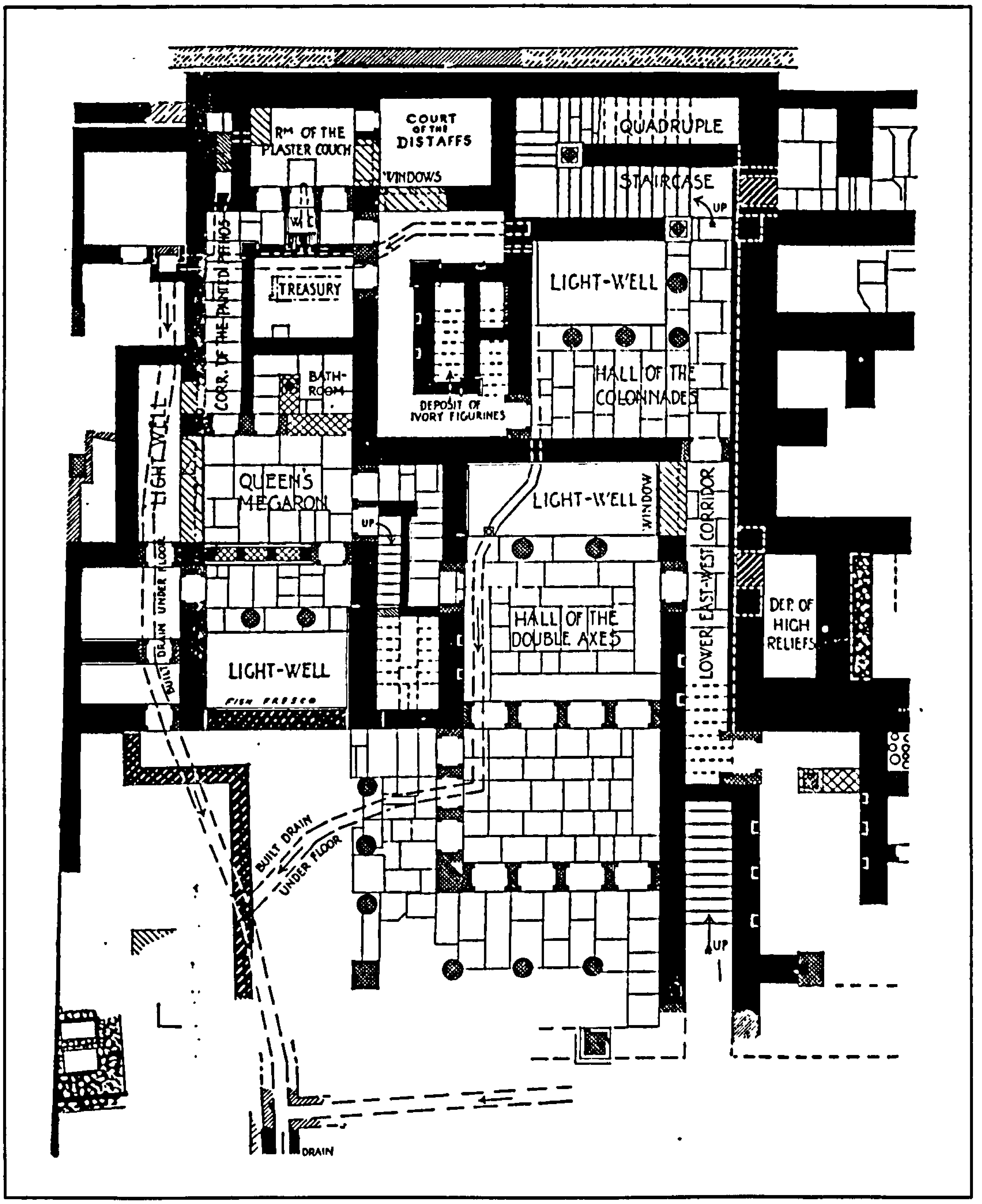

Figure 31 Ground plan of the Domestic Quarter. Drawing by Theodore Fyfe, 1902.

Several parts of the Domestic Quarter were excavated between 1901 and 1902 and experienced different stages of support work. Hence, they will be analysed in separate paragraphs.

3.3.1. The Grand Staircase

The excavation of the Grand Staircase, or Quadruple Staircase as it was labelled in Evans's earlier reports,[26] was one of the most challenging pieces of work at Knossos. When Evans excavated the Grand Staircase in 1901 the steps of the third flight were still in position and, consequently, mining methods were employed to tunnel under it in order to expose the first flight.[27] Evans described this process:

> "The excavation of this part was of extraordinary difficulty, owing to the constant danger of bringing down the stairway above. It was altogether miner's work, necessitating a constant succession of wooden arches. Two of our workmen, however, had worked in the Laurion mines, and after eight days' slow progress, a passage down the steps was finally cleared along the western wall of the staircase. The outer wall was found to end below in another limestone base, with a socketed slab above it for a wooden column, like that of the landing above."[28]

In this paragraph Evans explicitly mentions that two workmen with their knowledge of mining operations facilitated the excavation of the Grand Staircase. Thus, we must suppose that they aided Theodore Fyfe in designing the support frames and even might have designed these frames themselves. Furthermore, it is important to note that the excavation work followed the western, (i.e. middle) wall. Consequently, the Eastern wall, facing the courtyard, remained unexcavated aside from its northern end, where the limestone block and the socketed slab was found.[29] This resulted in the erroneous

[26]Evans, 1902a, p. 102.

[27]See plate 91.

[28]Evans, 1901, p. 104. The Laurion Mines are located in Attica, half-way between Athens and Cape Sunion. For more details on the Laurion Mines see: Hopper, 1953 and Hopper, 1968.

[29]Compare plates 90 and 94.

reconstruction of a massive Eastern wall featuring a small window.[30] Fyfe wrote:

> Digging from column bases on the lower wall of this [Hall of the Colonnades] towards staircase led to no result, but a dowel hole was found on top of one of the large stone blocks, so I think it likely there was a wood construction + perhaps windows there of some kind.[31]

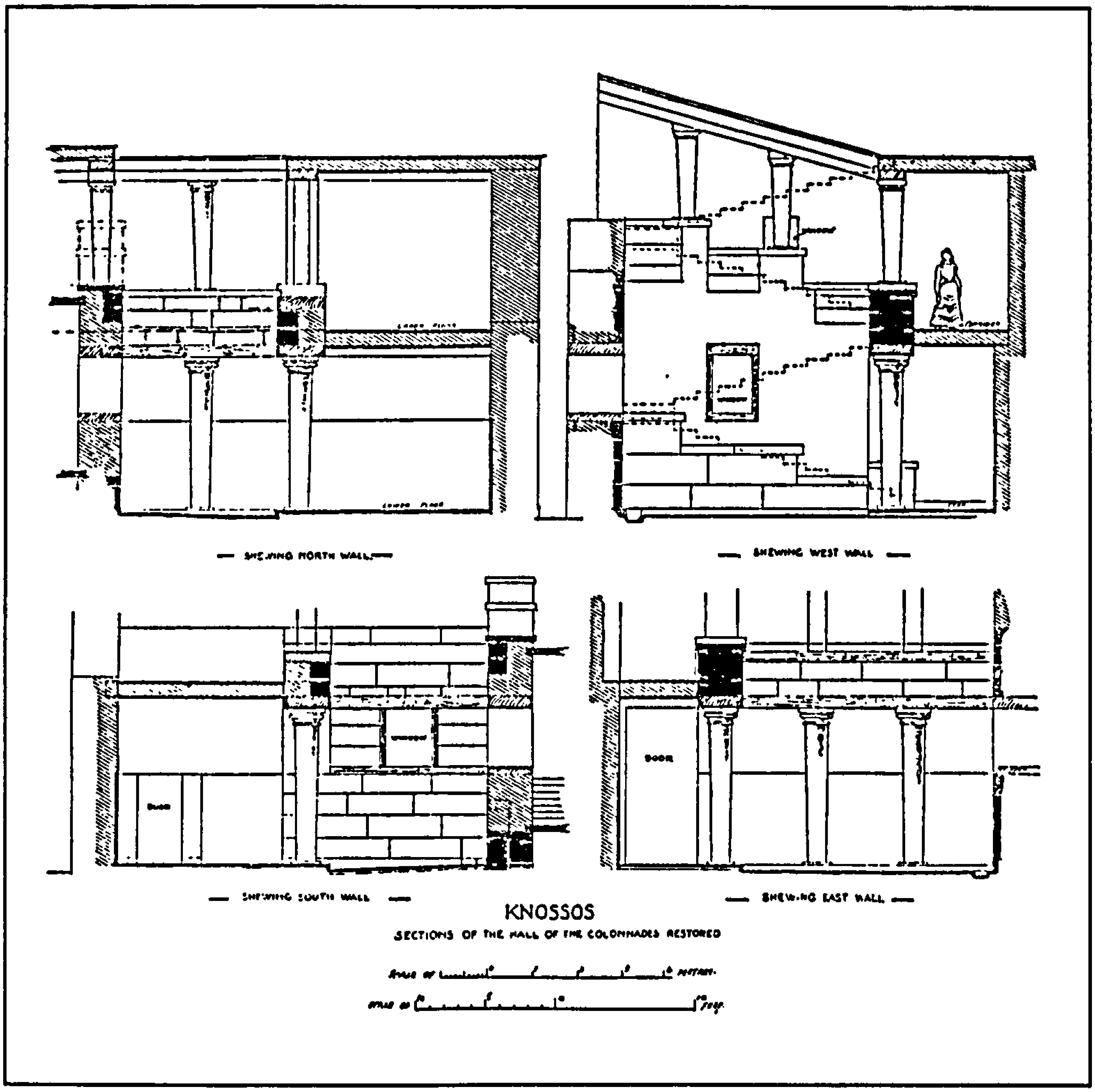

Figure 32 Restored Sections of the Hall of Colonnades. Theodore Fyfe, 1901.

As will be seen later, the excavations undertaken in 1905 to facilitate the reconstruction work under Christian Doll proved this reconstruction wrong. However, at the end of the campaign in June 1901 the wall immediately South of the Grand Staircase was

[30]Evans, 1901, p. 109. But see also figure 32.

[31]Letter from Theodore Fyfe to Arthur Evans, 19 June 1901. Ashmolean Museum Evans Archive.

reconstructed by Theodore Fyfe while excavating the Court of Distaffs.[32] When returning to the site one year later the middle wall separating the two flights of the Grand Staircase had begun to lean dramatically. Evans reports in The Annuals of the British School at Athens in 1902:

> "The leaning position of the thick rubble wall that formed the division between the upper staircases involved a far more difficult problem. It had heeled over to such an extent above the third flight as to threaten the destruction of both the stone stairs and the parapet beyond. It was impossible to prop it up adequately and it became necessary to resort to heroic measures. I therefore had a deep incision made at a low level on either side, wedges being at the same time inserted in the slit on the side to which it leaned. The wall was at the same time cut across transversely at the point where the window opening between the two staircases lessened the amount of cutting necessary. The whole mass was then cased with planks on either side, and bound round with ropes so as to prevent its disintegration. A wooden framework firmly buttressed against the inner terrace was now set up to act as a stop, its face answering to the original position of that of the wall on this side. Sixty men, harnessed by ropes to the plank-encased wall-section, were now stationed on the terrace above the inner staircase, and at a given signal the tug of war began. There was a moment of great suspense, but the whole mass moved homogenously and the wall righted itself in its original position. Stones and cement were ready to fill up the wedge-shaped opening along the outer staircase, and the work was complete."[33]

This paragraph is interesting for two reasons. First, Arthur Evans has not referred to Theodore Fyfe but instead has named himself responsible for the idea of the work. Secondly, in this action methods were employed which were very advanced in their attitude towards the protection of the fabric. The middle wall is only 1.50 m long and 0.80 metres thick with an height not exceeding 1.65 metres. Thus it would have been less time and labour intensive to pull down the wall and to reconstruct it with the same material. Nonetheless, a more expensive and time-consuming method was chosen to keep the fabric of the wall intact. After this work a pillar was erected at the northern end of this wall and the landing block was placed at its approximate original position.

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[32]Letter from Theodore Fyfe to Arthur Evans, 19 June 1901. Ashmolean Museum Evans' Archive. See plate 96 centre right, 97 centre and 167.

[33]Evans, 1902a, p. 33. See also Evans, 1927, p. 261.

Adjacent to the Grand Staircase the Hall of the Colonnades was excavated in the same year. The northern portico of the hall, which forms the continuation of the lower East-West Corridor, consists of a series of columns supporting the floor and breastwork of the upper hall, which itself is the continuation of the upper East-West Corridor. The columns, originally executed in timber, had vanished, but earth and debris had filled the void and kept the breastwork in position.[34] During the excavation process the breastwork was supported with timber studs but, unfortunately, during the night of 11 June 1901 the entire support work collapsed.[35] Immediately a new timber frame was erected covered with timber boards and the fallen breastwork was reinstalled.[36] Eight days later, Theodore Fyfe wrote a letter to Evans dated 19 June 1901:

> Things are going on pretty well on the site. The carpenter has practically finished today all the woodwork of the new reconstructions in the "Hall of the Colonnades".[37]

Plate 95 shows the newly inserted timber scaffolding but the entire breastwork had not yet been replaced. As can be seen in the photograph, remains of original paving slabs were stacked at the wall, but obviously this amount of material was not sufficient to repave the entire area. However, by 1904 the entire area of the northern hall was repaved with fragmented pieces of floor slabs, some of which must have been derived from other areas or been quarried for this purpose.[38]

However, the reinstallation of the floor was executed at the wrong height. It was discussed in the previous chapter that debris and earth were deliberately filled into the area right under the timber construction supporting the floor of the upper Hall of Colonnades.[39] When the timber joists had finally rotted away, the floor slabs sunk by the thickness of the original timbers.[40] The western part of the first floor landing of the Grand

[34]Compare page 155 ff.
[35]Evans, 1901, p. 106.
[36]See plates 94 and 95.
[37]Letter from Theodore Fyfe to Arthur Evans, 19 June 1901. Ashmolean Museum Evans Archive.
[38]See plate 158.
[39]See figure 33 b.
[40]See figure 33 c.

Staircase was supported by a massive earth build-up underneath and the sill of the door leading to the upper East-West Corridor in the east was supported by a wall. Consequently, these two features remained at their original height, while the floor of the upper hall, which connects both features, sunk to a lower level. The original height of the floor was given by the first floor landing at the western end and the door sill at the eastern end, and additionally by floor slabs sticking to the northern wall and supported by earth.[41]

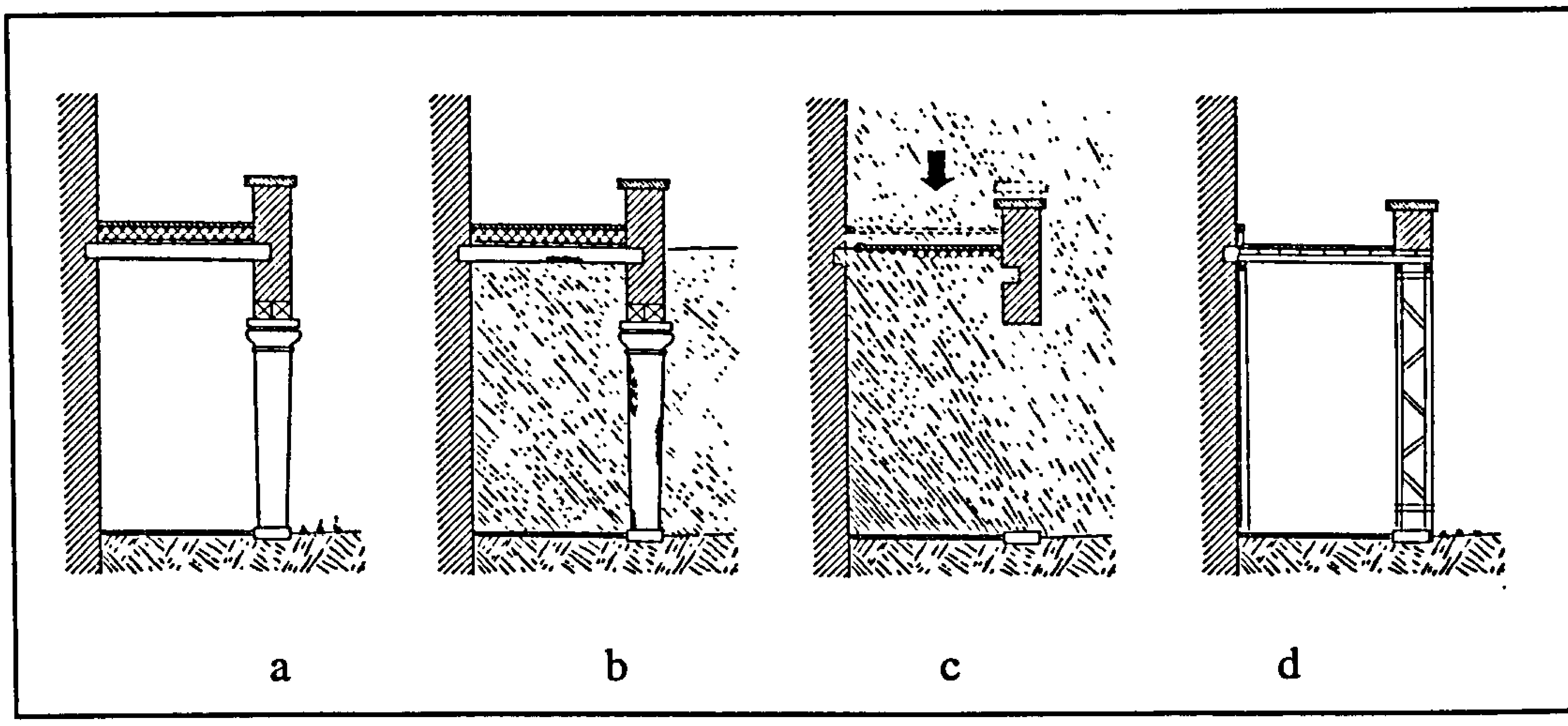

Figure 33 Schematic section through the East-West Corridor. The original construction (a), after the deliberate infill (b), after the beams rotted and the floor sunk (c), and Fyfe's reconstruction as found but at the wrong height (d).

It might be noteworthy that Arthur Evans described the breastwork of the north hall as kept 'in position' in his report of 1901[42] while he labels the same feature as 'practically in position' in 1905.[43] However, these minimal differences in Evans's writing should not be overrated since the original height was clearly detectable at all times. It is more prudent to assume that Theodore Fyfe reconstructed the floor at its sunk level to avoid problems with the connection to the third flight of stairs which had sunken by the same amount and remained in position. Consequently, a ramp was constructed at either end of the newly paved area leading to the higher original level. But this led to a very unfortunate situation: the floor of the northern portico of the upper Hall of Colonnades

[41]See plate 98 middle area.

[42]Evans, 1901, p 106.

[43]Evans, 1905, p. 23.

was enclosed by the wall in the north and the reinstalled breastwork on its south side, as well as by the ramps at its western and eastern end. Thus, a basin was created, which, being open to the sky, was a rainwater trap, that slowly dispensed the water through the joints of the fragmented paving slabs to the timber structure below. This, of course, severely affected the wooden structure.

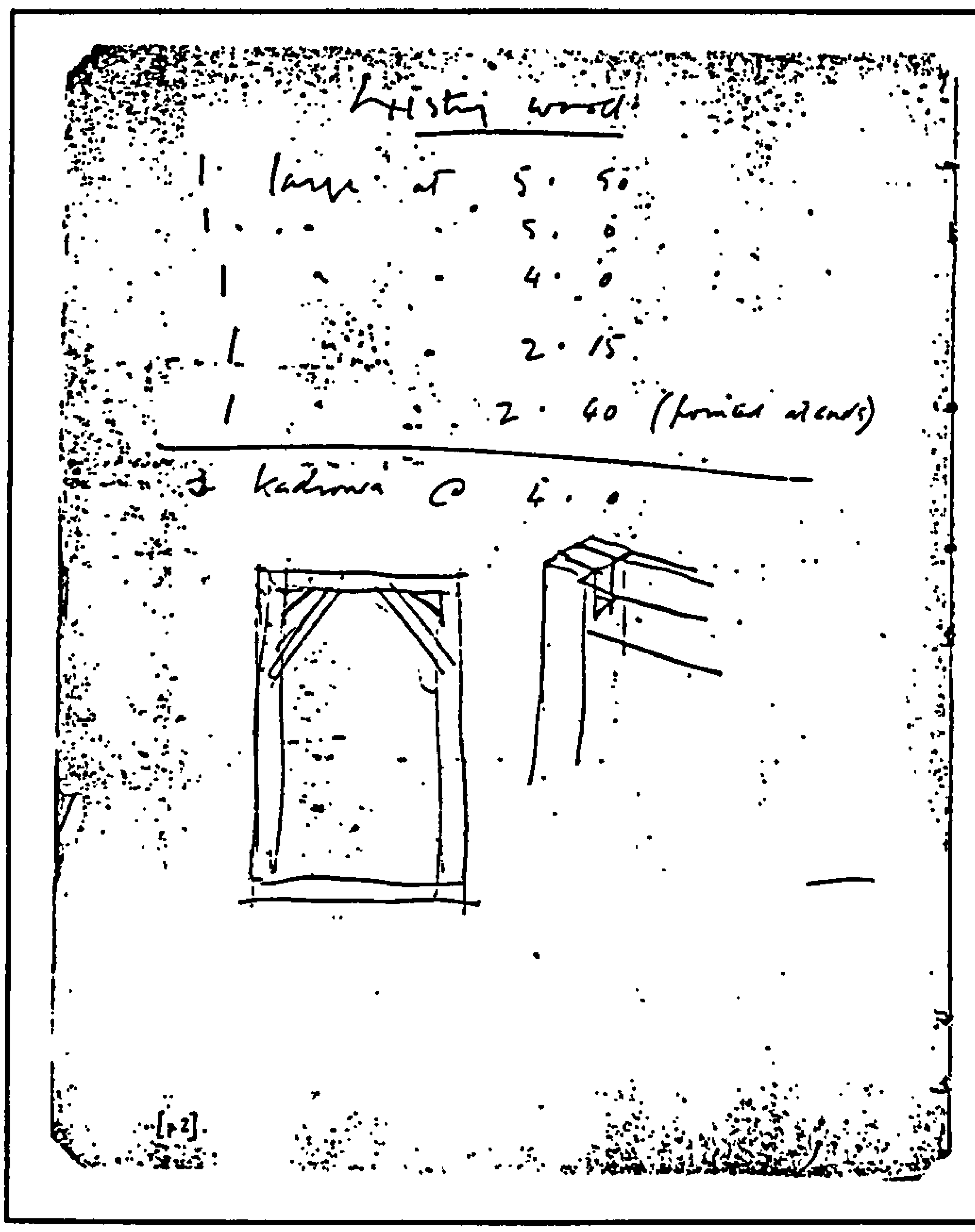

Figure 34 Sketch for the construction of a doorframe. Theodore Fyfe, Notebook 1902.

The door opening from the lower Hall of the Colonnades to the East-West Corridor featured 'exceptionally well preserved wooden posts and lintel'.[44] Evans did not discuss these finds in more detail, so we may assume that the beams forming the original door frame were found in position but, quite certainly, in a carbonised state. This might have helped Evans and Fyfe to understand the original door constructions. Theodore Fyfe opened the door by inserting a new wooden lintel and brick door jambs.[45] The door opening south from the Hall of Colonnades to the Corridor of the Demon Seals was reconstructed in a similar fashion, but here timber uprights were employed and placed in front of the brick jambs, thus re-creating the original structural system.[46]

[44]Evans 1901, p. 105

[45]See plate 92.

[46]See plate 112, bottom left corner.

3.3.2 The upper and lower East-West-Corridors

The northern part of the Domestic Quarter is formed by the East-West Corridors which form the continuation to the east of the northern portico of the Hall of Colonnades. At its eastern end the upper East-West Corridor descends with a flight of steps down to the level of the lower corridor.[47] Evans described:

> "Ten of these [steps] are preserved in an unbroken series, after which there is a small gap succeeded by three more steps, the first however, broken. The original flight consisted of fifteen steps, of which two and a portion of a third are now wanting. The cause of this break is due to the fact that whereas up to the tenth the steps rest on a solid foundation, at this point they reach to the beginning of the lower East-West Corridor already referred to [...]. The roof of this end of the lower Corridor collapsed, destroying the steps above it at this point. Beyond this point, however, the floor of the upper Corridor has remained intact for some distance, running, as was afterwards made clear, above the lower gangway, the floor of which is about 4 metres below it."[48]

Here Evans clearly explained the situation found and, from photographic evidence, it can be traced how Theodore Fyfe reacted to these problems. Plate 93 shows the excavation of the upper East-West Corridor. The still blocked door to the Room with the Drain Head, north of the Domestic Quarter, is visible on the right, while in the foreground a broken gypsum paving slab can be seen. Plate 95, taken probably some time after 19 June, 1901,[49] shows the newly inserted timber scaffolding in the Hall of the Colonnades but still unexcavated earth in the area of the East-West Corridor.

The lower East West Corridor was excavated and fitted with a similar system in 1902,[50] together with the work in the Hall of the Double Axes and the re-opening of the doorways to the Hall of the Double Axes and to the Hall of the Colonnades.[51] While plate

47 See Section B-B, Drawing 8.
48 Evans, 1902a, p. 99.
49 Compare letter Theodore Fyfe to Arthur Evans, 19 June 1901, Ashmolean Museum, Evans Archive.
50 Evans, 1902a, p. 34.
51 See page 187.

95 indicates that, by far, not all paving slabs survived, plate 98, taken in 1903 or 1904, features a new paving with what seems to be randomly selected fragments of paving slabs. Additional paving material must have been supplied either from new quarrying or from other parts of the palace. In context with the restoration of the floor of the East-West Corridor, the missing steps were replaced with new material. In the plan the new steps are clearly detectable by their crisp and unworn appearance.[52]

3.3.3 The Hall of the Double Axes

The Hall of the Double Axes required careful attention from the very beginning of the 1901 excavation process. In the original construction the outer (eastern) hall was enclosed at its eastern and southern side by a wall of piers and doors opening to a portico. Another similar wall separated the outer hall from the inner (western) hall, a feature that was repeated in the upper storey.[53] The base stones of these piers of the upper Hall of the Double Axes were found almost exactly in their original position, slightly sunken

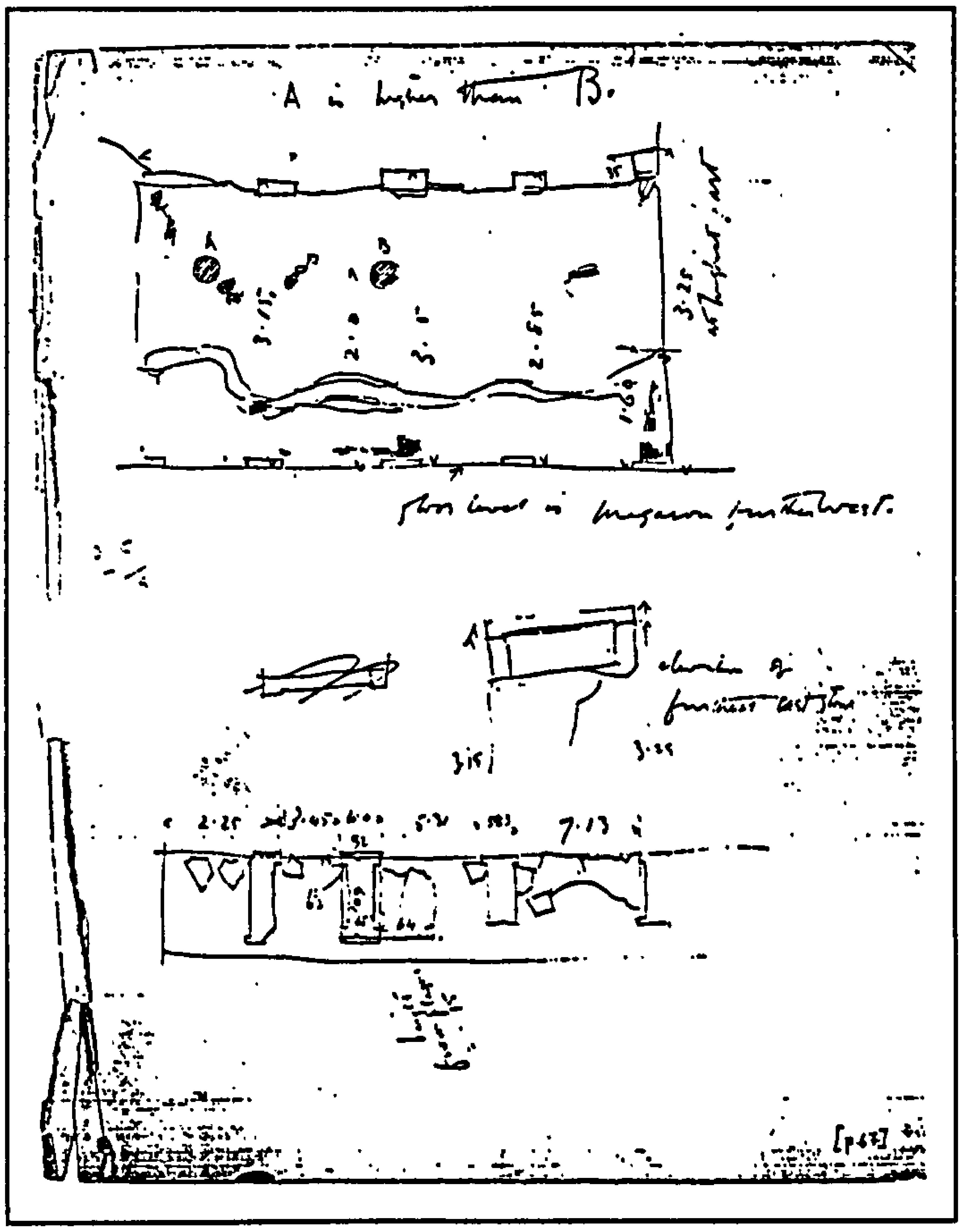

Figure 35 Sketch elevation (top) and ground plan (bottom) of the door jambs of the Hall of the Double Axes. Theodore Fyfe, Notebook 1901.

[52]See First Floor Plan, Drawing 7.

[53]See Ground Plan, Drawing 6 and First Floor Plan, Drawing 7.

below their former level.[54] As can be seen in plate 133, timber studs were employed throughout the excavation process to keep the stones in position while digging continued around them. However, in June 1901[55] the stones were taken down and a light timber framework was constructed to replace them at their former, sunken position. This work included replacement of the surviving pavement remains between the jamb bases.[56]

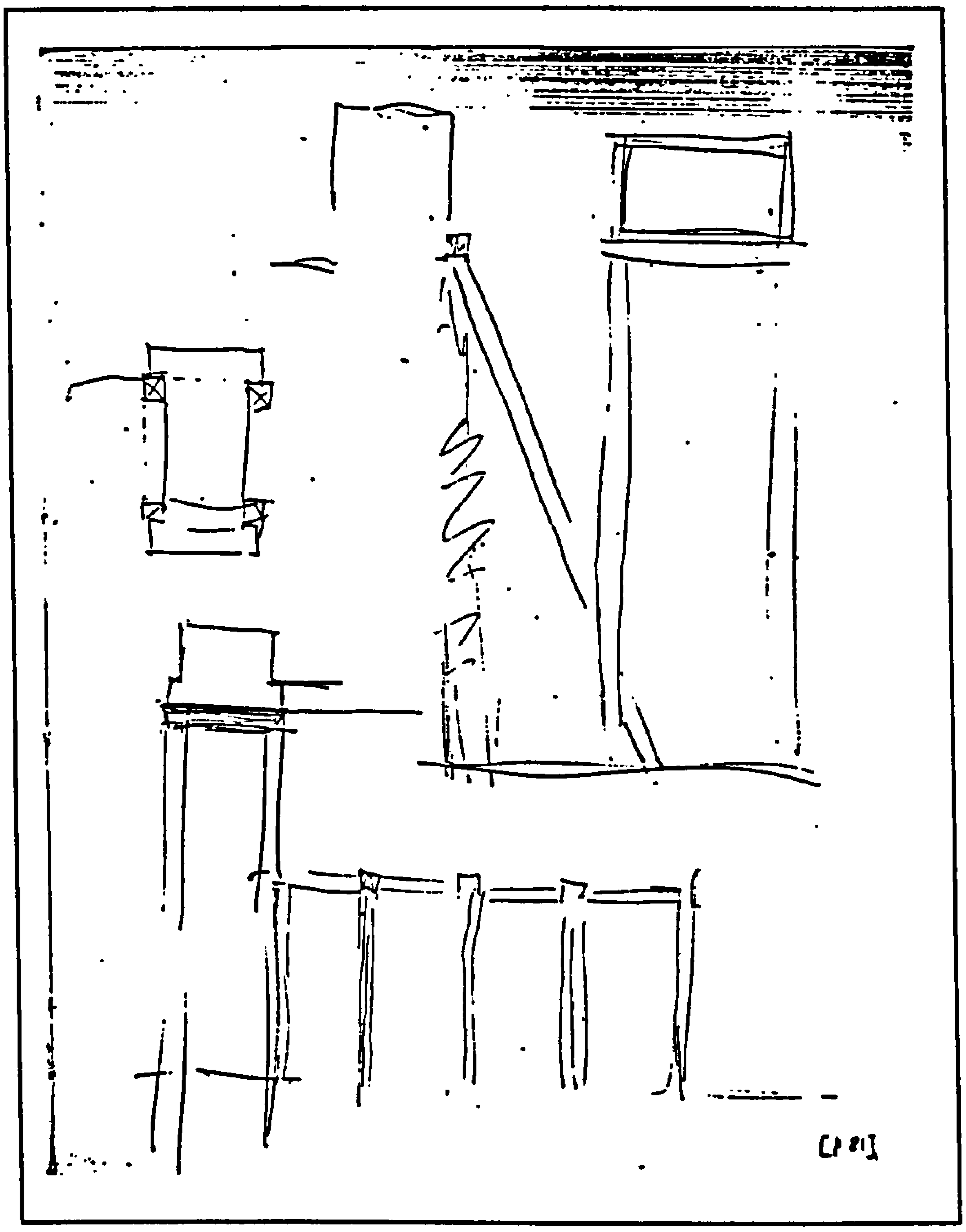

Figure 36 Sketch plan and elevation for the first timber support frame of the Hall of the Double Axes. Theodore Fyfe, Notebook 1901, p. 81.

This timber construction was made of four upright members in the position of each pier, tied together with horizontal braces round all four sides at a height of approximately 50 cm to their lower and upper end. Two diagonal braces in the middle prevented the construction from tilting to either the east or west, while tilting to the north or south was prevented by the walls. The upright timbers rest, not on the excavated door jamb bases, but on the pavement between their projecting ends.[57] Certainly, this was not done to protect the door

[54]See figure 35.

[55]Letter from Theodore Fyfe to Arthur Evans, 19 June 1901. Ashmolean Museum Evans Archive.

[56]See plate 136.

[57]See plate 136.

jambs because the pavement slabs were made of comparatively soft gypsum while the door jamb bases were made of limestone and were much thicker than the paving slabs. Nonetheless, the inadequate solution was chosen to place the load on the thinner slabs of softer material. The reconstructed timber frame was a very light structure and faced the same problem already described for the pillar at the entrance of the Throne Room.[58] The timber frame could not be fixed at the limestone jambs without interfering with the historic fabric. Subsequently, the upright posts were placed outside the jambs kept firmly in position by the projecting ends and the horizontal timber braces.[59]

On top of these timber framework piers two beams bridge from wall to wall.[60] The excavated door jamb bases and the remains of paving were placed on timber boards resting on these beams. Some distance further west, two diagonal beams support a shuttering which keeps part of the northern wall, which has no immediate connection with the piers, in position.[61] This structure is a typical scaffolding inserted during the excavation process.

Already in 1902[62] the entire framework was taken down and replaced with a new or, at least, altered, construction. In Plate 141 the same situation is depicted viewing from the outer Hall of the Double Axes westwards. The new timber framework consists of four upright timbers, this time placed on the projecting ends of the gypsum bases, thus recreating the original construction as far as it was known.[63] Braces were placed inside the four upright members at ground level. The simple horizontal beams supporting the bases of the upper storey in the earlier construction were replaced with a double layer construction. All spaces were filled with rubble masonry which was plastered over. Thus the weight of the structure kept the timber frame firmly in position. While the earlier

[58]Compare page 179 f.

[59]Compare plate 136.

[60]In plate 136 only two beams are visible. These two beams are strong enough to carry the load imposed on them and, thus, we might assume no more beams between these two.

[61]See plates 142 , 145 and 159 and figure 36

[62]See Evans, 1902a, p. 117 but see also compare plates 1 and 2.

[63]Compare Evans, 1900 p. 55.

construction only stretched from north to south, the new construction projected at its south to the east and covered another bay. Arthur Evans explained:

> "It has already been mentioned that a series of pillar bases and intervening sections of pavement belonging to the room above the Hall of the Double Axes were found in position, only slightly sunk below their level. Two further pillar bases subsequently came to light, corresponding to two of those found below facing the Southern Portico. The first series had been already temporarily supported in their position by wooden scaffolding, which both in the case of these and the bases, has now been replaced by pillars of wood and stucco answering as nearly as possible in character to those which had originally stood there [..] These rest on the original Limestone bases."[64]

The earlier reconstruction looks quite sturdy in the photographs and probably lasted well. Most likely, the replacement of the first scaffolding was not driven by its failure. The discovery of further bases, probably belonging to the upper Hall of the Double Axe, may have led to the desire to provide a support structure for them. But this structure could have been executed identically to the first timber frame. Another reason was responsible for a completely new designed framework. The upright posts of the first scaffolding imposed a heavy load on the thin gypsum slabs and may consequently have harmed them. Unlike the earlier construction, the new frame was filled with masonry and firmly rested on the jamb blocks due to its weight. It required no additional detail to keep it in position. It recreated the original structure as closely as possible and transmitted the load on to the jamb stones which were designed for this purpose. Thus the desire to recreate the original appearance and the technical necessity coincided.

Another interesting detail can be observed in plate 135 which was taken by Theodore Fyfe after the first timber frame was taken down and before the new framework was erected. It shows the west wall of the Hall of the Double Axe with limestone ashlar masonry courses interrupted by a horizontal interstice between the fourth and the fifth course. As already explained in the previous chapter, the gap left by the vanishing horizontal timbers caused structural problems. Because of this, Fyfe had the interstices in the ashlar masonry refilled with small stone chips to prevent the upper parts from

[64]Evans, 1902a, p. 44.

collapsing.[65] Close to its southern end the stone infill is interrupted which marks the former position of a tie beam connecting the horizontal timber reinforcement this side of the wall with the one on the other side. This was originally misinterpreted by Evans as the location of a jettied joist carrying a balcony[66] but was corrected one year later.

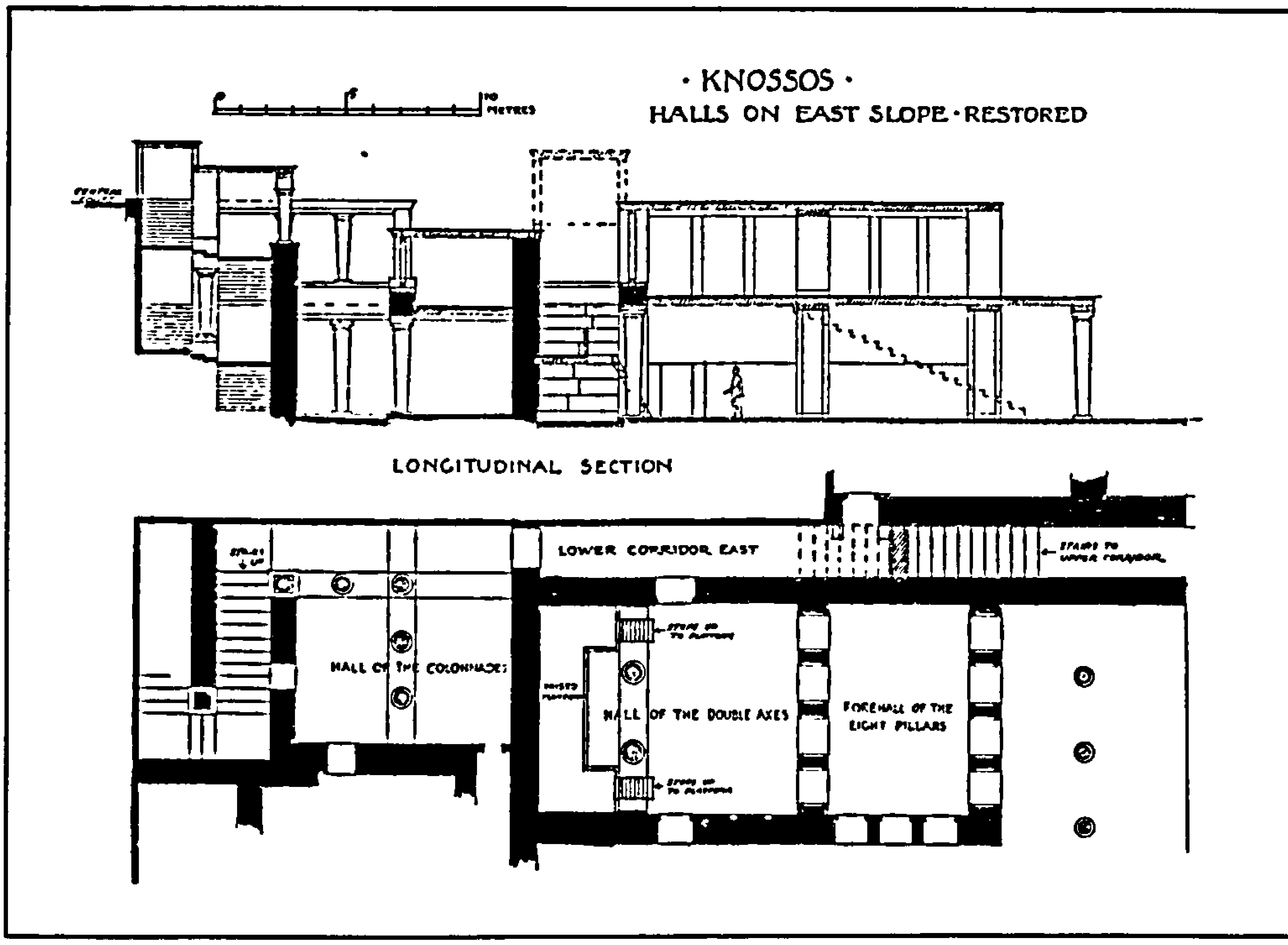

Figure 37 Restored Section of the Grand Staircase, Hall of Colonnades and the hall of the Double Axes. Theodore Fyfe

A doorway gives access from the lower East-West Corridor to the Hall of the Double Axes south of it, while west of this door a double window was opening from the corridor to the light well of the hall. The masonry above the window collapsed into the opening but the reconstruction drawings of 1901 show full ashlar masonry for this area.[67] The door opening east of it survived in a better state, and in 1902 was restored by Theodore

[65]See plates 137 and 138.

[66]Evans 1901, p. 113. See figure 37. Evans corrected his first interpretation already in 1902 (1902a, p. 40) but, nonetheless, was criticised for his first interpretation by Josef Durm, who visited the site in 1906, in his book on Greek architecture in 1910 (1910, p. 58).

[67]See Evans, 1901, p. 111.

Fyfe in the context of the other work in the Hall of the Double Axes.[68] He inserted new limestone jambs, and a wooden lintel which was relieved from the weight of the upper wall by the insertion of a corbelled arch.[69] The window was not opened by Theodore Fyfe, but remained filled until 1908.[70] Plate 92 shows a view from the landing of the Grand Staircase eastwards along the lower East-West Corridor. Clearly visible is the light entering from the right a short distance behind the reconstructed doorway between the Hall of the Colonnades and the corridor which indicates the reconstructed doorway. Thus it must be dated to 1902.[71]

Another doorway gives access from the Dog's Leg Corridor to the south side of the Hall of the Double Axe. This door was re-opened by Theodore Fyfe in 1902 by the same method employed for the door opposite, connecting the hall with the lower East West Corridor.[72] A timber frame was installed with up-braces supporting the lintel and a flat limestone relieving arch was placed above the door opening transferring the load of the upper masonry to new limestone jambs.[73] The reconstructed limestone jambs recede slightly and thus left the front part of the gypsum base stone exposed.[74]

3.3.4 The Queen's Megaron

The excavation of the Queen's Megaron and the adjacent areas started in 1902.[75] In the excavation process a number of amphorae and large stirrup vases were found, dated by Evans to the Mycenaean re-occupation, as well as fragments of pavement of the upper

[68]All relevant photographs of 1902 feature the reconstructed door while plate 136 shows the North wall of the Hall of the Double Axe in 1901 with the base stone for the door jamb in the left bottom corner.

[69]See plate 139 and compare Evans 1902a, p. 40, figure 21.

[70]See page 249 f.

[71]See Evans, 1901, p. 106 and see also page 185 f.

[72]Evans, 1902a, p. 45.

[73]See plate 163 and plate 164.

[74]See plate 164.

[75]Evans, 1902a, pp 45.

storey.[76] It appears that shortly before the final destruction of the palace, major restoration work started because large areas of the Queen's Megaron were covered with a deposit of lime. In other parts it appears as if plaster was deliberately picked from the walls and stored in heaps.[77] Adjacent to the Queen's Megaron a small bathroom with gypsum dado slabs and painted plaster friezes in a remarkably well preserved state was excavated. The division wall between the Queen's Megaron proper and the portico east of it was made of a raised stylobate supporting a series of three pillars and low benches on either side.[78] The wall south of the Queen's Megaron facing the South Light Well was executed in the same manner. The western parts of the Domestic Quarter were preserved in a remarkably good state because they were set into the 'deep cutting'.[79] Further east, less height was preserved due to the fact that the Kephala Hill slopes down towards the Kairatos valley. Consequently, east-west walls in the Domestic Quarters were preserved to a substantial height at their western end, but the height remaining declines towards the east and finally terminate completely. Thus, the eastern ends of the walls, in terms of conservation, required the most attention.

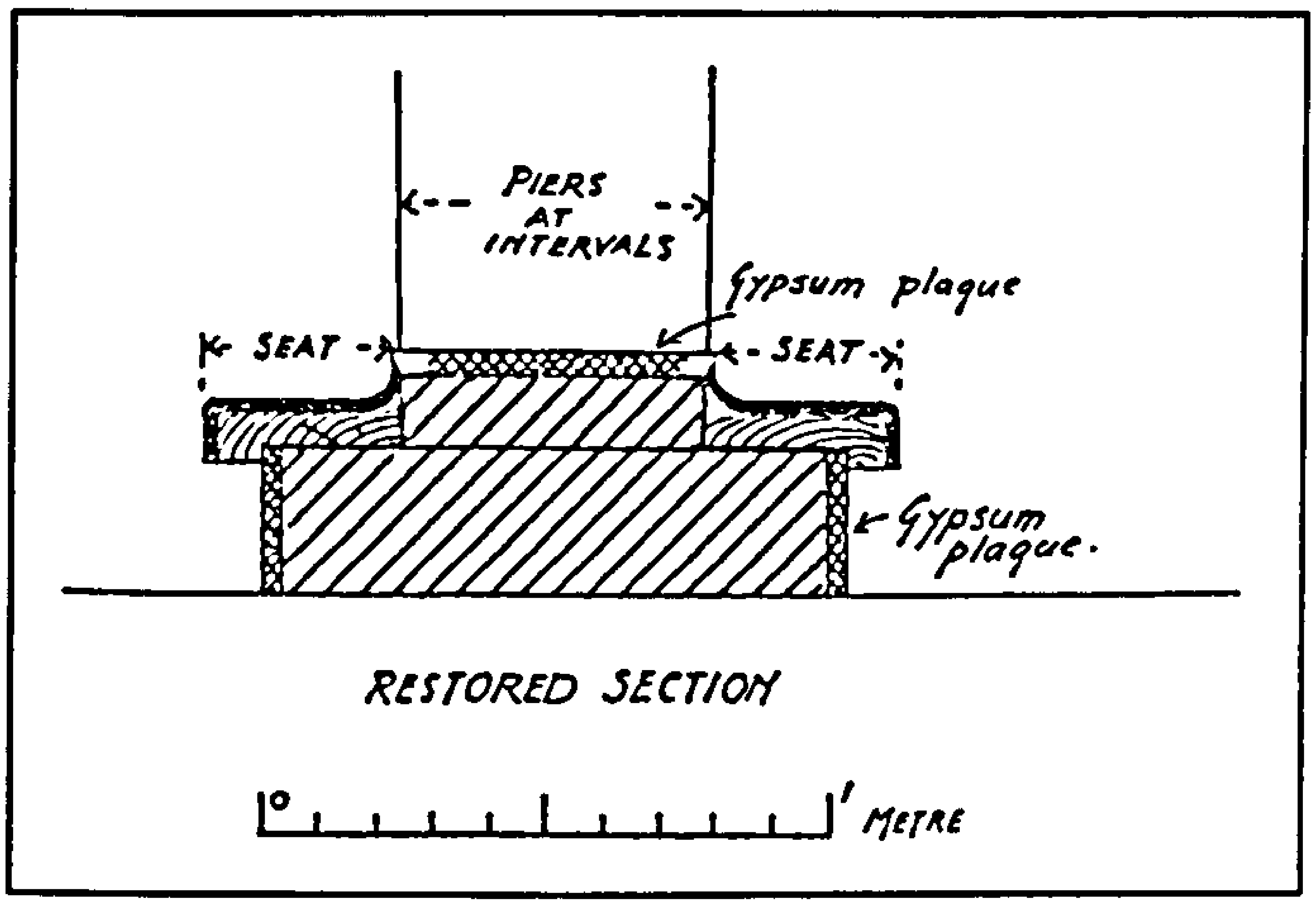

Figure 38 Restored section of the raised stylobate with the double benches.

Within the same year of excavation, 1902, Theodore Fyfe started a reconstruction programme to strengthen the sloping eastern ends of the excavated walls. A new wall end was constructed for the wall south of the Corridor of the Painted Pithoi featuring ashlar quoins.[80] A similar construction was chosen for the northern jamb of the window between

[76]Evans, 1902a, p. 46.
[77]Evans, 1902a, p. 48.
[78]See figure 38.
[79]PM II, p. 348.
[80]See plate 178.

the Queen's Megaron and the bathroom. In contrast, a completely different solution was employed for the northern wall of the Queen's Megaron. While the lower part of this wall was constructed in a similar technique, the upper part features a timber cage filled with rubble masonry. The lower timber rail was placed in the height of the Minoan timber reinforcement rail, still recognisable in the Bathroom. The upper member of the cage represented the assumed ceiling height.[81]

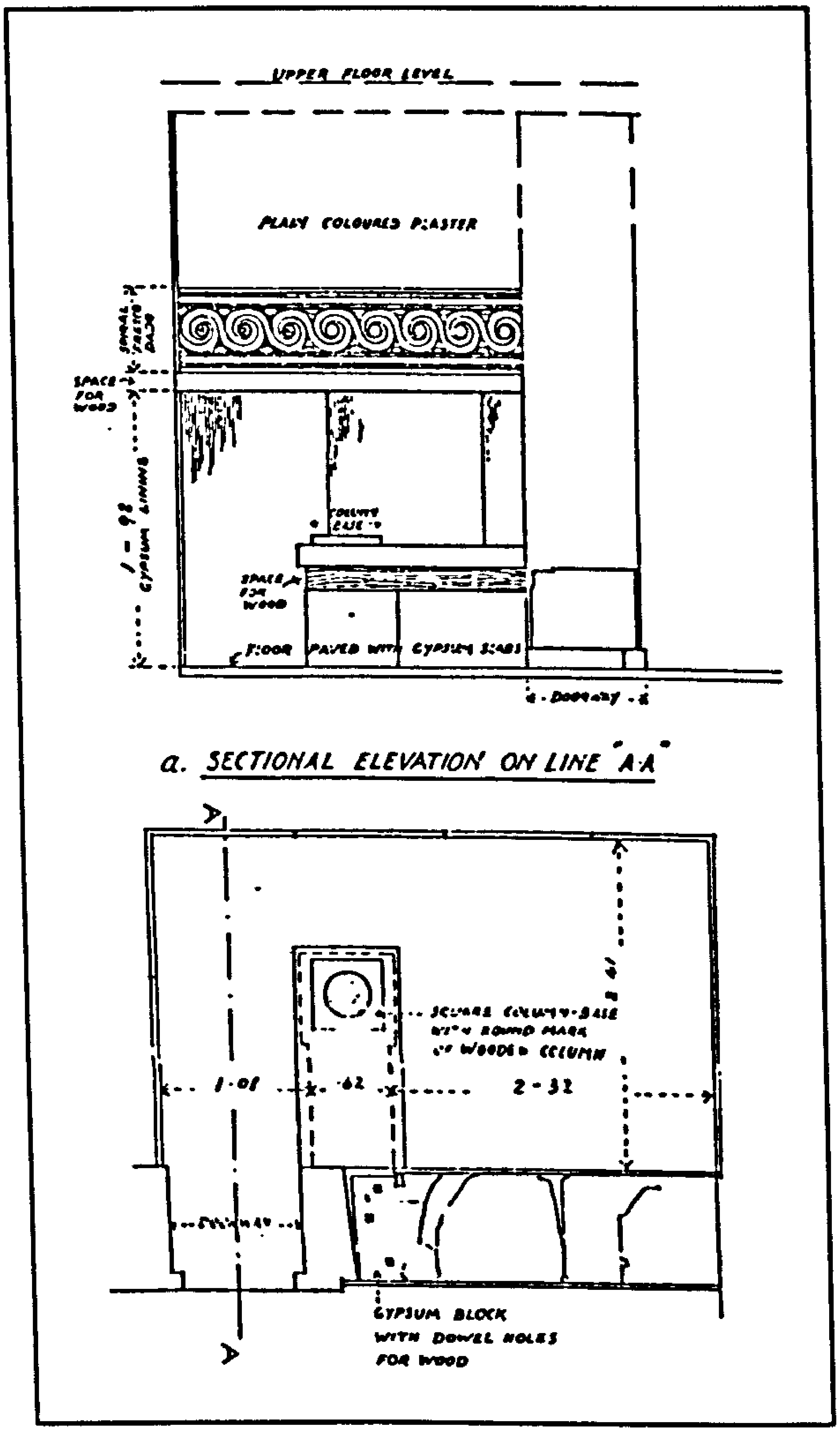

Figure 39 Plan and Elevation of the Bathroom with the spiral frieze. Theodore Fyfe, 1902.

To protect the excavated fresco remains in the Bathroom a small canopy was constructed projecting from the northern wall of the Bathroom. Another four courses of reconstructed masonry above the ceiling height provided the necessary counterweight to keep this construction in position. The projecting timber construction was covered with the replaced paving material and the jars found were placed on top of it.[82] The driving force behind the reconstruction of this part of the ceiling was certainly to protect the fresco remains rather than to reinstall the pavement and to place the jars found back to a place where they might have come from. Thus we have to understand this construction as a work of predominantly protective nature. The use of timber

[81]See plate 180.
[82]See plate 180.

and the construction of the cage framework indicates that Theodore Fyfe tried to recreate the former structural system employing the same materials used by the Minoan builders.

However, in 1902 Theodore Fyfe prepared a sketch plan in his diary showing a proposal to cover the entire area of the Bathroom with a roof. He suggested to cover the window and the door between the Queen's Megaron and the Bathroom with brick arches. The ceiling beams were supposed to stretch north-south being supported by two brick arches.[83] It is not clear if this sketch was made on Fyfe's own initiative or if Evans asked for it. It is not mentioned in Evans' notebooks of 1902 and it was not executed.

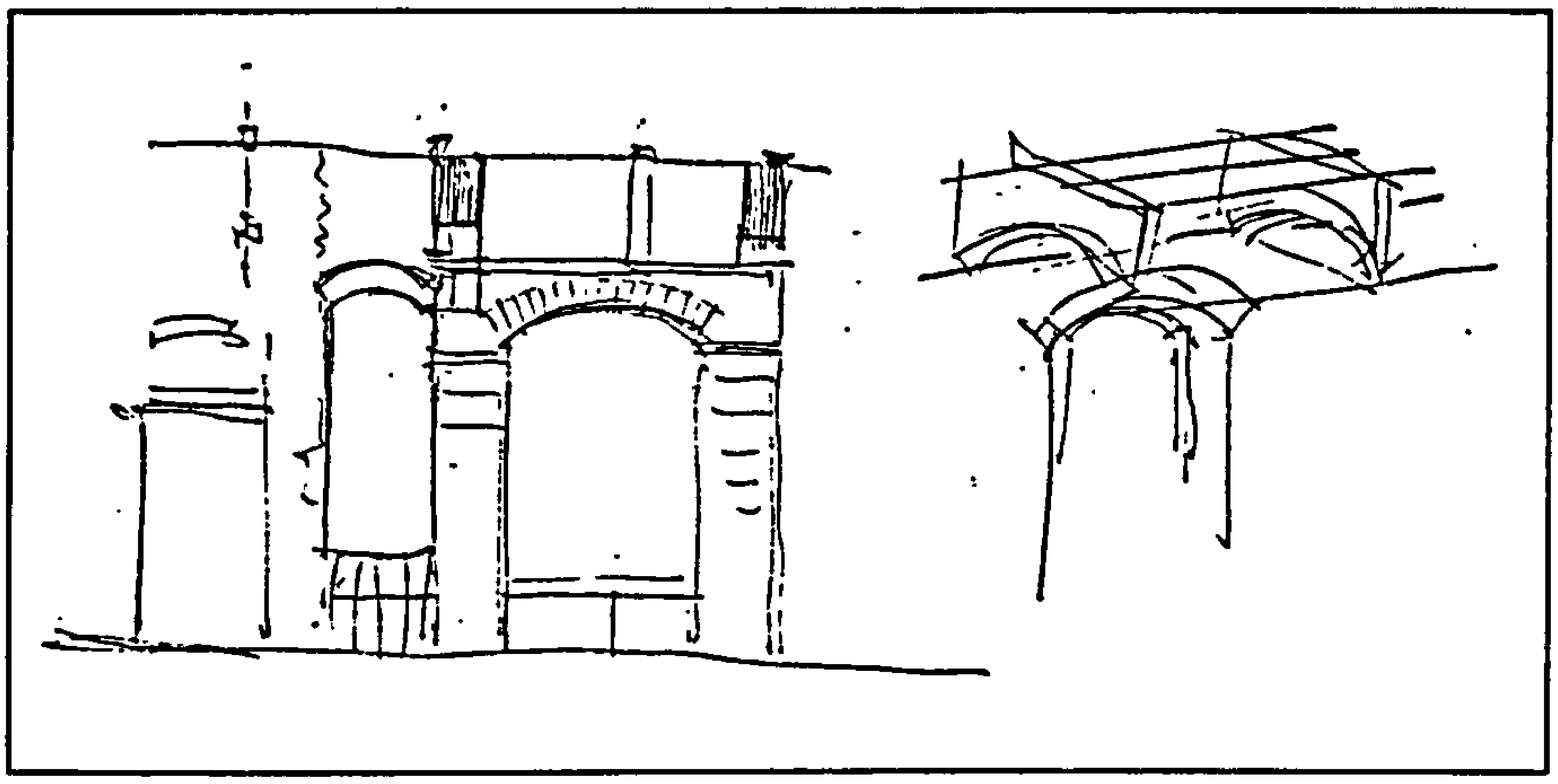

Figure 40 Sketch proposal for a roof above the Bathroom. Fyfe, Notebook 1902

In 1902 the eastern door jamb of the door leading from the Queen's Megaron to the Private Staircase was reconstructed with rubble masonry and ashlar quoins. Timber beams were employed bridging from this reconstructed jamb over the Private Staircase and the Dog's Leg Corridor in order to keep the upper landing block[84] of the Staircase in position.[85] In 1903 Theodore Fyfe had to return to the Queen's Megaron to strengthen the wall end of the partition wall between the Bathroom and the corridor in the same technique by employing a timber cage and rubble masonry.[86]

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[83]See figure 40.

[84]Evans, 1902a, p. 60.

[85]See plate 163 centre.

[86]See plate 179.

3.3.5 Other parts of the Domestic Quarter

The rooms to the west of the Queen's Megaron were excavated in 1901 and 1902. In his letter to Arthur Evans of 19 June, 1901, Theodore Fyfe reports on the additional excavations in the area south of the Court of the Distaffs, with the Room of the Stone Seat at the first floor level and the Room of the Plaster Couch at ground floor level underneath:

> "The room with the seat south of great staircase has been excavated right down to the ground floor (which is very deep down and has a slab lining) and is now ready for rebuilding. On the wall opposite the seat there is an interesting construction which has probably fallen down from the upper level but is still roughly in position; consisting of three doors or seats, as sketched. Jambs are rather to close together for doors (about ½ metre.)"[87]

The west wall of the Room with the Plaster Couch was also the retaining wall at the western side of the deep cutting which prevented the Central Court from collapsing into this area. In 1901 Theodore Fyfe reconstructed parts of it in order to recreate its function as a retaining wall and to support the remains of the gypsum bench in the Room of the Stone Seat at the first floor. The plates 168 and 169, which were taken by Theodore Fyfe, show the area before his intervention and after he completed his restoration. These two plates clearly illustrate the amount and the quality of Fyfe's work on site. However, the main part of the excavation work took place in 1902 and in the same year reconstruction work started.[88] The east wall of the Room of the Plaster Couch features three doors. The northern one leads to the Corridor of the Demon Seals which passes the Treasury and the Service Stairs and finally leads to the Hall of Colonnades. The southern one leads to the Corridor of the Painted Pithoi and to the Queen's Megaron. The middle

[87] Letter from Theodore Fyfe to Arthur Evans, 19. June 1901. Ashmolean Museum Evans's Archive. It is interesting to note that all measurements at Knossos were made in the metric system and not in the imperial system.

[88] Evans, 1902a, pp. 61.

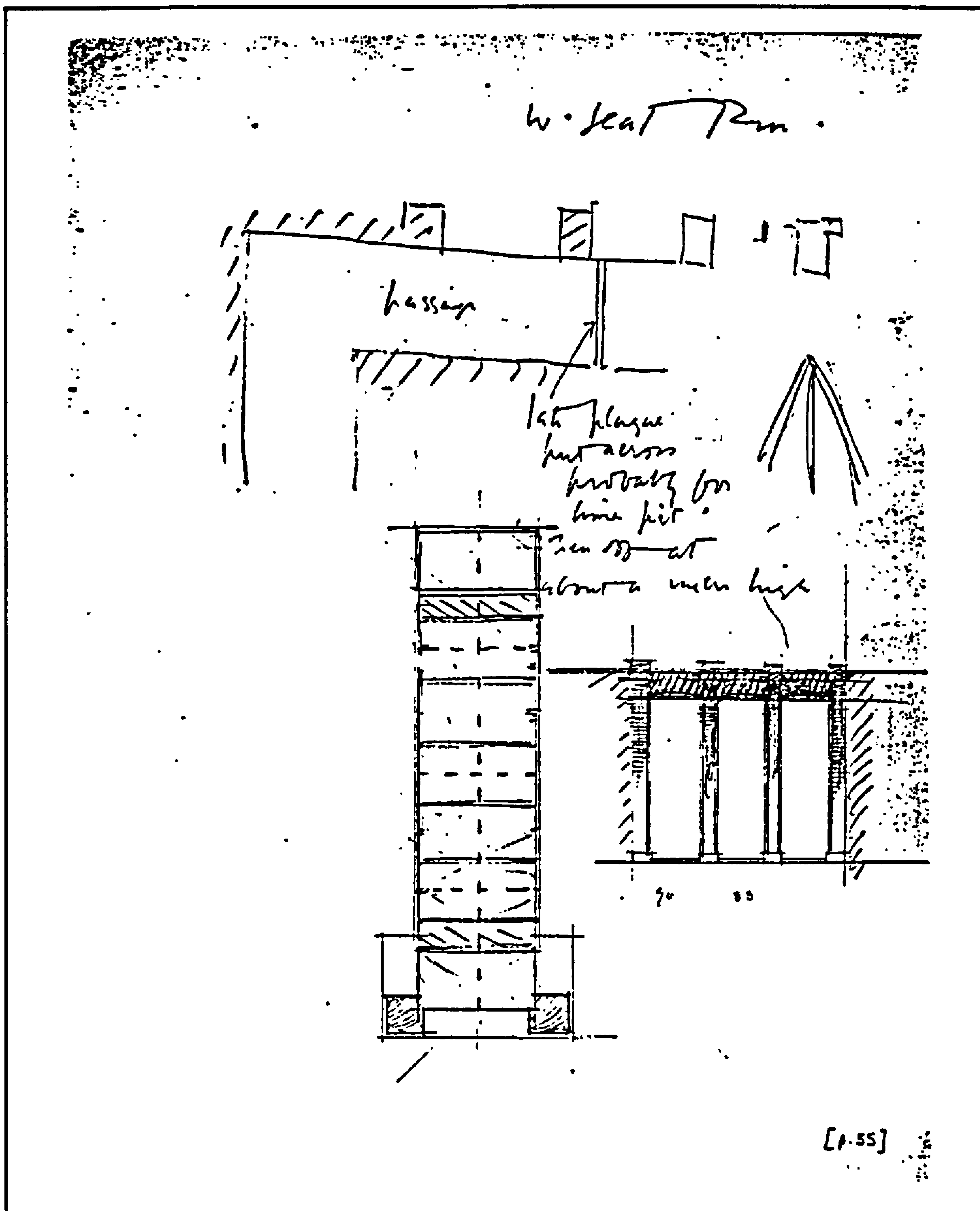

Figure 41 Ground plan of the brick pillar (centre bottom) and elevation of the east wall. Room of the Plaster Couch. Sketch plan by Theodore Fyfe.

door opens to a small closet, which was a toilet[89] separated from the corridor with thin upright gypsum slabs. In 1902 Theodore Fyfe reconstructed the jambs between these three doors with brick masonry and reinstalled the stone door jamb bases of the upper room in their original positions.[90] The brick pillars were framed with timber elements and the areas between them were plastered.[91]

[89]Evans, 1902a, p. 62.

[90]Evans, 1902a, p. 62 and see also the plate in the same article p. 37.

[91]See figure 41

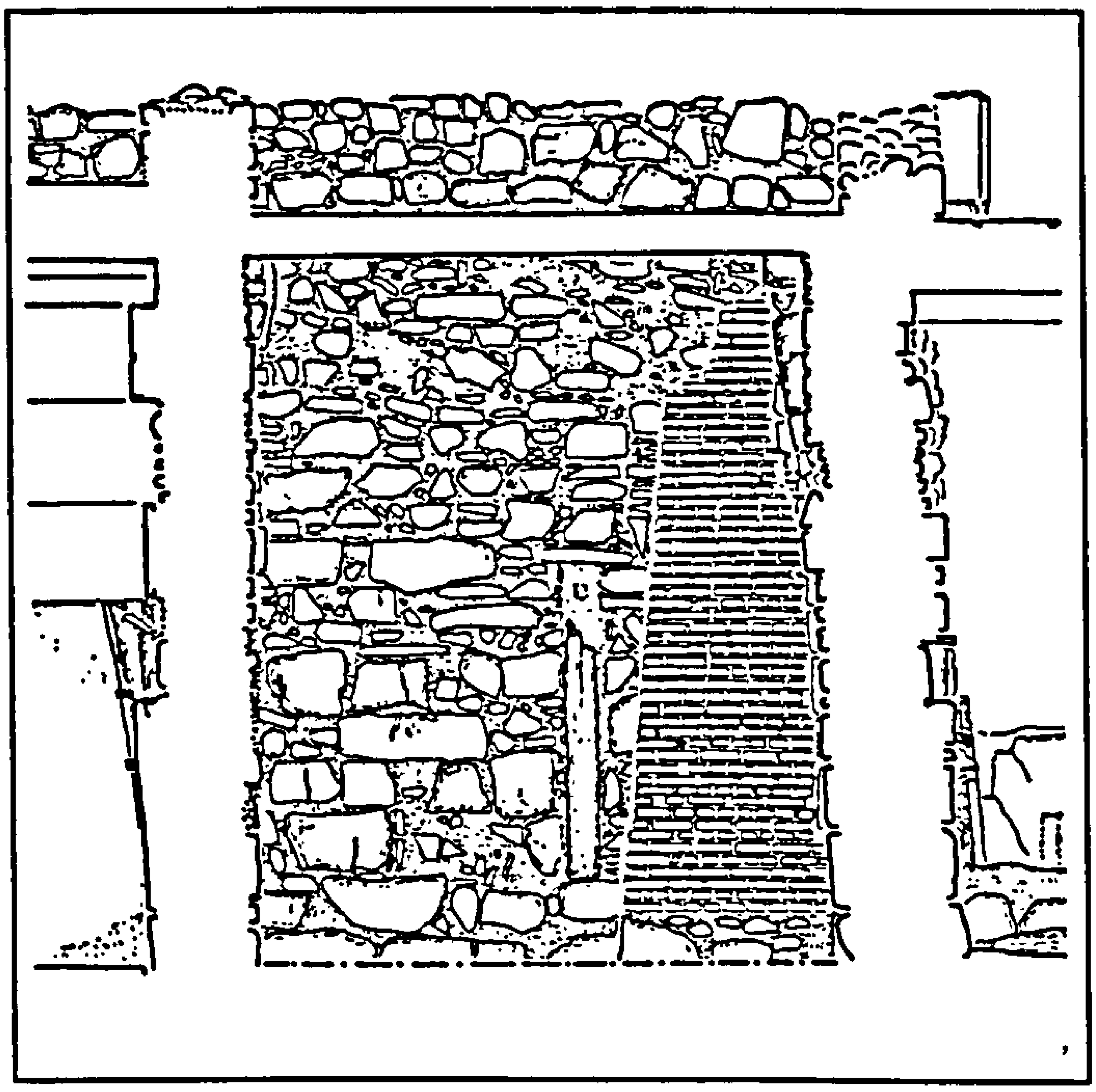

Figure 42 Elevation south wall of the Treasury.

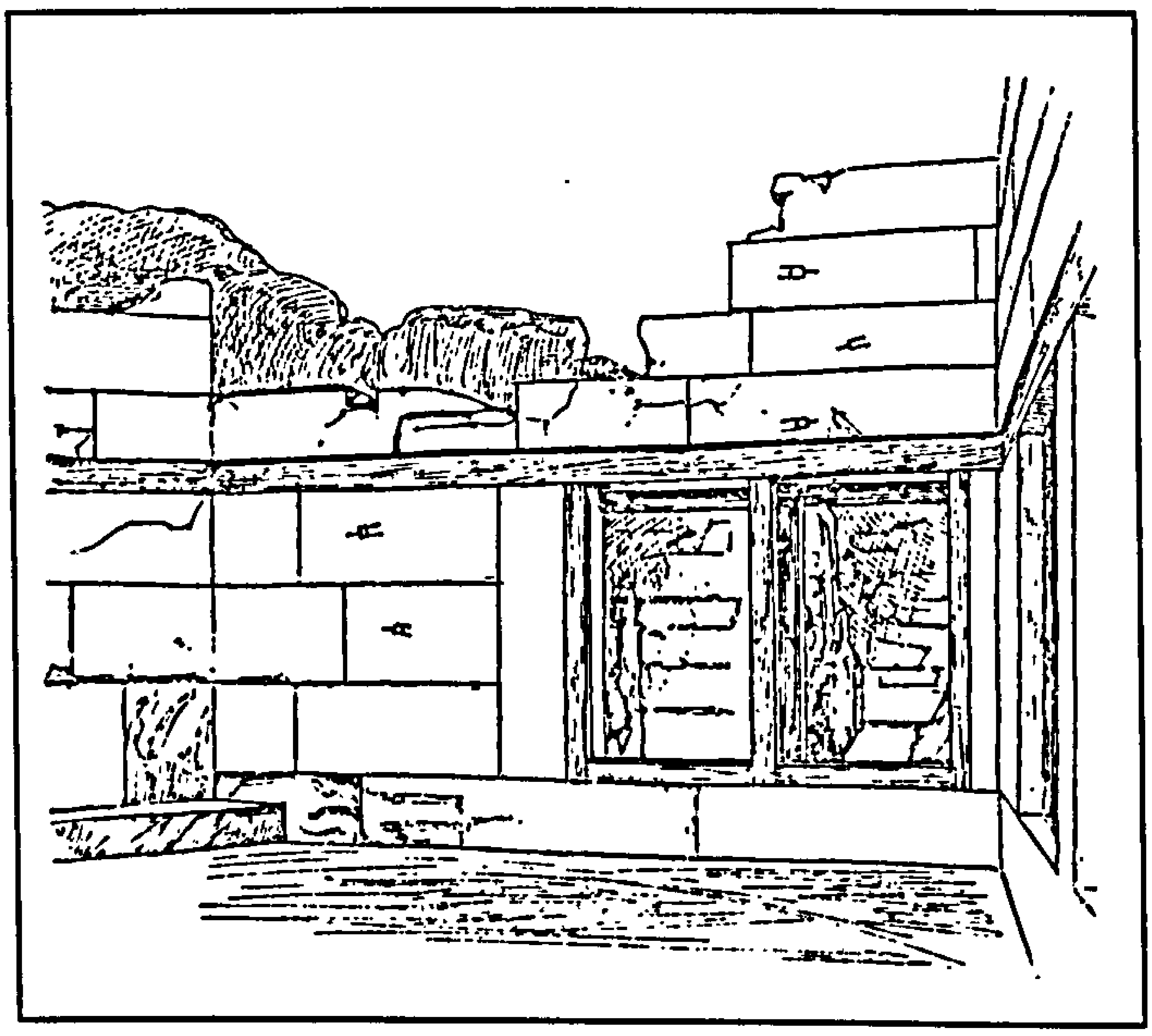

Figure 43 Court of the distaffs with restored timber frames.

The other doors leading to the Corridor of the Demon Seals and the Treasury were also executed in brick and timber. Fyfe also constructed a massive brick pillar in the Treasury which supported the western wall which was leaning dramatically.[92] It is significant, that this essential but rather unspectacular work was not mentioned explicitly in the reports of Arthur Evans. The windows opening to the Court of Distaffs were re-opened and supported with a timber framework while the jambs were reconstructed with limestone ashlar masonry.[93] Another timber-framed pillar was erected to support the gypsum block at the south-western corner of the Service Staircase.[94] A projecting timber ceiling was constructed in the south-western corner of the Room with the Plaster Couch specifically to protect this

[92]See figure 42

[93]Evans, 1902a, p. 64 and plate 170. See figure 43

[94]See plate 170.

feature from the weather. This ceiling, the areas between the door jambs and the firmly supported areas around the drain shafts were paved with broken paving slabs in the previously described method.[95] In a similar way parts of the Corridor of the Painted Pithoi were covered.[96] The northern end of this ceiling rested on the southern wall of the Treasury which featured vertical gaps, where formerly timber posts had been. Theodore Fyfe inserted softwood timber posts to reinforce this wall, remains of one of which survives in the Treasury today.[97]

By 1903 Theodore Fyfe returned to the area to cover the Corridor of the Demon Seals and the area of the toilet east of the Room of the Plaster Couch. Plate 178 which was taken in 1902 shows the Corridor of the Painted Pithoi partially roofed.[98] One year later, the Corridor of the Painted Pithoi occurs as a dark rectangular shape, thus indicating that in 1903 the corridors were roofed completely.[99] A timber structure, similar to the one employed in the Hall of the Colonnades in 1901, was erected in the area of the Corridors.[100] This indicates that the ceiling construction rested partially on reconstructed walls but was also supported by timber posts. Only a limited amount of load was imposed on the excavated walls. Most of the area was covered with rectangular limestone slabs, some of which were incorporated by Christian Doll in his reconstruction work, and consequently survives until today.[101] In the area of the toilet, this roofing over was certainly necessary to protect the gypsum partition walls.

It was probably at the same time that the Service Stairs immediately south of the light well of the Hall of the Colonnades were reconstructed in wood.[102] When Arthur Evans

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[95]See Evans, 1902a, p. 79.

[96]See plate 159 bottom right corner and 166 centre.

[97]See section in figure 42.

[98]Plate 178 centre left.

[99]See plate 179 centre right. See also plate 3 which shows a general view of the site taken in 1903.The plate was taken after the construction of the Observation Tower in 1903 but before the roofing of the Magazines of the knobbed Pithoi in 1904 which is dating the ceilings of the corridors to 1903.

[100]See plate 112 top left corner.

[101]See Drawing 7.

[102]See plate 158.

excavated the area of the Service Stairs in 1902, he could not find any steps and concluded that the stair was originally made of wood.[103] Consequently, Theodore Fyfe introduced a wooden stair in this area in the reconstructions of 1903. This would explain the necessity not only to cover the corridor above the toilet but also to cover the Corridor of the Demon Seals. The gypsum corner block at the south-western corner of the Service Stairs which was reset at its original height on top of a timber framework pillar in 1902 could now be held firmly in position.[104] Furthermore, access was given from the stairs to the reconstructed first floor level in this area.

However, as can be seen in plate 159, the area of the Corridor immediately south of the Hall of the Colonnades was paved with the already known system of broken slabs while the other parts were paved with rectangular limestone slabs. It might be possible that until then all paving material had been taken from the palace area and, at this point, no more paving material was left. Consequently, Theodore Fyfe switched to newly quarried limestone slabs. However, no other evidence supports this theory. Plate 167 shows the rectangular paving slabs above the corridors and the toilet on the right side and the broken slabs in the area of the shafts on the left side. While the broken slabs were laid flush in mortar, the rectangular slabs feature distinctive joints and it appears that the joints were not pointed. Subsequently, these open joints led to water penetration which affected the timber structure below.

3.4 The Lobby of the Wooden Posts

The Lobby of the Wooden Posts, north of the Hall of the Double Axes, was excavated in 1901.[105] Its name referred to the many vertical cavities which were left in the walls after the timber reinforcement beams rotted. A gypsum block was found at 3.10 metres above the pavement of the room and Evans suggested that this represented the floor

[103] Evans, 1902a, p. 75.
[104] See plate 167 centre right margin.
[105] Evans, 1901, p. 98.

level in this area. He further supposed that this block was originally supported by a square wooden pillar which had decayed but left the gypsum block in its original position.[106] The block was left in its position supported by a pillar of unexcavated earth underneath and timber props.[107] However, in 1902 the gypsum block was removed and the balustrade underneath was restored. An ashlar pillar was constructed resting on the balustrade. Timber beams were laid from the wall to the pillar on top, of which, the gypsum block was replaced.[108]

An interesting detail of this work is the fact that the pillar was reconstructed in ashlar masonry. Evans suggested that the original pillar was made of timber and Fyfe employed this traditional technique - wooden frames filled with rubble masonry - for reconstructions at other areas of the palace. However, at the Lobby of the Wooden Posts he used ashlar masonry but used horizontal timber beams on top of the pillar. Obviously, Fyfe did not generally consider wood to be the wrong material. The pillar carried the weight of the gypsum block but was, besides the two horizontal beams to the north, not connected to any other structure. Fyfe probably employed ashlar masonry because this material provided the necessary weight which ensured the structural stability of the pillar.

3.5 The Retaining Wall in 1902

Probably one of the most elaborate works undertaken on site by Theodore Fyfe was the construction of the retaining wall of the Central Court. Owing to the geography of the site, the Central Court had to be supported on its east side to prevent its collapse into the area of the newly excavated Domestic Quarter.

Plate 1 shows a general view of the excavation site in 1901 with the retaining wall still missing. In contrast plate 2 shows the new masonry structure supporting the platform of

[106]Evans, 1901, p. 98.
[107]See plate 129.
[108]See plate 131.

the Central Court. The wall stretches from the north-east corner of the Central Court to the south-east corner, and continues at a lower height southward alongside the ramp. Debris and unwanted pottery from the excavation campaigns of 1900 and 1901 were dumped east of the Central Court - visible in the foreground of plate 1 - but unfortunately in 1902 it was discovered that the palace extended under these heaps, and thus this debris had to be removed in 1902.[109] The first observation platform, erected in 1901[110] is carefully scratched out in plate 2 and the observation tower in the Central Court was not yet erected, thus plate 2 must be dated to 1902.

The northern part of the retaining wall up to the stairs immediately north of the Corridor of the Bays is still visible today. The southward continuation of this wall is not visible any more since a new wall was erected east of this retaining wall in connection with the restoration of the Corridor of the Bays, the Grand Staircase and the Domestic Quarter. The gap between these two walls still existed in 1930 but was filled in at a later date.[111] A bridge is visible in this photograph spanning from the retaining wall to the upper level of the Grand Staircase restored by Piet de Jong in 1928.[112] When the Greek Archaeological Service widened the stairs immediately north of the Corridor of Bays in 1996, they exposed this earlier wall which had not been destroyed when the new wall was executed in alignment with the western wall of the Domestic Quarter. The new wall, executed without incline, most certainly relies on the structural properties of the earlier hidden retaining wall.

As far as can be judged from photographic evidence, the retaining wall was constructed with dry stone walling[113] in coursed rubble masonry where larger stone courses alternate with chip infill levelling courses. The entire structure featured an incline which is typical and, for structural reasons, a necessary element of supporting walls. Thus this wall ideally fulfilled its task to support the area of the Central Court. Water can penetrate through

[109]Evans, 1902a, p 1.

[110]See page 208 f.

[111]See aerial photograph, Plate G, page326.

[112]See page 296 ff.

[113]See plate 167.

the masonry and is not caught behind the wall. Thus a sudden collapse of the retaining wall is unlikely.

3.6 The reconstruction of the Theatral Area in 1903

An interesting but, as we will see later on, recurring fact is that Arthur Evans began excavations in an area and exposed the most important features but returned to the same area at a later point to execute supplementary excavations to clarify details. He began excavations in the Theatral Area in 1901 and came back in 1903 to continue and complete his work; and, while doing so, he discovered more details clarifying the former use and shape of this area.[114] He found the northern wall of the area which had sunk because it had originally rested on earth. Consequently, the area was restored:

> "Another large undertaking of that kind was the rebuilding of the upper part of the northern wall of the Theatre and restoring the adjoining tiers of stone seats, without which the whole of these interesting remains would have been rapidly disintegrated."[115]

Here again the retaining wall shows an incline, and judging from the photographic evidence, the masonry was executed as dry stone walling in which mortar was only applied to the upper courses to prevent rainwater intrusion[116]. In the photograph the new work is clearly visible as being much brighter than the original work. However, in contrast to much of the conservation work in the Palace itself, this work was not based on the necessity to protect specific sensitive features. The material the Theatral Area was made of is in limestone and the new work is limestone as well. Clearly there is no material-related reason for the work executed. More likely, we must assume that the missing northern wall allowed the excavated structure to slide down northwards. But this

[114]DM 1903/ii pp. 1-29 (8 April - 23 April 1903)

[115]Evans, 1903, p 3.

[116]Plate 78.

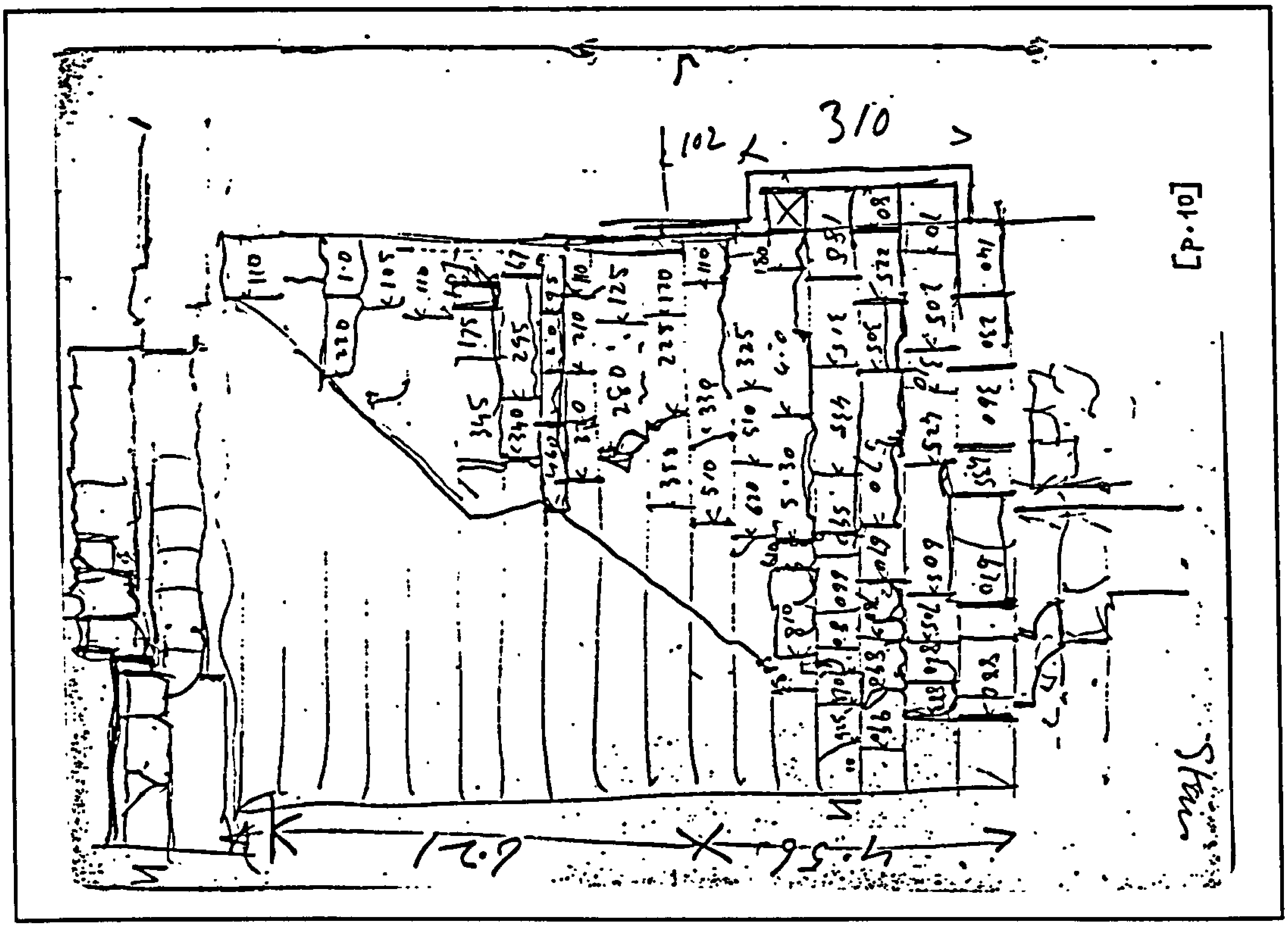

Figure 44 Sketch plan of the Theatral Area. Theodore Fyfe

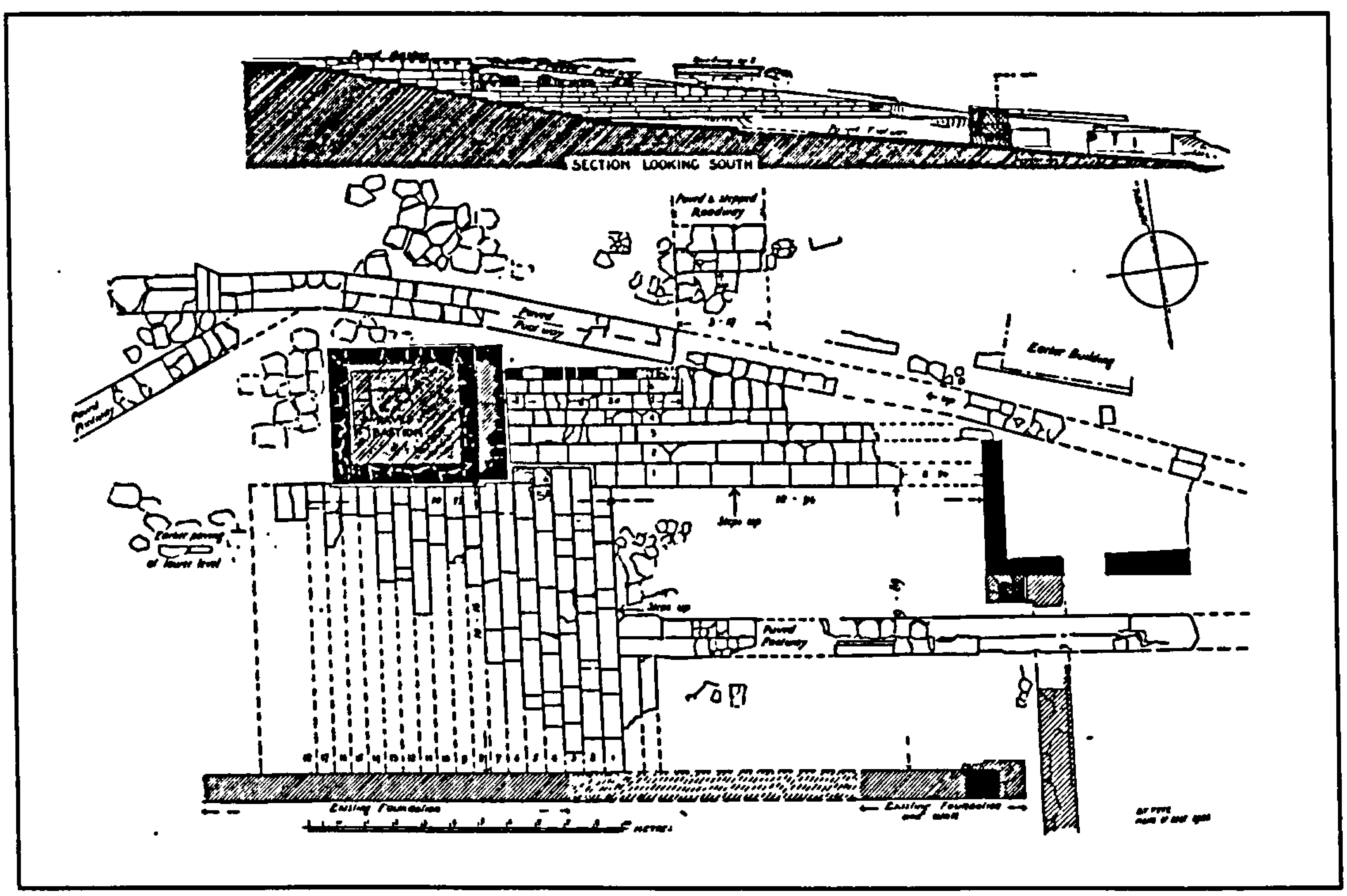

Figure 45 Plan and section of the Theatral Area indicating restoration work. Theodore Fyfe.

certainly would not have been a 'rapid disintegration' and it could have easily been prevented by piling some earth on to the northern side of the area.

Obviously, the decision to carry out such extensive restoration work must have had other reasons. In the same report Arthur Evans describes:

> "In the circumstances I did not hesitate to secure the remains of this unique monument of the Minoan world from further collapse and disintegration by undertaking the considerable task of rebuilding the North supporting wall to what was probably its original height and by restoring the missing slabs of the North East section of the Southern flight of steps. Several of the sunken slabs were also partially raised and the remaining parts were carefully preserved in their original context. The result .... has been to a considerable extent to reproduce what may have been the original effect of this part of the building."[117]

Clearly, it was intended to restore the Theatral Area to its former shape. Consequently, we have to reject Evans's introductory statement of the conservation necessity and accept his intention to present the area in its 'original effect'. Thus we have another early example of restoration work at Knossos which was not predominantly driven by the necessity for protection but was driven much more by the desire to present the site in its original state or at least what Evans believed to be its original state.

The reason for this restoration was probably the annual visit of the German scholar Wilhelm Dörpfeld and his party on the palace on the 'Inselreise'. It has been mentioned in chapter one that Evans respected Dörpfeld and it seems that he wanted to impress him and his party with a performance of traditional Greek dances. Thus, he organised a dance of the Cretan workmen and 'their womanfolk' at the restored Theatral Area.[118]

[117]Evans, 1903, p 104.

[118]Evans, 1903, p. 111 and PM II, p. 585.

3.7 The Construction of the Observation Towers in 1900 and 1903

In a strict sense, the observation towers cannot be called conservation or reconstruction work. They have always been distinctively new building work erected exclusively for the purpose of presentation. Nonetheless, they should be discussed in the context of this thesis since they may shed some light on the philosophy and the ethics on site.

By 1900 Arthur Evans probably had a wooden viewing platform erected above Magazine IX. This place was chosen at the end of the first campaign when Evans still believed the Palace consisted exclusively of the West Range flanked by the West Court and an East Court. For a palace covering such an area, the chosen site was excellent since it was in the middle of the structure and was high enough to take photographs. Two stone slabs were placed on each of the partition walls between the VIIIth and the IXth and on the wall between the IXth and the Xth magazine. A timber platform was erected on these stone slabs which was accessible via a steep narrow stair from the Xth Magazine. In 1901, a wooden pavilion framework construction was placed on the platform[119] and a ladder led from the platform to the flat roof, which offered a good overview of the excavation and was used to take photographs.

The excavations from 1901 to 1903 exposed the Domestic Quarter, and consequently the original viewing platform was rendered unusable. It was not only unsuitably located at the western part of the palace but also was not high enough to view the lower parts of the eastern wing. Consequently, a new observation tower was built in 1903[120] which was positioned close to the eastern end of the Central Court next to the Court of the Distaffs[121]. The new position and the increased height of this tower allowed an overview of the site including observation of the Court of the Distaffs and other parts of the palace which are located deep in the 'great cutting'.

[119]Theodore Fyfe in a letter to Arthur Evans, 19 June 1901. Ashmolean Museum, Evans Archive.
[120]Evans, 1903, p. 3.
[121]See plate 3.

The observation tower consisted of four masonry pillars stretching over three storeys. On the first storey the space between these pillars was filled in with rubble masonry and featured a window at the east side and a door at the north side; whereas the second and third storeys had wooden platforms placed between the pillars. An additional viewing platform was placed on top of the tower. An internal stairway gave access to the different levels up to the rooftop of the fourth storey.[122] Since the first storey was a closed room it prevented unwanted access to the internal stairs. In the background of plate 78 the tower is still under construction while the main object of the photograph shows the completed Theatral Area. At a later date, however, the upper viewing platform was removed and the tower remained three storeys high until 1930.[123]

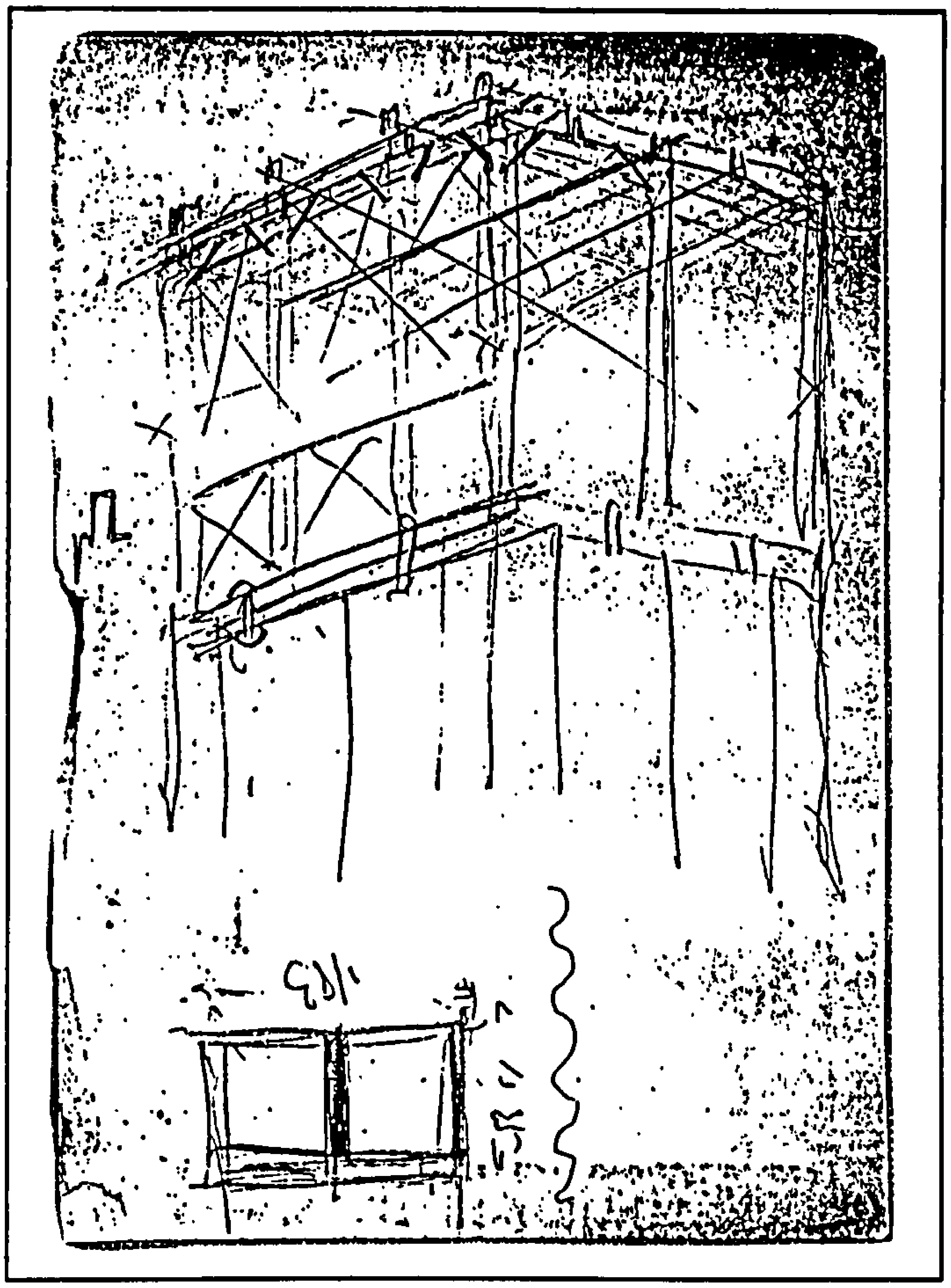

Figure 46 Sketch drawing of the viewing platform on top of the observation tower. Theodore Fyfe.

The construction of this observation tower was purely for presentation reasons, and certainly served neither conservation nor reconstruction purposes. According to Josef Durm, who visited the site in 1906, the tower 'eases' the orientation at site, and this is most certainly what Evans intended by erecting the tower. Consequently, we have to understand this as an early feature of site presentation.

[122]See plate 3.

[123]See plates 3 and 5.

3.8 Pitched roof of the Throne Room in 1904

In 1900 Arthur Evans excavated the Throne Room, the Antechamber, the Inner Sanctuary; and the Room with the Lady's Seat - the easternmost room of the suite north of the Throne Room.[124] There was no direct access between the Room with the Lady's Seat and the Throne Room area.[125] The remaining rooms of the northern suite and the Service Section, located between the Inner Sanctuary and the Long Corridor were excavated in 1901.[126] In the same year Fyfe constructed the flat roof covering the Throne Room and the Inner Sanctuary. In 1904 Theodore Fyfe executed the pitched roof on top of his earlier flat roof and he also constructed the lean-to which protected the suit of service rooms north of the Throne Room. However, this roof did not protect the Service Section which was located between the Inner Sanctuary and the Long Corridor to the west of this complex.[127] Theodore Fyfe constructed this pitched roof in 1904, the year in which he came to Knossos the final time as the excavation architect.

As described earlier, the design of the flat roof of the Throne Room was based on the erroneous interpretation of the Lustral Basin. After a short time it became evident that the open skylight resulted in water collecting in the basin, thus damaging its gypsum lining. Furthermore, it covered only the Throne Room and the Inner sanctuary but left other rooms exposed. Three years later, in 1904, it was decided that the situation must be improved. Evans mentioned in his report for 1904:

> "The roofing of the Throne Room had also to be carried out in a more permanent and efficient way."[128]

[124]Compare figure 27 and see plate 7.

[125]See Evans, 1901, p. 35 f. The Room with the Lady's seat was called the Room with the Cupboard in the first report.

[126]DM 1901/i 26 March to 9 April.

[127]See Ground Plan, Drawing 1.

[128]Evans, 1904, p 3.

The flat roof was left in its position and a pitched roof was simply placed on top of it.[129] A sketch in Fyfe's notebook of 1904 suggests that it was a timber roof construction covered with clay tiles.[130] These are likely to be a local Cretan product or of Greek origin. A glazed skylight above the opening in the flat roof provided light for the Lustral Basin. The eastern gable end, facing the Central Court, was fitted with two windows another window and door, giving access to the loft, were fitted in the western gable.[131] The gable ends and parts of the reconstructed walls erected in 1901 were plastered. The three rooms to the north of the Throne Room - the Room of the Stone Drum, the Room of the Stone Bench and the Room of the Lady's Seat - were covered with a lean-to roof.

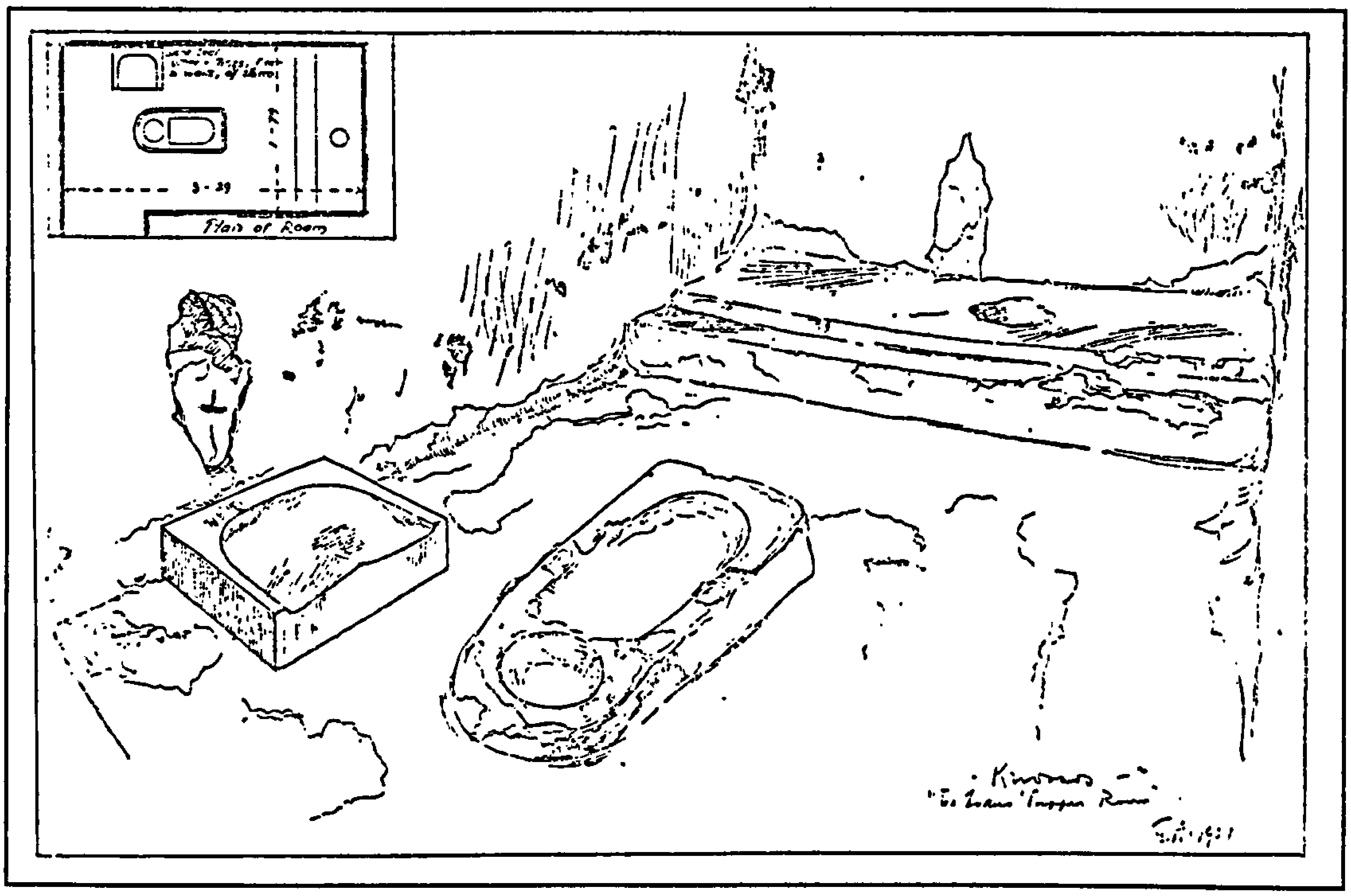

Figure 47 View of the Kitchen showing plaster table and the stone seat. Theodore Fyfe

The Service Section - west of the Throne Room - was not covered despite featuring similar sensitive features. Plate 51 shows the Kitchen - the southernmost room of the Service Section . The stone seat was embedded in a plaster floor and also the table and

[129]See plates 33 and 58. The edge of the flat roof is visible as a cornice.

[130]See Notebook 1903 /i, p. 14. Compare footnote 7 in this chapter.

[131]See plate 58.

the steps at the western site were made of plaster.[132] It is surprising, that these features were not regarded worth protecting in the 1901 reconstruction or in the improvement of 1904. However, plate 58 shows a view from Magazine XI eastwards to the gable of the Throne Room roof. On the right hand the gable is obstructed by a new masonry wall which rested on the excavated wall between the Service Section and the Long Corridor. The new wall features a pitched outline at its upper end which, however, was not identical with the incline of the roof above the Throne Room. In this photograph, the sun casts a shadow on the gable wall which indicates a beams bridging from the new masonry wall to the gable. This seemed to be some sort of protective shelter for the sensitive plaster features in the Kitchen underneath.

3.9 Other Pitched Roofs

In 1902 the Shrine of the Double Axes was excavated in the south-east part of the palace. This small room, located north of a passageway running east to west, is divided into three areas: the southernmost part with a plain stamped clay floor, a raised step with pebble flooring in the middle part and, at the northern end, a bench made of clay and rubble. The entire room was filled with vessels and objects, most probably used for offerings.[133] Two reasons led to the decision to roof over this shrine. First, the building materials employed in the construction of the floors and steps were very sensitive to the exposure to weather. Second, the numerous objects found in that shrine could be left in their original position and exhibited to the visitors.

Taking these reasons into account, Theodore Fyfe had a small hut constructed above the area that covered the actual shrine and a part of the passageway immediately to its south.[134] The walls consisted of new rubble masonry which was placed on top of the ruined walls of the chamber. A window opened to the east and a door probably gave

[132]Compare Evans, 1901, p. 31 f.

[133]Evans, 1902a, p. 96.

[134]See plate 2.

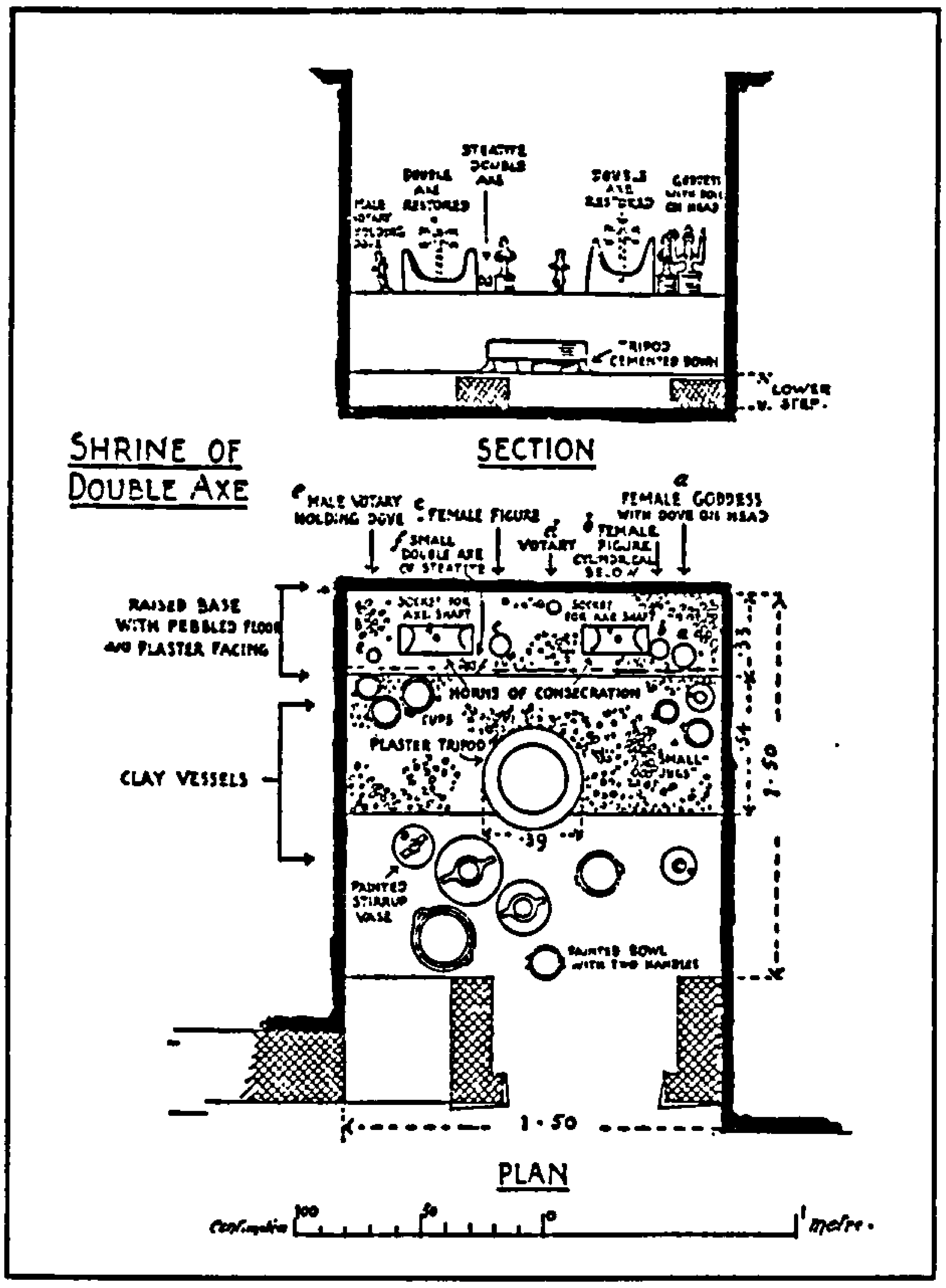

Figure 48 Plan and Section of the Shrine of the Double Axes. Theodore Fyfe.

access to the building from the Corridor of the Sword Tablets in the west. A pitched roof was constructed in timber and covered with clay tiles and a skylight was inserted in the western roof.[135] With the construction of this completely closed house at the Shrine of the Double Axes, the sensitive features, clay floors and steps as well as the artefacts found, were protected from both weather and theft. Protection and presentation of the finds were combined in this structure.

In a supplementary excavation of the north-eastern quarter the Magazine of the Giant Pithoi was exposed in 1902.[136] It consists of two parallel rooms, each of which is approximately three metres wide and five metres long. The pithoi, much larger than those excavated in the Western Magazines, were highly decorated with a pattern of ropes and knobs. Despite being close to the surface before the excavation process, they survived particularly well. In 1904 Theodore Fyfe had a protective roof erected over the Magazine, thereby preserving the restored pithoi underneath.[137] On top of the excavated surrounding walls of the Magazine new thinner rubble walls were erected, except for the southern area, which remained open. Instead of a massive middle wall between the rooms, ashlar pillars were built at the northern and southern ends. The southern pillar features a niche at its bottom part which was constructed to allow a mason's mark to be

[135]See plate 120, background.

[136]Evans, 1902a, p. 9 ff.

[137]Evans, 1904, p. 11.

left visible.[138] The entire structure was covered with a pitched roof constructed in timber and covered with tiles which followed the slope of the site. A window in the eastern wall and two skylights illuminated the structure.[139] At a later point, however, the skylights were removed and a plain tiled roof installed.[140]

Both protection shelters show the same distinct features of Theodore Fyfe's attitude towards reconstruction. Rubble masonry walls in combination with ashlar quoins have been employed to elevate the excavated walls to the height required. The pitched roof was constructed in timber and covered with clay tiles.

3.10 Theodore Fyfe after 1904

1904 was the last year Theodore Fyfe worked for an entire campaign for Arthur Evans at Knossos, but he definitely returned to the site in 1908, 1926 and perhaps at other occasions.[141] In late 1904 or early 1905[142] Theodore Fyfe started his own private practice in London.[143] He also assisted Sir John Burnet,[144] to whom he has already been articled from 1890 to 1896. From 1905 until 1912 he was part of a team editing the annual Architectural Association Sketchbooks. In 1907 he became Fellow of the R.I.B.A. and in the following year he designed the Shaftesbury Institute Lodging Home for working women in Lisson Grove, London. He married Mary Nina Brown in 1911 despite heavy opposition of his family.[145] In the same year became Junior Partner at the architectural

[138]See plate 87.

[139]See plate 4.

[140]See plate 5.

[141]*The Times*, 27 August 1908, and Fyfe, 1926a, p. 479 f.

[142]According to Who's Who in Architecture, 1923, Theodore Fyfe was assistant to Sir John Burnet from 1904 to 1913 whereas, according to Who's Who, 1930, Fyfe held the assistantship between 1905 and 1915.

[143]Obituary: *R.I.B.A. Journal*, February 1945, p. 116.

[144]Sir John James Burnet (1857 - 1938), son of an Glasgow architect, was educated in his father's office and Paris. He built in Scotland (mostly Edinburgh and Glasgow) and in London. He restored Duart Castle, Scotland, in 1911. His major contributions are the General Accident Building and the Kodak House in London. See: Gray, 1985, p. 128 ff.

[145]June Yorke, in a private letter to the author.

office of Sir John Burnet. He stopped both his private practice and the work for Burnet in 1915 due to ill health.[146] Subsequently, he moved to 34 King Street, Chester in late 1915 or early 1916 and began working as Housing Architect for the Ministry of Health at Queensferry, west of Chester[147]. One year later Theodore Fyfe moved to Lysfasi Manor, Pentre-Celyn, North Wales, a few miles south of Ruthin. In the following years he designed some cottages and farm buildings in Lysfasi and in 1921 became Cathedral Architect to the Dean and Chapter of Chester. Theodore Fyfe executed repair work at the cathedral[148] and he also designed a memorial for the Chester Yeomanry. In the same year he started lecturing on Greek and Roman Architecture for the Architectural Association School and at the University of Oxford.[149]

In 1922 he became Master, and afterwards, Director of the newly established University School of Architecture at Cambridge.[150] In 1926 and again in 1927 he was director at the excavations of Glastonbury Abbey. From 1932 - 1934 Fyfe held the Henry L. Florence Bursary of the Royal Institute of British Architects, which enabled him to travel the Eastern Mediterranean in the first half 1934. As a result of these travels he published a book on Hellenistic Architecture in 1936.[151]

In 1942 Theodore Fyfe published a small book on *Architecture in Cambridge*. According to his wife, he was asked by the Vice Chancellor of the University of Cambridge as early as 1924 or 1925 to produce the book and illustrate it with his own drawings.[152] Nonetheless, it took him until 1942 to publish the book. In the introduction, he summarizes his attitude to architectural history:

> There is no more common form of question put to the historian of architecture than 'How are we to

[146]Private letter of Nina Mary Fyfe to Mr. Spraggs of the R.I.B.A. dated 11 January 1945.
[147]Private letter of Nina Mary Fyfe to Mr. Spraggs of the R.I.B.A. dated 11 January 1945.
[148]See file Chester Cathedral. Archive of S.P.A.B.
[149]Who's Who, 1930, p. 1121.
[150]*The Builder*, 19 January 1945, p. 59.
[151]Fyfe, 1936, p. vii. The book's title was *Hellenistic Architecture. An Introductory Study*
[152]Private letter of Nina Mary Fyfe to Mr. Spraggs of the R.I.B.A. dated 11 January 1945.

> know that a building belongs to a particular style or period?' We must begin with *construction*, as in any consideration of architectural style we cannot ignore the limitations of particular materials; and what we call a 'style' was something which was made in a gradual process, controlled, more or less strictly, by local methods of handling materials.[153]

He remained Head of the Department of Architecture until 1936 but, even after his retirement, he kept close links with the University. During World War II he was convenor of the 'Panel of Architects for Air Raid Damage to Buildings of Historic Importance'.[154] Theodore Fyfe died 1 January 1945 as a result of a skating accident[155]. At this time he was working on another book called *Little Country Church*.[156]

3.11 Conclusion

Throughout his life Theodore Fyfe was closely involved with historic buildings and he maintained the strong position, that architecture is closely linked to materials, techniques and craftsmanship.[157] Unsurprisingly, in all the work executed by Theodore Fyfe at Knossos there is one significant factor: the use of traditional materials. As far as it was technically possible, he employed the original materials, and in many areas even the original structural system. Timber was employed as the structural element in many cases except for the columns in the Throne Room and the pillars at the Lobby of the Wooden Posts and at entrance to the Throne Room, to which Evans refers in an almost apologetical manner.[158] Obviously, Fyfe tried to reproduce not only the appearance but also to reconstruct the historic structural system. In his theoretical approach Fyfe believed that the missing elements should be replaced with original materials and with techniques as close to the original ones as possible.

[153] Fyfe, 1942, p. 3. The word *construction* is highlighted by Theodore Fyfe himself.
[154] *The Times*, 5 January 1945.
[155] *The Builder*, 19 January 1945.
[156] Private letter of Nina Mary Fyfe to Mr. Spraggs of the R.I.B.A. dated 11 January 1945.
[157] See Fyfe, 1942, p. 3.
[158] Evans, 1901, p. 2.

Furthermore, most of the work executed by Theodore Fyfe is of comparatively small scale. The Grand Staircase was not excavated completely but propped up, and the roofs are just small protective timber constructions covering a specific feature rather than an entire room or hall.[159] He executed his conservation and restoration work according to the principles of minimal intervention.

In the northern portico of the Hall of the Colonnades he responded to the sunken level of the Staircase and, thus, created a rainwater trap. Another important source is the letter he wrote to Arthur Evans in 1901:

> "The roofs of Throne Room v [= et] Museum adjoining are nearly finished. We had better put a coat of paint, by the way, on all of the external woodwork for the winter. The account for wood will be pretty heavy. Glavisos [?] says wood is dear, and we really need a good deal."

Clearly, the omission to paint the woodwork had facilitated the decay of timber constructions, especially when employing fir from Tyrol.[160] Adequate timber for the reconstructions could not be obtained in Crete and had to be imported from other countries. As can be seen in the quotation above, this was expensive and economic reasons may have rather contradicted the choice of timber. Nonetheless, timber was chosen as the correct reconstruction material.

The timber support in the Hall of the Colonnades failed once; nonetheless, it was replaced with timber. The pillars in the Hall of the Double Axes featured two stages of timber reconstruction and the Throne Room was roofed over twice within four years. Theodore Fyfe must have been aware of the technical difficulties related to his wooden reconstructions. The question remains, to what extent was he aware of these difficulties, and why did he chose solutions which were likely to fail?

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[159]For example fresco in the Bathroom, the plaster couch, the Toilet, etc.
[160]PM III, p. 288.

Roofing over the Throne Room and the two rooms immediately west of it was the first major conservation work executed on site. From the very beginning, it was realised that the sensitive features in the Throne Room area needed protection. To address this a protective roof was designed. Thus, these rooms were exposed to the weather for the maximum period of one winter. However, while Evans reports in a very general way on the reconstruction work, he highlights one issue very carefully:

> "The wooden columns were found in their sockets in a carbonised condition, but together with the upper part of the walls and the roof, they have now, in accordance with my directions, been restored by Mr. Fyfe after a wall-painting of a small shrine found in the palace, so that this little gem of Knossian architecture has been rescued from destruction."[161]

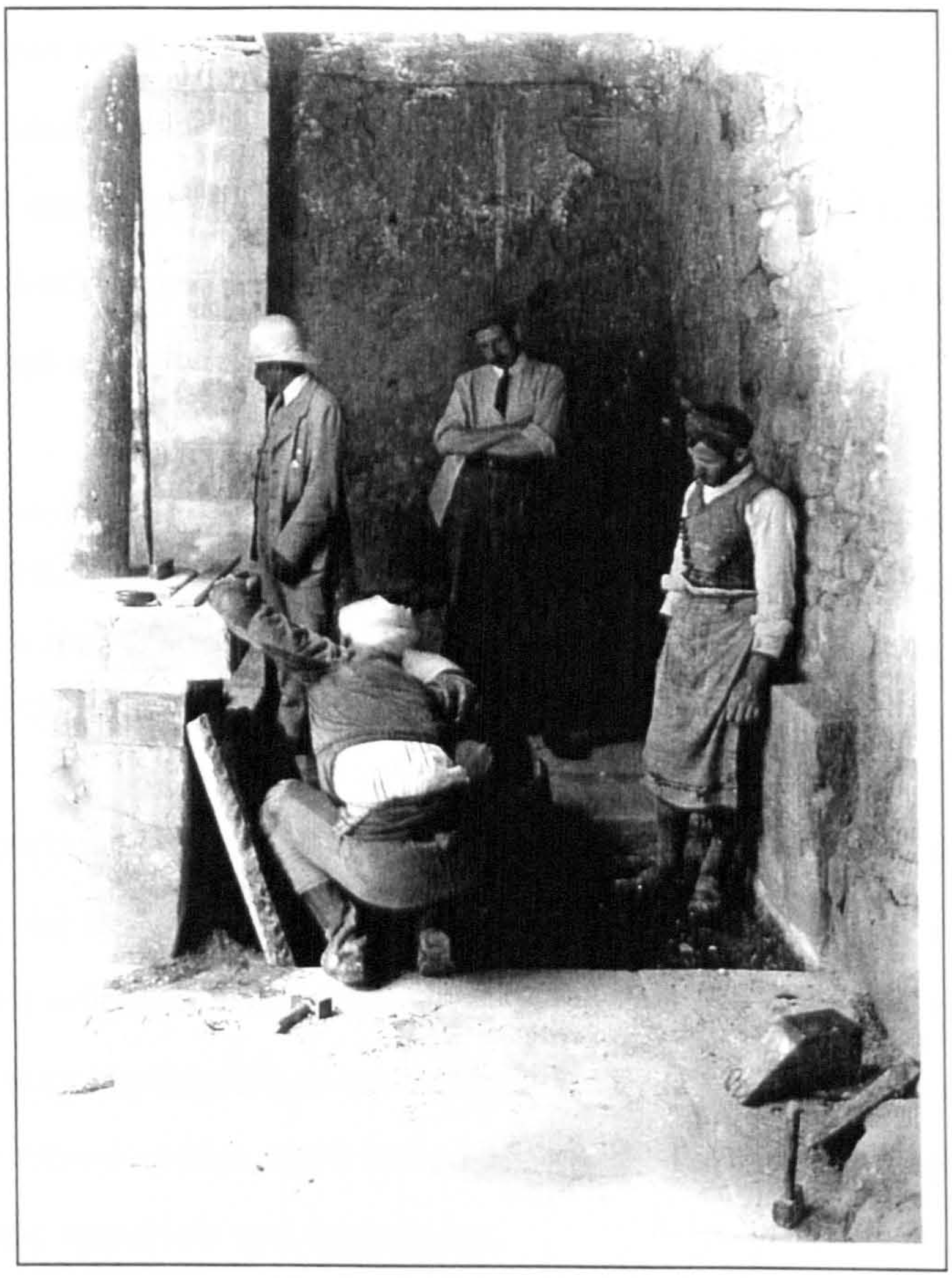
Considerable parts of Arthur Evans's report on the reconstruction work are dedicated to highlighting the truthfulness of the work, for example the issues of ceiling height,[162] the shape of the columns[163] and the colour scheme. This indicates that archaeological research was a very important element to facilitate the reconstruction design; but, on the other hand, the reconstruction work had to be modelled after the archaeological evidence using the historic materials and techniques.

Thus, we are at the starting point of a classical dilemma. The reconstruction work was necessary to prevent the excavated structures from collapse. The work was executed with the original materials and techniques but the principle of minimal intervention was also applied. Only fragmentary parts of the palace were reconstructed, but these were still exposed to the weather and consequently collapsed later. Theodore Fyfe employed methods which were as close to the original as possible but these building techniques were designed to be employed in covered buildings. They failed in the ruins of an excavation site.

[161]Evans, 1902b, pp 99 - 100.
[162]See page 414 f.
[163]See page 413 f.

Chapter 4

The Works by Christian Doll 1905 to 1910



There is ever less and less to preserve. And everything possible must be garnered before it has entirely vanished. The present has its most serious duty to history in saving the past for the benefit of the future.
(Flinders Petrie, 1904, p130.)

Chapter 4

The Works by Christian Doll 1905 to 1910

4.0 Introduction

Christian Doll was the second architect employed by Arthur Evans at Knossos. He succeeded Theodore Fyfe, who left Knossos after the 1904 campaign to work for John Burnet and to start his own practice. Like Theodore Fyfe, Christian Doll was only 25 years old when he started working at Knossos and, like Fyfe, he came into contact with Evans while he was admitted as architectural student at the British School at Athens. But by comparison with Fyfe, Christian Doll had been exposed to architecture from early childhood through his father, Charles Fitzroy Doll. Christian Doll was employed by Evans in March 1905, based on his need to find an architect quickly. Born out of this need, a five year working relationship developed; and even after 1910 Christian Doll executed occasional work for Arthur Evans.

Doll was not only responsible for the reconstruction of the Grand Staircase, one of the most impressive features on site, he also executed many minor reconstructions. However, it will become clear in this chapter how Doll's attitude towards conservation and reconstruction, which differed completely from that of his predecessor, helped to shape the excavation site at Knossos.

4.1 Before Knossos

Christian Charles Tyler Doll was born in 1880 the eldest son of Charles Fitzroy Doll, an architect and surveyor to the London estates of the Duke of Bedford. These estates stretch between Bloomsbury Square and Russell Square, and Charles Fitzroy Doll not only executed many important buildings in this area but also had his office at 5 Southampton Street, on this estate.[1] Not much is known about Doll's childhood but he received his architectural training at the University of Cambridge, where he received an MA (1st Class) and was then articled to his father's office in London.[2] During this time, Charles Fitzroy Doll constructed Hotel Russell (1898) and the Imperial Hotel, now demolished, at Russell Place for the Duke of Bedford.[3] Both buildings borrowed many elements from historical sources and reproduce them in faience, terracotta and tile, while the structural frame system of the buildings was executed in brick and metal girders.[4] Christian, who was an apprentice architect in his father's office at this time, participated in the construction of these two major buildings. Thus, he got an early insight in the up to date metropolitan construction techniques of the turn of the century, which - as will be shown - influenced his approach to the reconstruction work he executed at Knossos between 1905 and 1910. In summer 1904, Christian Doll left his father's office to become a student at the British School at Athens.

4.2 The reconstruction work in 1905

When Arthur Evans and Duncan Mackenzie returned to Knossos in March 1905 they discovered the damage on site caused by the heavy winter rains. Parts of the Grand

[1] Pevsner, 1952, p. 216 f.

[2] R.I.B.A. Biographical File on C.C.T. Doll.

[3] Obituary in *The Builder*, 6 May 1955, p. 761.

[4] On the two hotels, Hotel Russell and the Imperial Hotel, see: Pevsner, 1952, p. 217 and Gray, 1985, p. 175 f.

Staircase were on the verge of collapse.[5] Theodore Fyfe, who had undertaken the architectural work up to this point was no longer able to spend time in Knossos. Consequently, Arthur Evans had to look for a new architect. Christian Doll was at Athens in this time and had considerable experience in architecture. Thus, Evans employed him to come to Knossos to tackle the task of reconstructing the collapsing staircase.

4.2.1 The Theoretical Reconstruction of the Grand Staircase

The Grand Staircase was excavated in 1901 by means of tunnelling under the third flight. This tunnel, lined with wooden frames similar to the ones employed in mining operations, was used to keep the third flight in position[6]. A similar construction was employed to support the western part of the East-West Corridor, but it had collapsed by 11 June 1901 and was subsequently replaced with a more permanent solution.[7] However, both these timber support frames gave way in the winter of 1904 / 1905 due to heavy rain. Arthur Evans wrote in The Times:

> "An exceptionally rainy season led to the falling of the second landing of the Grand Staircase. The wooden props inserted at that time of excavation to support the upper structures of this - which, in default of the original wooden pillars, simply rested on indurated debris - had given way at this point and the whole upper flights and balustrades, together with the adjoining upper corridor, were threatened with ruin. To avert this demanded nothing less than heroic measures."[8]

Heavy rain was certainly the factor that triggered the collapse of the timber structures; but, nonetheless, two other reasons facilitated this event. As already explored earlier, Fyfe omitted to treat the timber prior to its installation, and he also employed softwood rather than hardwood. Duncan Mackenzie described in more detail how the timber,

[5]See DM 1905, 1 March to 11 March. Ashmolean Museum Oxford.
[6]See page 182 ff.
[7]See page 185.
[8]*The Times*, 31 October 1905, p 4.

inserted in 1901 and 1902, decayed due to its exposure to the weather. For the Grand Staircase, he wrote:

> "This [decay] was still more apparent in the region of the East-West corridor and of the Royal Stair. Here the might of the damp superincumbent earth pressing on the decaying wooden roof of our tunnel caused this to collapse carrying with it the greater part of the upper landing and of the flight of steps of the stair up S. The reconstitution of this landing and of this landing and of theses steps will form one serious problem in the work of this campaign."[9]

The third reason for the collapse can be found in Evans's, Mackenzie's and Fyfe's mistaken interpretation of the eastern wall of the first flight in 1901. What was supposed to be a massive wall in 1901 turned out to be nothing more the fallen debris.[10] The timber support work inserted in the first instance was clearly not designed to reflect this. As can be seen in plate 51, the timber framework was equipped with diagonal braces to withstand horizontal forces in the north-south direction alongside the steps. However,

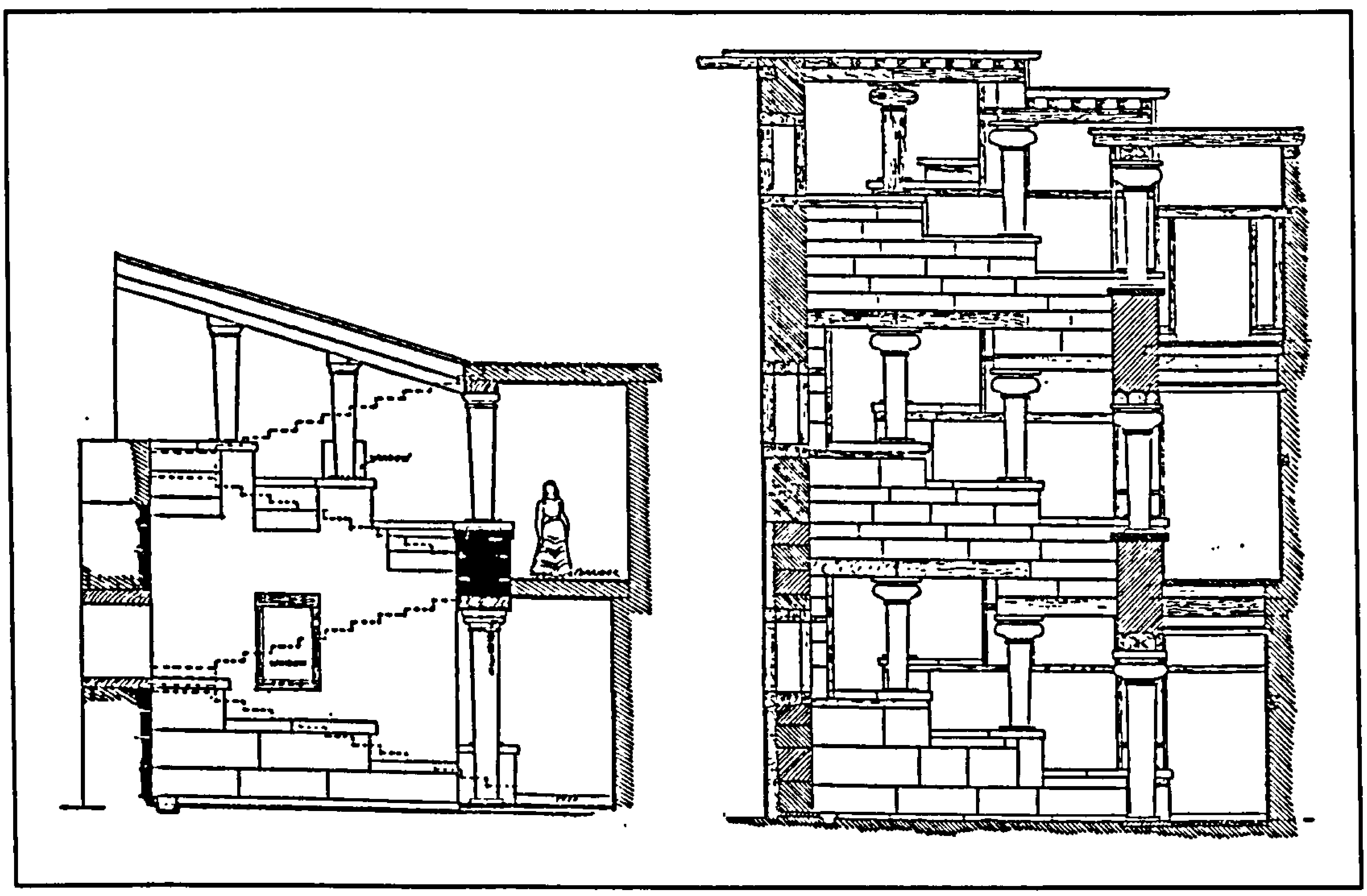


Figure 49 Grand Staircase elevation looking west by Fyfe, 1901 (left) and Doll, 1905 (right).

[9]DM, 1905, 1 March to 11 March.
[10]DM, 1905, Saturday, 8 April.

no braces were inserted to withstand horizontal forces across the steps in the east-west direction. This is adequate in a mining tunnel with almost exclusively vertical forces and compression, but at the Grand Staircase the eastern wall consisted of debris and not of massive masonry. It was neither possible for the broken steps of the third flight or the floor slabs of the landing to respond to any tensile strength nor could the outer wall or the inserted timber frame respond to horizontal forces. Furthermore, the timber of the support frames decayed because it was affected by damp. Rainwater penetrated through the joints of paving slabs and steps and saturated the unexcavated earth between the timber boards on top of the frames and the first floor paving. This in return affected the timber boards and the load on this structure increased due to the saturation of the superimposed earth with rain water. No part of the entire structure responded to the horizontal forces, damp affected the timbers and the load increased. Consequently, the collapse of the structure, sooner or later, was inevitable.

Most of Christian Doll's dated drawings relating to the Grand Staircase are marked April or May 1905.[11] The detailed information on the historic fabric indicates that Doll spent his time at Knossos executing the plans on site. While he developed the reconstruction proposal and ordered the materials in Britain, Duncan Mackenzie supervised the deconstruction of the third flight and the upper balustrades of the staircase and all parts of the upper East-West Corridor and the Hall of the Colonnades. Duncan Mackenzie, who normally did not note any reconstruction work in his diaries, wrote 6 April 1905:

> "Simultaneously with our work in the area of the Royal Road the most serious undertaking of the season was the reconstruction of the Royal Stair in the E. wing of the Palace which was rendered by the partial collapse of the second floor landing as a result of the actions of the heavy winter rain to which reference has been made in the beginning of this daybook. It was once apparent that unless tremendous measures were taken at once the whole upper fabric of the stair might collapse. Our plan of operations was as follows: while awaiting the arrival of an architect who could undertake the work of reconstruction the first thing to be done was the removal of the fallen debris that now encumbered the lower landing at the foot of the lowest flight of steps. Here (secondly) the individual gypsum slabs of the second flight of the stair up S. [third flight] had to be carefully removed one by one beginning

[11]See Doll's drawings in the Ashmolean Museum, Evans Archive.

> at the top. Thirdly the unexcavated debris underlying the steps and originally - before the penetration of our tunnel of 1901 - entirely filling up the interval between this and the third flight of steps up S. which on the Ground floor expanded up to the upper flight."[12]

Steps and ashlar blocks were carefully taken down one by one, numbered and placed together in the Central Court for re-use in the reconstruction.[13] Three drawings of the so called 'Doll's Folder' in the Ashmolean Museum show details which could have only come to light in the process of dismantling.[14] This indicates the close cooperation between the archaeologist Duncan Mackenzie and the architect Doll. Taking down the third flight of steps led to an important discovery. Until then it had been presumed that a massive wall supported the third flight on its eastern side, and that the lower flight of steps was lit by a small window.[15] Now it was discovered that, similar to the upper storey, a stepped balustrade and colonnades supported the upper flight.[16] This was essential new knowledge which considerably altered the existing reconstruction drawing by Theodore Fyfe.

Christian Doll produced a series of reconstruction drawings in ink, some of which were printed in Arthur Evans's extensive publication on the excavations, 'The Palace of Minos'. Since they are not dated, and only few are labelled, it is impossible to determine the date of their production. However, these ink drawings show the reconstruction of the original Minoan Grand Staircase and the adjoining features as they might have looked more than 3,000 years ago. Drawing G/S 1 shows two sections of the Grand Staircase in 1:50 scale, while drawing G/S 4 shows, based on the former plan, a isometric reconstruction of the timber framework of the same area.[17] Both plans try to reconstruct the former Minoan structural timber frame work of the Grand Staircase based on the archaeological evidence of slots and charcoaled timber remains. However, both plans

[12]DM 1905, Thursday, 6 April.
[13]Evans, 1905, p. 25.
[14]Doll's Folder Nr. 5, Nr. 6, Nr. 7.
[15]Compare figure 49.
[16]The Cretan Exploration Fund, 1905, p. 3.
[17]For drawing G/S 1 see figure 50 for drawing G/S 4 see plate 101.

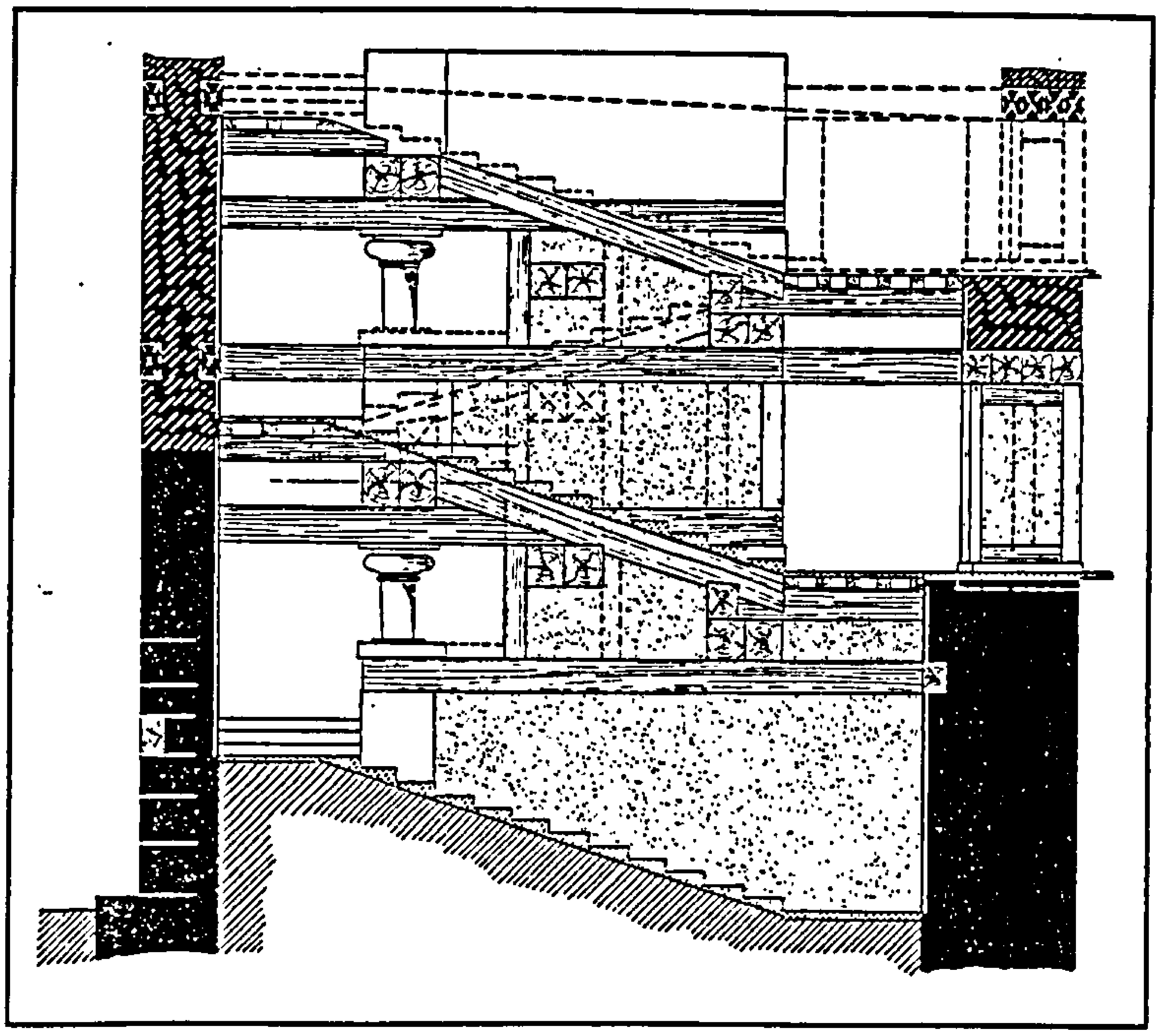


Figure 50 Drawing G/S 1, Section of Grand Staircase. Unpublished drawing by Christian Doll. 1905.

were never completed or printed, and neither of them was labelled with any information. Drawing G/S 1 features scales at the bottom and a key in the top right corner but no information to go with it. Christian Doll also produced a third drawing, G/S 2, in the same scale based on the previous two plans which is the only drawing completed and published, shows the eastern elevation of the Grand Staircase.[18]

These three reconstruction drawings are similar in that they feature problematic details. For example, the stocky columns at the middle wall between the two flights of the staircase seem, somehow, not to be right. But even more important is a problem of structural engineering. According to drawing G/S 1, the load of the stone steps was carried by the inclined beams which in turn rested on cross beams. Surprisingly, at their upper ends the inclined beams did not rest on top of the cross beams but rather stopped before them. The only possible way of fixing them to the cross beams would have been a mortice and tenon joint. This is technically possible, but it would be a very weak point in the construction of the stairs since the stone steps and the hugely oversized beams impose a considerable load on this joint. This is a very unlikely detail. Doll also executed a plan, G/S 7, where he superimposed in red ink the structural system featured in the section on a copy of the elevation plan of the Grand Staircase.[19] In this plan it becomes even more obvious that the structural system, as it was recreated from the interpretation

[18]See figure 51.

[19]See plate 100.

of archaeological evidence, could not have worked. In this plan, the pitched beams carrying the load of the stone steps are almost completely interrupted by the cross beams instead of resting on them. Thus, transferring the load to the ground was rendered almost impossible. A third problem is depicted in the east elevation where the storey height for the upper floor is given as approximately one metre less than the height for the ground

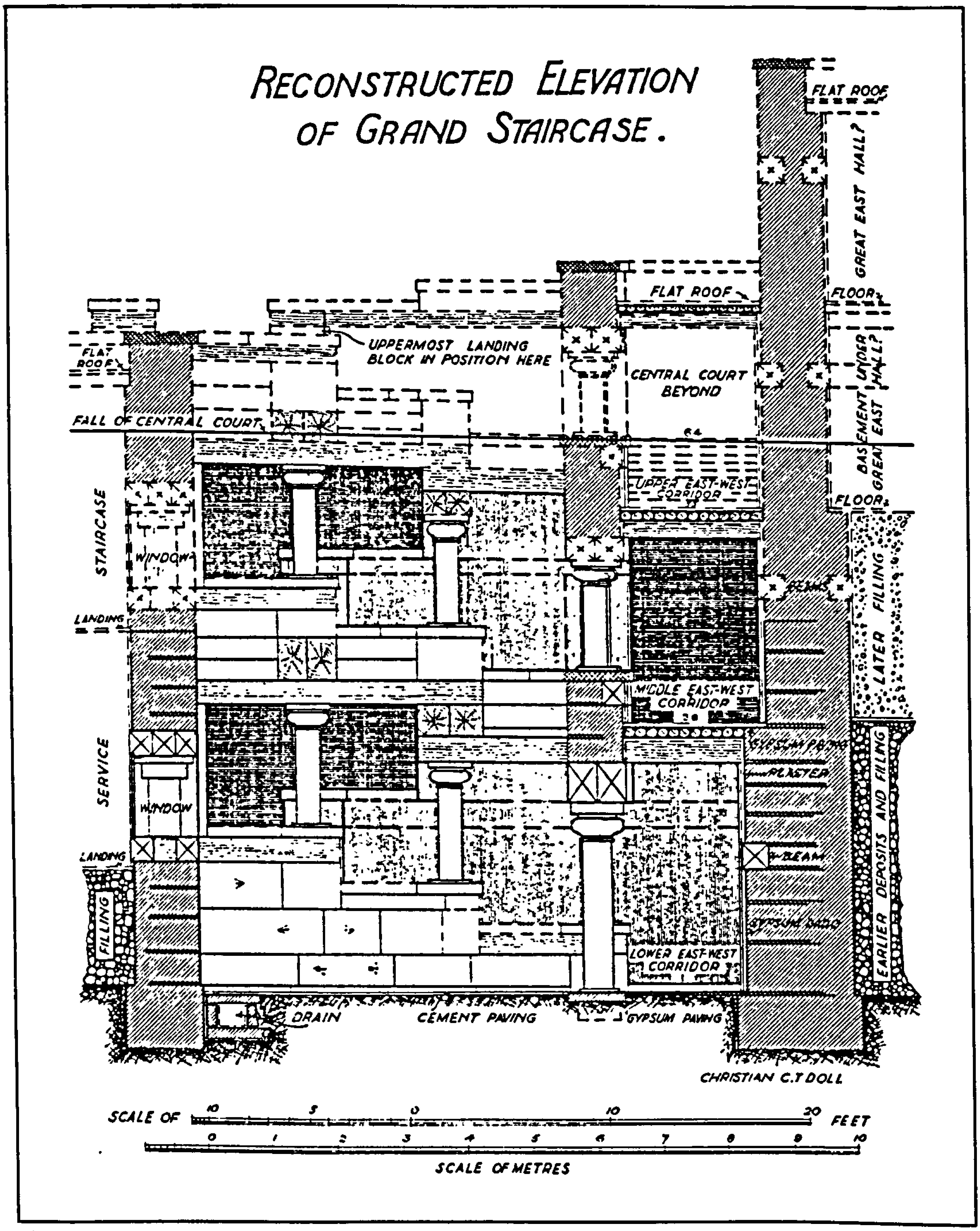


Figure 51 Reconstructed elevation of Grand Staircase (G/S 2). Drawing by Christian Doll.

floor. Thus a flight of steps became necessary, which ran from the second floor landing to the level of the Central Court which is one metre higher.[20] Thus, Doll was caught in the dilemma where archaeological evidence contradicted aesthetics, spatial understanding and, even worse, the technical necessities of structural engineering.

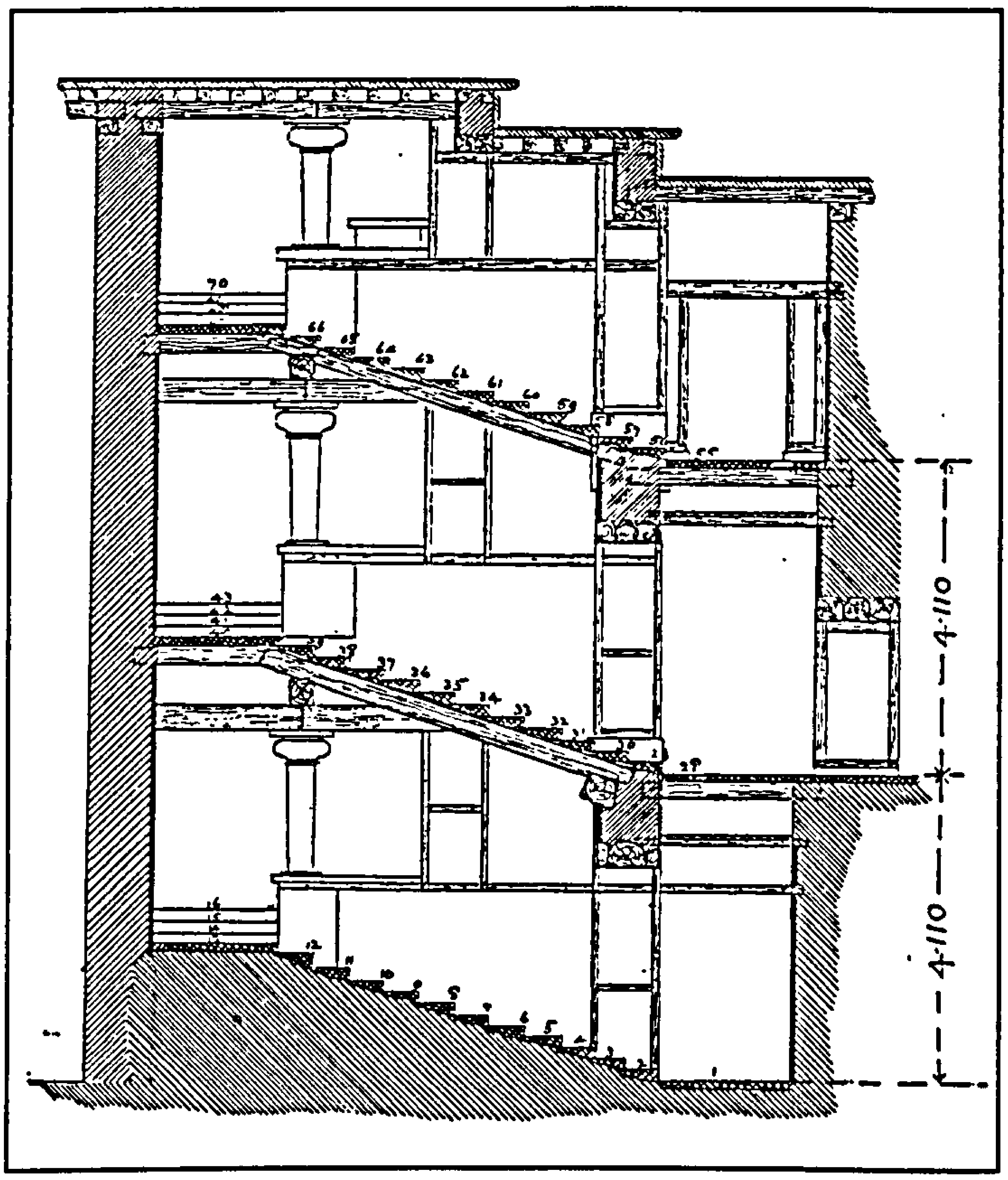


Figure 52 Plan GS/HC 3, section of the Grand Staircase. Unpublished plan by Christian Doll. Probably 1905.

These problems led to a new reconstruction version based more on the understanding of structural logic than on the actual findings. Christian Doll created a new drawing, GS/HC 3, which eliminated the failures depicted in the previous plans. Again, these plans were not published; but, apparently, they served as a model for the physical work on site. In this drawing the proportions of the column at the first landing seem to be more appropriate now and the height of the upper storey is extended, so that a level access to the Central Court was now possible. Doll was quoted in a discussion that followed Arthur Evans's paper to the Society of Antiquaries, 9 December 1926, as saying that 'the staircase could be reconstructed on mathematical lines, the dimensions being multiples of one another and the tread three times the riser.'[21] Obviously a more theoretical approach was chosen. In GS/HC 3, the structural system of the suggested timber frame is more logical in respect to the inclined beams, but now, however, the support beams

[20]See figure 51.

[21]Evans, 1927, p. 267.

for the intermediate landing seem to lack proper support. The east elevation in this plan features a masonry balustrade which is not interrupted by the head ends of the cross beams as in the first elevation, G/S 2, which reflects the new reconstruction of the load-bearing timber framework.

Plate 90 shows that obviously not enough fabric survived to indicate a balustrade, originally made completely of ashlar masonry as depicted in the later reconstruction drawing, GS/HC 3.[22] It is unlikely that these ashlar blocks were removed by masons of a later historic period for re-use, since intact masonry survived above this level. Also, it is unlikely that these blocks collapsed into the light well, when upper parts and more sensitive features, for example the steps, stayed in position. Thus, it is reasonable to anticipate that the first elevation, G/S 2, was modelled as closely as possible to the archaeological evidence and the head ends of the beams might have been visible in the elevation. However, this elevation was based on a reconstruction, which featured aesthetical (stocky column), structural (joint of beams) and spatial (access to Central Court) problems. Thus, the first drawings were rejected either by Evans, or by Doll, or jointly by both of them even before the plan was completed. Subsequently, a new drawing was executed avoiding these mistakes. This new reconstruction drawing, however, was not as close to the archaeological evidence as the previous one.

Based on this new reconstruction drawing, plan GS/HC 3, Christian Doll drew the proposal plans for the reconstruction of the Grand Staircase in April and May 1905. This included plans and sections of the Grand Staircase, the Hall of the Colonnades and the western section of the East West Corridor which stretches between these two features.[23] These quite large plans were executed in pencil on cardboard, inked over and coloured with water colours. They show in minute details the work suggested by Doll and include the materials to be used. The detailed information on the historic fabric on site given in these plans indicates that Doll spent a considerable amount of time at Knossos sketching or even executing his plans on site.

[22]See figure 52.

[23]See plates 103 to 110.

However, basing the physical reconstruction of the Grand Staircase on the later version of the drawings caused another problem. The column at the middle wall between the two flights of stairs is much higher in the later plans than in the earlier one and, thus, the lintel above this column rested at a higher level. The width of the opening to the north of this column was given by archaeological evidence and, thus, the dimensions of the opening were defined. An irregularity in the vaulted ceiling construction above the first flight responded to this later reconstruction.[24] As can be seen in Christian Doll's proposal, it was necessary to place one of the iron girders higher than usual to allow for the opening between the two flights of the stairs. Anticipating that the historic steps rested on massive timber beams as shown in the drawings, these beams would have intersected with the window if this reconstructed version is correct. Certainly, this is technically possible but it seems to be rather unlikely, since Minoan architecture was strongly concerned with the visual qualities of the buildings.[25] Obviously both the earlier and the later reconstructions feature details which were wrong. This gives a clear indication that the exact original construction of the Grand Staircase could not be understood from the archaeological evidence.

4.2.2 The Physical Reconstruction of the Grand Staircase

Christian Doll had new columns placed at the position of the original timber columns in both the sockets of the balustrade and on the column bases of the colonnades. These columns, including capital and *abacus*, were made of limestone masonry, plastered over and subsequently painted.[26] The architraves were made of iron girders, which were laid on top of the *abaci*.[27] These architraves supported masonry balustrades which consisted partially of reinstated original material, saved when it was taken down by Duncan Mackenzie earlier on, but also a considerable amount of new material was employed. The

[24]See plate 104.

[25]Compare page 142.

[26]Evans, 1905, p. 25.

[27]See plate 107.

new masonry, executed in rectangular plain limestone ashlar blocks, stands out clearly in plate 111 and, thus, is clearly distinguishable from the reused original material. The ceiling of the corridor and the substructure for the staircase was formed by iron I-beam girders, which were laid across from wall to wall, and flat brick vaults which were inserted between them.[28] The spandrels on top of the brick vaults were filled with concrete and the steps and the broken paving slabs were re-laid in mortar. In the plans, the iron girders were labelled 'R.S.J.s', which is the abbreviation for rolled steel joists, a common building material for floors in Britain at the turn of the century. Embedded in concrete, they provide a fireproof floor, but they were known to be a rather expensive solution.[29]

The rolled steel joists of the architrave were cased with timber boards to represent the massive beams of the original Minoan construction. The vertical board at the outer sides and the outer soffit boards were joined firmly, while the joints between the three soffit boards themselves were intensified[30]. Thus, it was accomplished that the clad iron girders looked like three timber beams next to each other, just as Evans stated in 1926:

> "In this way it was possible for Mr. Doll to reproduce both the effect and the reality of the original timber framework of this part of the building as it existed in the last Middle Minoan period."[31]

A constructive problem resulted from this detail. In Minoan architecture the timber beams rested flush on top of the *abaci*.[32] In the reconstructed version, the load-bearing element, the steel joists, had to rest on the *abaci*. Consequently, the timber boards underneath the girders were located at a lower level and were interrupted by the *abacus* of each column.[33] Another problem was how to fix the timber boards to the iron girders. A lath under-construction, to which the boards could be nailed, had to be inserted. In

[28]See plate 110.
[29]Adams, 1894, p. 60. and Anon., 1879, p. 271.
[30]See plate 114.
[31]Evans, 1927, p. 262.
[32]Compare figure 51.
[33]See Section B-B, Drawing 8 and plates 111 and 114.

contrast to the massive original beams, these timber boards were quite thin and, if exposed to the weather, they warped. The poor under-construction could not respond to these forces and, subsequently, the timber cladding failed.[34]

The drawings included proposals to reconstruct the Hall of the Colonnades in the same way with plastered masonry columns, iron girders and brick vaults; however, the plan for roofing the eastern portico of the Hall of the Colonnades was not executed at this time. The columns and the architrave were constructed in the same way as already described, but only a few courses of masonry were placed on top of the architrave. In both the first and the second inked reconstruction drawing, a massive wall, facing the light well, was suggested for the upper storeys of the Hall of the Colonnades. This massive wall featured windows in the upper storeys overlooking the courtyard, but it had no colonnades. This was probably the reason why the reconstruction of this wall terminated with an irregular top course, an indication of the incomplete state of this wall. Also, some courses of masonry and door jambs were placed at the joint between the Loggia and the corridor in the upper Hall of the Colonnades.[35] Again, this reflected the reconstruction in both plans, G/S 1 and GS/HC 3, which suggested a wall and a door at this position.

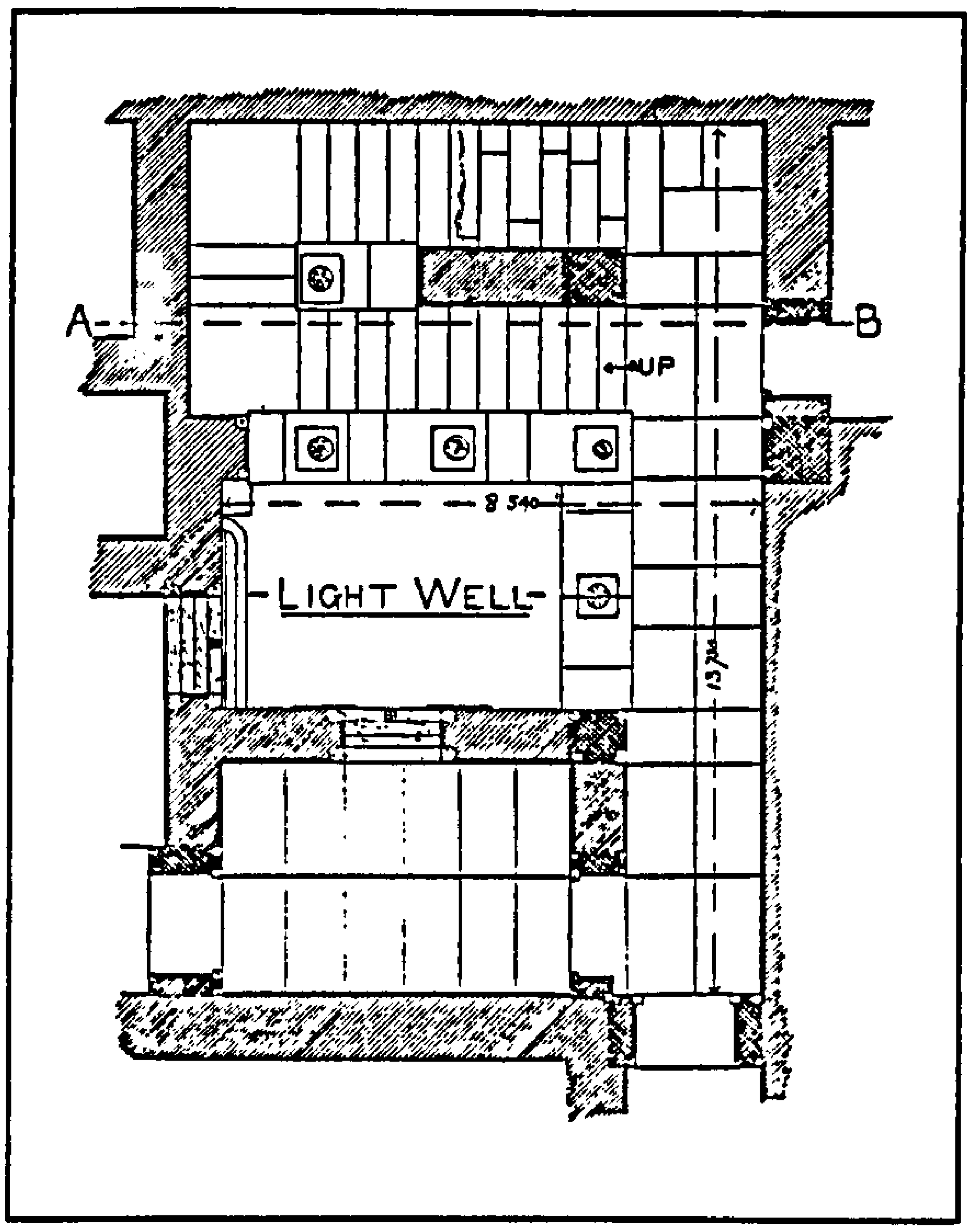


Figure 53 First Floor ground plan, Grand Staircase. Christian Doll, probably 1905.

It was planned to cover the eastern portico of the Hall of the Colonnades with a ceiling which, if it had been executed, would have provided a first floor access from the Grand

[34]See plate 116.

[35]See plate 112, bottom right.

Staircase to the first floor corridors of the Domestic Quarter reconstructed by Theodore Fyfe in 1902.[36] However, the ceiling was not executed, despite Arthur Evans having reported it done in both the report for the Annual of the British School at Athens[37] and the almost identical article in The Times.[38] Evans was probably writing the articles in Britain but, meanwhile back in Crete, Doll had difficulties to execute the planned reconstruction work. In a later report Evans mentioned that some of the iron girders in an unloading accident in the harbour of Candia fell into the water and could not be retrieved.[39] No evidence survived which could help dating this accident. It must be left open as to whether the missing ceiling of the Hall of Colonnades is a direct result of this accident.

In his proposals, Doll suggested a suspended flat timber ceiling to cover the rolled steel joists and brick vault construction.[40] Thus, it appeared as if the ceiling was made of wooden beams. Plate 114 shows the flat ceiling inserted and traces of the suspended ceiling are still visible in the Hall of the Colonnades. This is another example of how Doll focussed much more on the appearance then on reconstruction of original materials.

As already discussed earlier, Theodore Fyfe, in the tradition of minimal intervention, reconstructed the corridor at the sunken level to prevent major restoration work. This resulted in the construction of a basin, open to the sky, which collected rain water and dispensed it through the joints of the pavement to the earth and timber structure underneath. This was one of the reasons why the support work failed, necessitating Christian Doll's reconstruction of the Grand Staircase and the Hall of the Colonnades. Since it was necessary to remove all upper material anyway, the reconstructed height of the new stairs could resemble the original height which was derived from the Western part of the first floor landing, the door sill of the upper East-West Corridor and the two

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[36]See page 198 ff.
[37]Evans, 1905, p. 26.
[38]*The Times*, 1905, p. 4.
[39]Evans, 1928, p. 97.
[40]See plate 106.

floor fragments still adhering to the wall.[41] This was certainly not the driving force behind the reconstruction work, but it was a welcome side effect.

Christian Doll also reconstructed the south wall of the light well adjacent to the Grand Staircase. The wall originally featured a window above the fourth course of the ashlar masonry, which was constructed with a timber frame, forming jambs, sill and lintel. In the destruction of the palace the opening was filled with debris, subsequently the beams deteriorated. With no firm support the upper structure sunk slightly.[42] Theodore Fyfe left the opening unexcavated, but obviously this never could have been a permanent solution. After the area of the light well to the north and the area of the Service Stairs to the south of this wall were excavated in 1901 and 1902 respectively, only debris with the thickness of the wall supported the upper structure.[43] This debris was exposed to the weather and could not possibly provide sufficient permanent support for the weight of the ashlar blocks above. Thus, in 1905 Christian Doll removed the upper ashlar blocks and the blocks to the right of the window[44] and, following this, recorded the blocks of the uppermost course which had been left in position.[45] Instead of using timber beams he placed a framework of iron girders at this place and reinstalled the masonry. The visible sides of the I-beams were covered with timber boards in the usual way, in order to recreate the image of massive timber beams.[46] Once again, Doll employed a system where the necessary structural system was separate from the outer appearance of the reconstruction work.

In early April 1905 Duncan Mackenzie supervised dismantling the remains of the Grand Staircase and Christian Doll recorded the remains.[47] At the same time, 8 - 9 April, Arthur Evans attended the Congrès International d Archéologie at Athens where he presented

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[41]See page 185 ff.

[42]See plate 90.

[43]See plate 96.

[44]See plates 106 and 108.

[45]See Doll's Folder 6 and 7, Ashmolean Museum, Evans Archive.

[46]See plate 112.

[47]See DM 1905, April.

his Minoan chronology.[48] However, the participants also discussed Balanos' conservation work at the Acropolis and probably visited the site.[49] Balanos employed girders for the reconstructions of both the Parthenon (1898 - 1902) and the Erechtheion (1902 - 1909). The work at the Erechtheion was in progress when the conference happened. Thus, it is debateable whether Evans got the idea to employ iron girders at Knossos from the work at the Acropolis or Doll got the idea from his practical experience in London. It is quite likely, that Evans was impressed by Banalos' work, which was well received at this time, and found an ideal partner in Doll who had worked with this material before.

4.2.3 The Throne Room Area

This section is placed here despite the fact that no exact information survives, which can date the work described. The extension of Fyfe's pitched roof was executed between 1905, when Doll began working at Knossos, and 1908, since plate 4 proves that the roof was in place by 1908.[50] In 1905 Evans wrote that the Throne Room and the adjoining corridors were covered and shelves were fitted to store pottery as a reference museum.[51] There is no clear indication whether this refers to Fyfe's pitched roof from the previous year or to the extension by Doll at a later date. Nonetheless, it is possible that the extension was built in 1905 and, therefore, this section was placed here.

In 1901 Fyfe constructed the flat roof covering the Throne Room and the Inner Sanctuary. Three years later he executed the pitched roof on top of his earlier flat roof and he also constructed the lean-to which protected the suite of rooms north of the Throne Room. However, this roof did not protect the Service Section which was located between the Inner Sanctuary and the Long Corridor to the west of this complex.[52] Fyfe

[48] *The Times*, 12 April 1905, p. 4. See also Jokilehto, 1986, p. 420.

[49] Mallouchou-Tufano, 1994, p. 83.

[50] Plate 4 was taken after the reconstruction of the Queen's Megaron in 1908 but before the reconstruction of the fourth flight of the staircase in 1910.

[51] Evans, 1905, p. 23. See also Pendlebury, 1933, p. 1.

[52] See Ground Floor Plan, Drawing 1.

constructed this pitched roof in the year in which he came to Knossos for the final time as the excavation architect. Consequently, the extension of the pitched roof which covered the Service Section must be assigned to a later architect, in most probability Christian Doll.

A new west gable of rubble masonry was constructed on top of the excavated eastern wall of the Long Corridor. No traces survived to indicate the incorporation of the earlier rubble wall erected by Theodore Fyfe in 1904 to shelter the plaster features in the Kitchen. However, parts of Doll's rubble wall were later incorporated by Piet de Jong in his reconstructions in 1930. The outline of the roof is still visible at the first floor level of this wall where batten remains can be found.[53] The new wall constructed was considerably thinner than the original one.[54] This not only reduces the load on the historic structures underneath, it also clearly indicates the level above which the reconstructions start. Ann Brown, anticipating that the entire pitched roof was built at

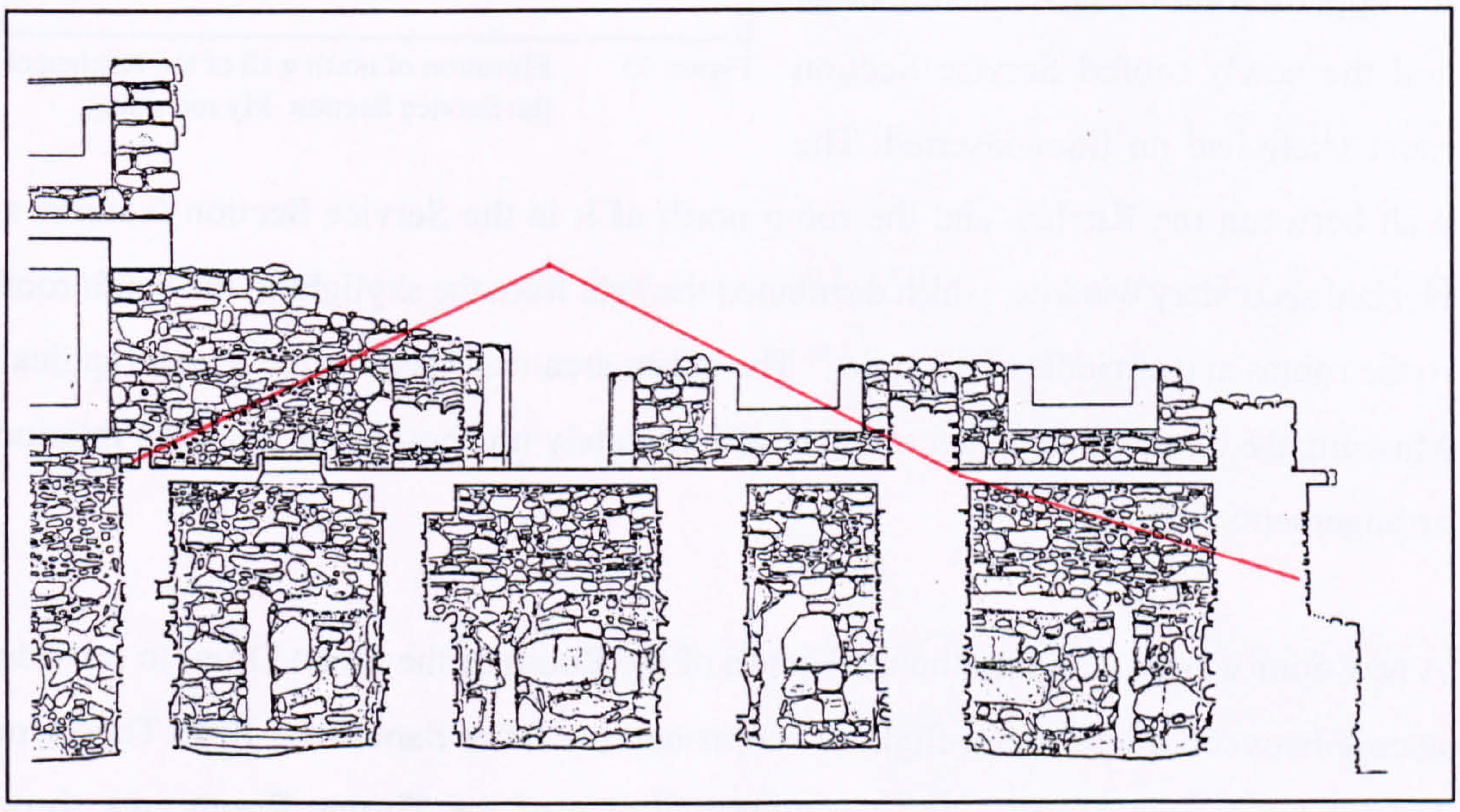

Figure 54 Elevation of west wall of the Service Section showing batten remains. Red line indicates outline of former pitched roof.

[53]See Section C-C, Drawing 4.

[54]See Section A-A, Drawing 3.

once, stated that the roof was constructed with metal girders.[55] This, however, would be a material most likely chosen by Christian Doll rather than Theodore Fyfe during his reconstruction of 1904. Thus, it might be possible that the roof extension was constructed with iron girders, while the main roof was conventionally executed in timber but this is rather unlikely. However, on top of this construction, whether it was timber or metal girders, wooden battens were fixed, remains of which still exist in sockets in the western wall.[56]

The extended roof, like the original part, was covered with tiles and in addition to the three glazed skylights already inserted in the existing roof, another two were installed in the new part.[57] Since the new western gable no longer featured a window and door, access to the upper floor must have been internal and the newly roofed Service Section most likely had no floor inserted. The wall between the Kitchen and the room north of it in the Service Section features a blocked secondary window, which distributed the light from the skylight in the south roof to the rooms in the middle of the suite.[58] The entire area was used for the Stratigraphical Museum, the on site shard collection, but unfortunately no photograph from the interior arrangements survives.

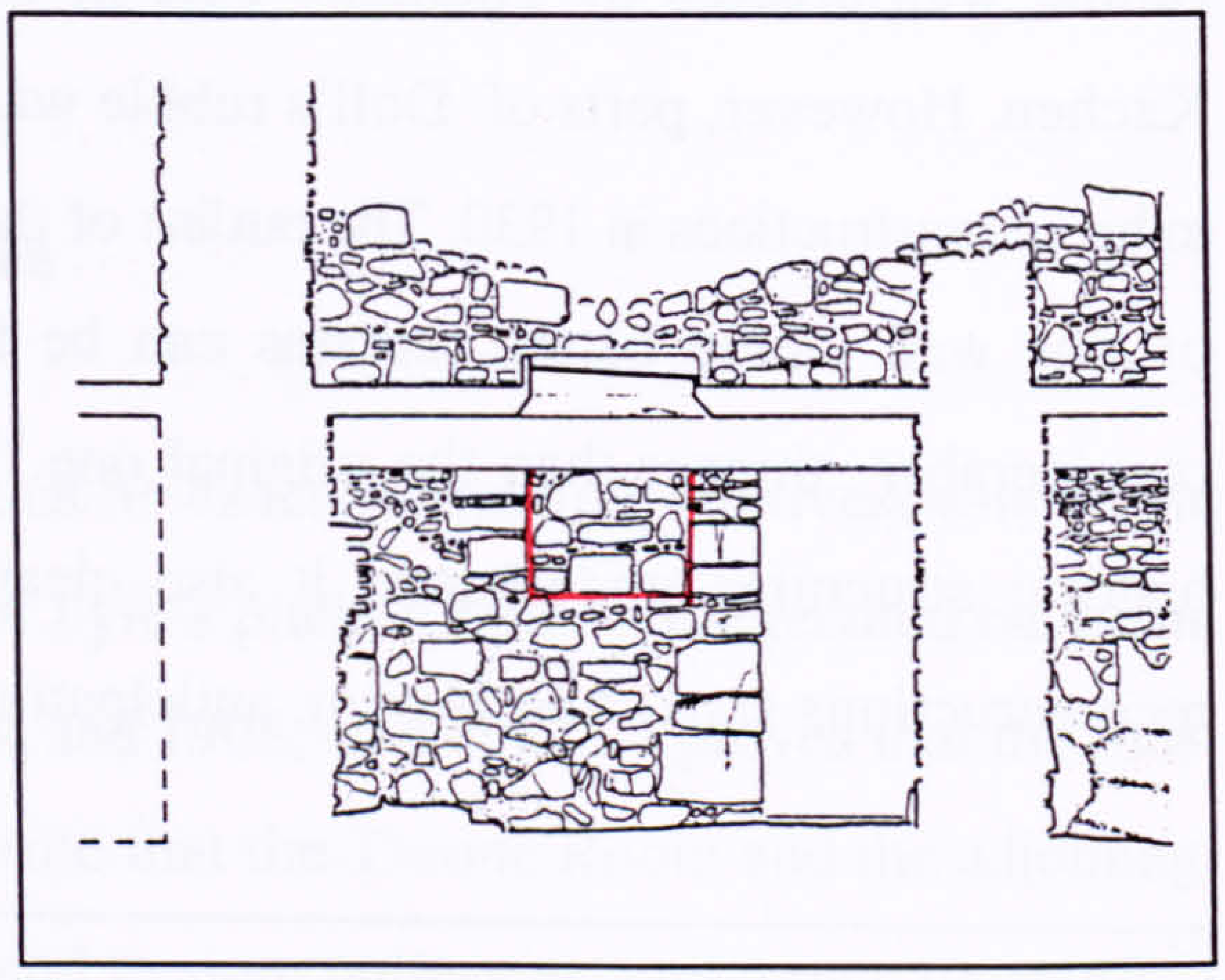

Figure 55 Elevation of north wall of the Kitchen of the Service Section. My recording.

A new door was broken into the wall south of the Room of the Stone Drum to provide access between the northern flight of rooms and the Inner Sanctuary. Both Theodore Fyfe's sketch plan of 1901 and the published plan of the Throne Room area show

[55]Brown, 1994, p. 42. Unfortunately, Mrs Brown gives no reference. In a personal letter, Mrs Brown regrets not having kept her notes but she could not remember the source of this statement.

[56]See figure 54.

[57]See plate 4.

[58]See figure 55.

massive walls at these areas.[59] In contrast the current state shows the doorway inserted later.[60] Both, the Inner Sanctuary and the northern flight of rooms were used to store pottery from the excavation and this door was necessary for internal communication between the two areas. The new splayed jambs were constructed in brickwork and dressed stone blocks.[61] It is not clear whether this door was broken into the wall by Fyfe in 1904 when he constructed the lean-to or by Christian Doll when he completed the pitched roof at a later date. The choice of material - brickwork combined with dressed limestone - is frequently used by Doll whereas Fyfe preferred simple brickwork.[62]

The kitchen of the Service Section featured very sensitive elements of plaster, including for example, the table and the floor.[63] The small roof executed by Fyfe in 1904 was not sufficient protection for these features, and consequently Christian Doll improved this situation with a more permanent structure. The extension of the existing roof was the most suitable solution because it also provided additional storage space for the growing collection of shards.[64]

4.3 The Villa Ariadne

Initially Arthur Evans believed that the site of Knossos could be excavated within a few years[65]. For the first campaign Evans had rented a house close to the site, but it proved to be unhealthy.[66] From 1901 he rented a house in Candia (now Herakleion) in which to sleep but he kept the house at Knossos as an on site base camp.[67] Evans, Mackenzie and

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[59]See figure 27 and figure 28.

[60]See Ground Plan, Drawing 1.

[61]See plate 56.

[62]For Doll see buttresses in the East-West Corridor and the construction of the Villa Ariadne. For Fyfe see the buttress in the Treasury and the door Jambs in the Room of the Plaster Couch.

[63]See plate 51.

[64]Pendlebury, 1933, p 1.

[65]See for example: Evans, 1902a, p. 1; Evans 1903, p. 114.

[66]Brown 1994, p. 30.

[67]Brown, 1994, p. 20 and p. 30.

Fyfe had to ride to the excavation site every day to supervise the work. However, by 1905 Evans realized that he would be staying in Knossos for a long time. Not only were the excavations much larger than he had assumed, but he also realised that besides the actual digging work long periods of research would be necessary. Thus, he decided to have a house built close to the site specifically for his purpose. According to Evans' half-sister he decided on the building site of his excavation house already in 1895 when he visited Knossos with Myres.[68]

Furthermore, Joan Evans suggested that Evans planned the Villa Ariadne himself and Doll was duly executing the his plans.[69] However, this is contradicted by Doll's diary entries such as 'found many difficulties in the way of carrying out my original idea'.[70] Evans and Doll had probably the normal architect-client relationship in which the client voices his wishes while the architect produces plans which reflect these wishes and finally supervises the construction of the building. [71] Christian Doll designed and started to build an excavation house in 1906, a year when Evans conducted no excavation work on site, and finished the work in early 1907.[72] The house was named Villa Ariadne after the legendary daughter of King Minos who helped the Athenian Theseus to overcome the Minotaur and escape the maze.

The Villa is a two storey, flat roof building with an irregular shaped ground plan. The semi-basement ground floor accommodated bedrooms for Evans, Mackenzie, Doll and visitors. The upper storey was composed of a dining room, offices and a hall.[73] A kitchen and a house keeper's flat was accommodated in an adjoining smaller wing. Christian Doll employed some of the masons and carpenters, who normally would have executed reconstruction work on site, to construct the house. The Villa Ariadne was built with the same techniques, employed by Doll for reconstruction work on site in the previous year.

[68]Evans, 1943, p. 318

[69]Evans, 1943, p. 353.

[70]Doll diary, Wednesday 18 April 1906. Ashmolean Museum, Evans Archive.

[71]For contrary opinions see Brown, 1994, p. 22 or Powell, 1982, p. 31.

[72]See letters from Doll to Evans 1906 and 1907.Ashmolean Museum, Evans Archive.

[73]Kiosse, 1998, p. 11.

The thick walls were constructed in rubble masonry, wall ends and jambs were executed in brick and dressed limestone blocks.[74] The exterior walls were faced with irregular stone slabs while quoins and dressings were emphasised with vermiculated rustication. The ceiling construction was identical to that employed on site: iron girders and brick vaults. A terrace was built next to the main entrance at the east side and another one was built at the west side of the Villa.[75] Thus, the Villa was extremely well equipped for the hot Cretan climate. The bedrooms in the semi-basement stayed comparatively cool and, depending on the time of day, a shaded terrace could be used.

Throughout the building process Christian Doll regularly wrote letters to Arthur Evans informing him of the progress some of which survived to date. These letters give a very detailed account of building work and the prices charged for it. In his letter of 3 October 1906 Doll tells Evans about the difficulties getting cement through customs.[76] This indicates that in 1906 Doll still imported cement from Britain. He also kept close contact with his father who gave advice for the building work and ordered some of the materials in England.[77] In January 1907 he wrote to Evans:

> "I have received all the goods ordered from England in a more or less sound condition. The bath was ordered by my father. He chose a porcelain one because he could get it for almost as little as an enamelled iron one. Of course, they are beyond comparison."[78]

The area around the villa was arranged as a garden and included water basins and displayed a statue found at the site of Roman Knossos. In three successive letters Doll referred to trees, which were supposed to be planted in the garden and which had not been delivered so far. Both house and garden were a mixture of traditional English and Mediterranean features. The heads of rainwater downpipes which were decorated with double axes and the separation of servant quarters from the main building indicate the

[74]See plate 222.

[75]Plates 223 and 224.

[76]Letter from Doll to Arthur Evans, 3 October 1906. Ashmolean Museum, Evans Archive.

[77]The letters have not survived but Doll noted all letters he wrote in his diary.

[78]Letter from Doll to Arthur Evans, 21 January 1907. Ashmolean Museum, Evans Archive.

taste of a client who was brought up in Victorian England. The accommodation of bed rooms in the basement, the flat roof and the many terraces refer to Mediterranean sources.[79] The considerations spent for the design of house and garden as well as the high quality of the brass fittings, the woodwork and the porcelain bath, show, how important the Villa was to Evans as the employer and Doll as the architect.

The excavation of Knossos, by then seven years old, attracted numerous scholars and visitors. Evans had not been in Crete in 1906 and Christian Doll had to entertain the visitors and to show them round the palace.[80] In 1906, one of these visitors was Josef Durm, a German scholar who published a book on Greek architecture in 1910. The part on Knossos contains a devastating critique of the reconstructions on which much of the later criticism was based. Durm actually refers to Doll in a footnote of his accounts of the Palace.[81]

4.4 The work in 1908

After he completed the Villa Ariadne in early 1907, Christian Doll returned to England; however, he went back to Knossos in 1908, when he was principally engaged in executing reconstruction work in three areas: The Queen's Megaron, the Room with the Plaster Couch and the eastern part of the East-West Corridor. Evans wrote in the report for 1908:

> "It is the Domestic Quarter where the remains of upper storeys are most in evidence, that the work of excavation has involved the heaviest responsibilities. The wood work provisionally inserted for the support of the upper floors and galleries has proved insufficient to withstand the violent extremes of the Cretan climate. The Grand Staircase, indeed, had been already rescued from its perilous position, and Mr. Christian Doll, to whose construction ability this work was due, was happily enabled to come out again this season to follow up the work conservation in the bordering region. Thanks to his effort

[79]Macdonald in a lecture to the Friends of the British School, 1997.
[80]Letter from Doll to Arthur Evans, 26 February, 1907. Ashmolean Museum, Evans Archive.
[81]See: Durm, 1910, p. 50 ff.

the floor of the adjoining upper corridor has been thoroughly re-supported and at the same time the window of the lower gallery, looking on the light well of the Hall of the Double Axes, opened out - a task which involved the raising into their original position above its restored lintel of over six tons weight of sunken blocks. Another window off the "Court of Distaffs" has been opened out in a similar way, and the paved floor of the room above, which is flanked by a stone bench in position, has been reconstituted and permanently supported."[82]

All these areas described in the quotation above had been attended to previously by Theodore Fyfe. Thus, Christian Doll was not starting work in new areas but was mainly concerned with improving the reconstruction and support systems introduced by his predecessor. Duncan Mackenzie already mentioned in his diary entry for 1 March to 11 March 1905 that the timber frames inserted by Theodore Fyfe were decaying. Evans believed that this was due to the 'violent extremes of the Cretan climate', but this is only a minor factor.[83] As we have seen earlier, this was much more due to a range of materially based and structural problems. Basically, these were the same problems found at the Grand Staircase as well as at other areas of the Domestic Quarter. However, the Grand Staircase required the most urgent attention and was resolved in 1905. The other areas followed in successive years.

4.4.1 The Queen's Megaron

After the Queen's Megaron was excavated in 1902, Fyfe constructed a small projecting roof to protect the spiral fresco in the adjacent Bath Room.[84] The timber employed for this work is very dark in the photographs,[85] thus we may anticipate that, unlike the Throne Room, the timber was properly treated with paint prior to its insertion. Nonetheless, the projecting construction with its cover of broken paving slabs was doomed to fail. Rain penetrated through the joints of the broken paving slabs and

[82]*The Times*, 27 August 1908, p. 6.
[83]*The Times*, 27 August 1908, p. 6.
[84]See page 195 ff.
[85]See for example plate 178.

affected the softwood timber structure underneath. This construction may have lasted for several years, but certainly could not have endured for a longer period. In addition, this projecting roof covered only one important feature while other sensitive elements were still exposed: for example the gypsum dado slabs or the plaster benches. Thus, it is not surprising that in 1908 Arthur Evans could write:

> "In the neighbouring "Queen's Megaron" a still more serious question confronted us, for this, the most interesting of all the Palace Halls remained exposed to the rapidly decomposing forces of the elements. To put it in a position of permanent security involved nothing less than the roofing over of the whole area, as a preliminary to which the burnt wooden columns and pillars had to be restored in stone and a large part of the east wall reconstructed. Mr. Doll's energy, however, has been equal to the task, and this considerable undertaking has now been brought to a successful conclusion. The glazing over of the light court on the East side of the Hall enables it to fulfill the function of a small Palace Museum, in which some fine painted jars have already been placed and it is to be hoped that the remains of the wall paintings found here, representing dolphins and other fishes amid sea spray, may be ultimately set up once more against the wall to which they belonged. The shape and colouring of the columns and capitals of the adjoining portico have been reproduced from designs supplied by other wall paintings, the divan of the inner section of the hall has been partly restored, and the column of the inner alcove , that served as a bath room, has been modelled after one of the fluted examples of which impressions were preserved in an impluvium of the "Little Palace."[86]

It is important to note that Christian Doll carefully recorded the area of the Queen's Megaron and the adjoining rooms to the east.[87] Unfortunately, this plan is not dated but it may be reasonable to anticipate that Doll recorded the area prior to his reconstruction work in 1908. Subsequently, he produced large plans showing the reconstruction proposal. Unlike the drawings of the Grand Staircase, these were executed with pencil on cardboard.[88]

Christian Doll's concept was similar to the one employed for the reconstruction of the Grand Staircase. Both the columns in the eastern light well and the pillars between the

[86] *The Times*, 27 August 1908, p. 6.
[87] See Doll's Folder 15. Ashmolean Museum, Evans Archive.
[88] See plate 181.

benches were reconstructed in stone and coated with plaster in the way previously described. The column in the Bath Room was reconstructed with the same techniques, only in a different shape. As seen in the quotation above, the form was derived from the impressions which the original wooden columns left in the clay wall at the Little Palace. Hence, a model from outside the palace precincts was employed for the reconstruction of the column.

The walls were elevated to the necessary height by employing rubble masonry with ashlar quoins at window jambs and wall ends. The walls of the eastern light well were reconstructed in ashlar masonry to a height of approximately 2.10 metres, at which level a timber board was fixed in a horizontal slot to mark the position of the former horizontal reinforcement beam. Both eastern and southern walls of the eastern light well survived only to the height of one and in some areas two courses of ashlar. The height of the slot was derived from the northern wall which survived considerably higher. Above this height plastered rubble masonry was utilized for the reconstruction of the walls.

All door and window jambs were reconstructed in ashlar masonry which receded slightly from the surviving jamb blocks. Timber dowels were inserted into the ashlar jambs and timber boards, representing the original timber framework of the Minoan door construction, were nailed to them. In the same way, a timber board was fixed to the wall at two metres above ground. It represented the original horizontal timber reinforcing beam, remains of which have been discovered at the north wall of the light well as also in the Bath Room. The area above these boards was plastered as was the under side of the ceiling construction[89]. The timber boards, besides the one in the light well, were decorated with spiral patterns recreating a design found in the Bath Room adjacent to the Queen's Megaron and with rosettes.[90] However, the benches of the partition walls between the inner room of the Queen's Megaron and the light wells had not yet been reconstructed.[91]

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[89]See plate 189.

[90]See plate 189.

[91]See plate 187.

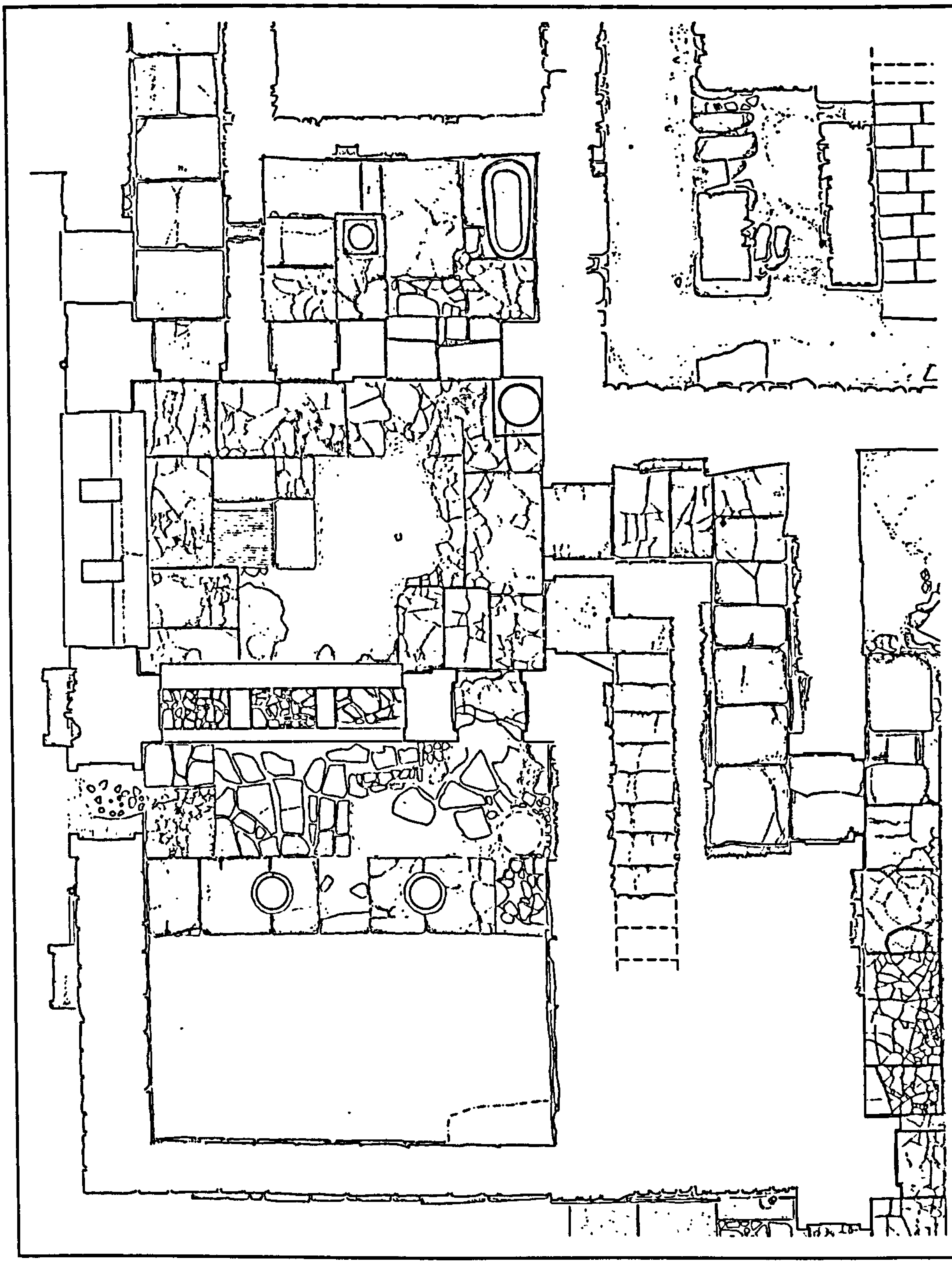

Figure 56 Ground plan of the Queen's Megaron and adjoining areas.

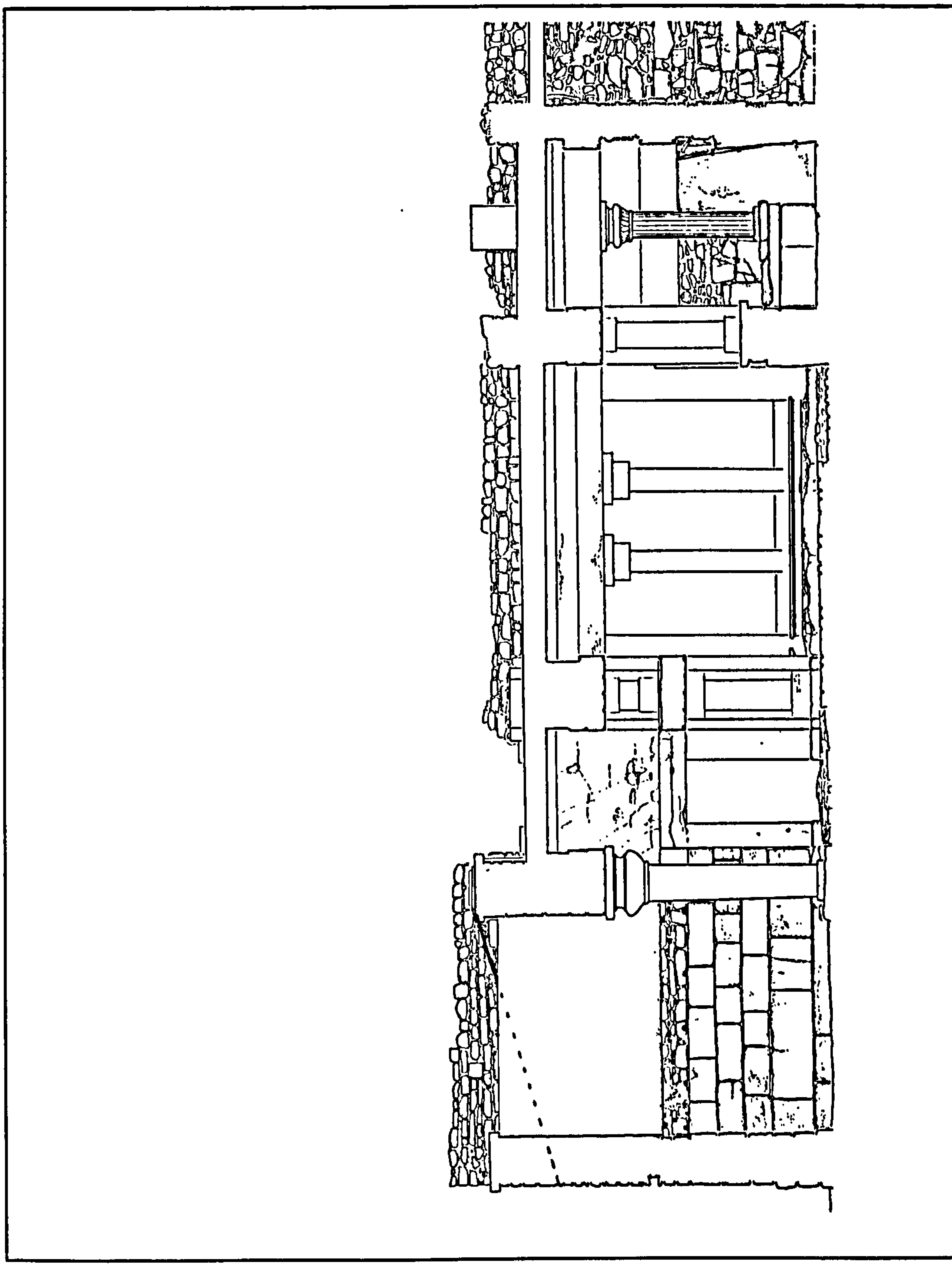

Figure 57 Section of the Queen's Megaron and the Bath Room.

The Queen's Megaron, including the Bath Room and the porch, was roofed over using Christian Doll's usual method of iron-girders and brick vaults.[92] At first floor level the spandrels between these vaults were filled with concrete, and square slabs of 'Maltese Stone' were placed in hot asphalt on top of it.[93] The broken paving slabs employed by Theodore Fyfe to cover the projecting roof above the northern part of the Bath Room were re-laid by Christian Doll in this particular area.[94] The southern wall was elevated above floor level like a balustrade and topped with coping stones. To prevent the repetition of earlier mistakes, the floor above the Queen's Megaron was designed with a decline towards two gaps in the balustrade at the southern end which led to stone spouts. From here the rain water was drained into lead downpipes, which disgorged the water into the old Minoan sewage canal.[95] Thus, a proper system was installed to prevent any further water damage to the rooms, although one could criticise the re-use of the Minoan sewage canals.

The eastern light well was covered with a pitched roof featuring three skylights.[96] Thus, the light well was lit from above in a way which recreated the original light's fall. The northern wall of the light well was elevated and the former window recreated at the level of the intermediate landing of the Private Staircase. The covered light well was used as a small on-site museum in which two interesting finds from the Domestic Quarter were exhibited: the drum shaped *pithos*, found in the Corridor of the Painted Pithos, and the clay bath tub which was found in the Bath Room. Thus, both features were exhibited close to the place where they were found and were also protected from the weather. However, it seems that the skylights have not lasted well and at a later point they were removed and a window was inserted in the eastern wall of the light well.[97] The shape of

[92]See figure 57.
[93]Letter Mackenzie to Evans 14 September 1920. Ashmolean Museum, Evans Archive.
[94]See plate 160.
[95]Plate 190. See also Doll's comment on Evans' lecture at the R.I.B.A. Evans, 1928, p. 101.
[96]See plate 5 and plate 181.
[97]See plate 187.

the former window and the outline of the pitched roof are still detectable at the walls.[98] Unfortunately, no information has survived that could date this alteration.

4.4.2 The Room of the Plaster Couch

The Room with the Plaster Couch is located immediately south of the Court of Distaffs. The plaster couch from which the room gained its name, was identified by Evans as a vulnerable feature as early as 1902. In order to protect the plaster couch Fyfe reconstructed a projecting ceiling in timber in the south western corner but left all other areas of the room unattended.[99] The northern wall of the room, towards the Court of Distaffs, originally featured a door and window opening to the Court of Distaffs. After its excavation in 1902 Theodore Fyfe reinforced this fragile wall with a rubble masonry backing. By doing this, he blocked access to the Court of Distaffs from this room, while opening up the window from the Corridor of the Demon Seal to the court.[100]

In June 1908 Doll removed the rubble masonry backing and exposed the former wall construction. He took down the ashlar courses above the height of the lintels and thoroughly recorded the remains found.[101] As in the Queen's Megaron, he reinstalled the jambs of the door and window in ashlar masonry, which receded slightly from the original building line so that timber boards could be fitted to imitate the original structural beams. The lintels were made in the usual method by using iron girders clad with timber boards.[102] The brick pillars at the eastern side of the room, which had been installed by Theodore Fyfe, were left in position but were stripped of their plaster and reduced in height. Doll inserted new lintels at a lower height which responded to the lintel height of

[98]See plate 197.

[99]See plate 167.

[100]See plates 167 and 170. See also PMI p. 339.

[101]See Doll's Folder 21.

[102]See plate 171, right margin.

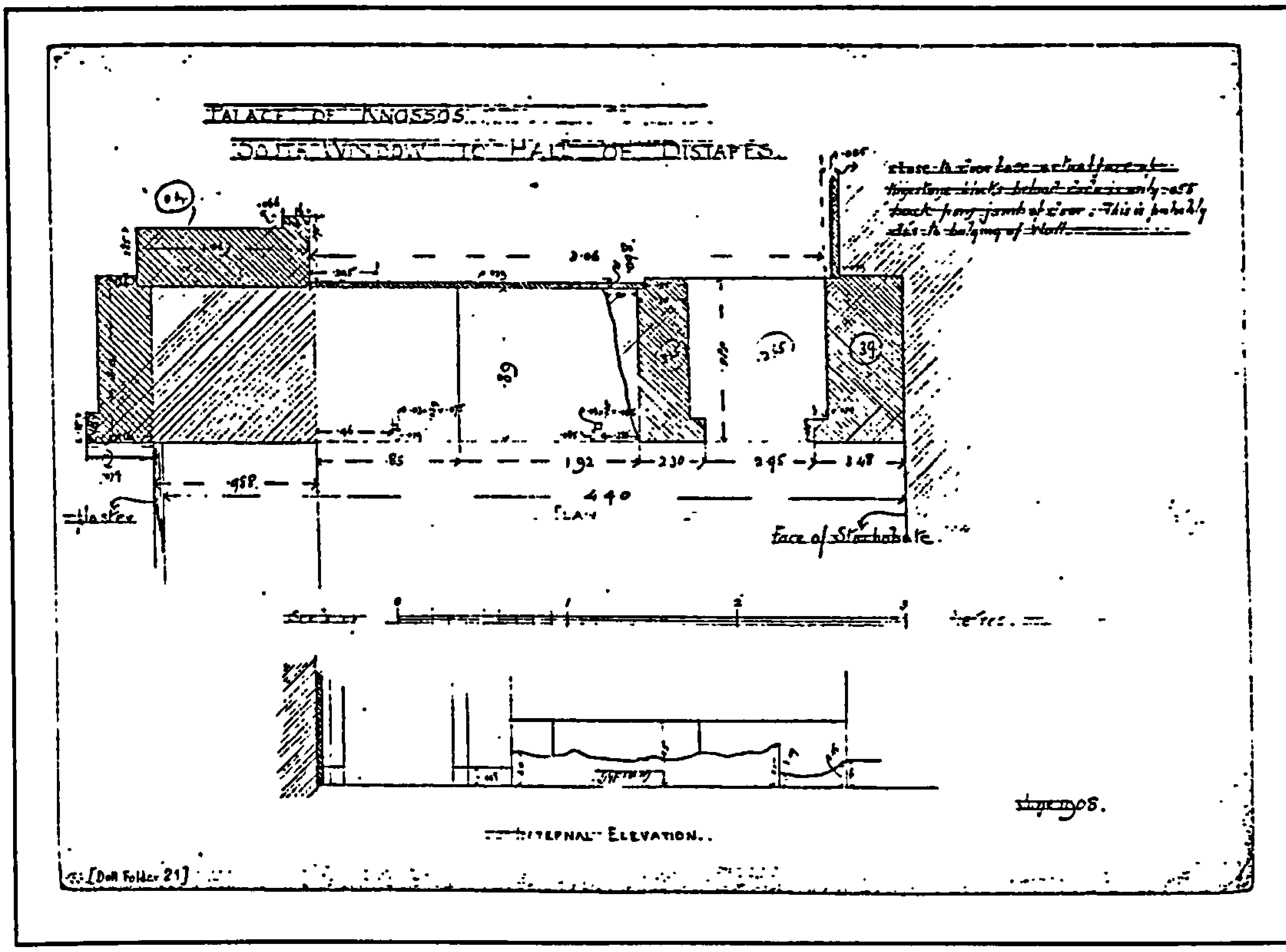

Figure 58 Measured Drawing of the South Window of the Court of Distaffs. Dated Christian Doll, June 1908. Doll's Folder, Evans' archive, Ashmolean Museum.

the door and window in the north wall.[103] Subsequently, the ceiling was reconstructed in the usual way employing iron girders and brick vaults. Again, the spandrels were filled with concrete but, unfortunately, no photograph survived which shows the paving material on top of this construction. However, it is quite likely that he reused the broken paving slabs of Fyfe's projecting ceiling and paved the remaining area with Maltese stone as he did at the Bath Room.[104] Metal clamps were employed to tie the already dangerously affected gypsum dado slabs to the walls. In the same way as already applied in the Throne Room, the reconstructed walls were plastered with a lime render while the original walls were left bare.[105]

[103]See Section C-C, Drawing 9 and compare plate 96. There is no evidence that the lower lintel originates from 1908 but the used material - iron girders - and the necessary constructive sequence indicate that the work was executed by Doll in 1908.

[104]Both the Bath Room and the Room of the Plaster Couch were stripped of their paving materials by Piet de Jong. He laid new concrete floors in these areas. See First Floor Plan, Drawing 7.

[105]See Section A-A, Drawing 8 and Section C-C, Drawing 9.

4.4.3 The East-West Corridor

After the Hall of the Colonnades and the East-West Corridor were excavated in 1901, Fyfe inserted timber frames to support the remains of the upper floors. The northern portico of the Hall of Colonnades, which forms the western continuation of the East-West Corridor, collapsed on 11 June 1901 and was subsequently replaced but Fyfe's construction in the corridor itself survived until 1908.[106] However, both these timber support structures, the replaced one and the original one, faced identical long term problems. The humidity trapped in the earth between the paving and the ceiling boards hastened the deterioration of the timber.

At the East-West Corridor the load of the upper floor rested on timber posts and was further supported by two massive walls to the north and south.[107] Situated between these two walls, the upper floor did not have to withstand the horizontal forces in the same way it had to in the northern portico of the Hall of Colonnades and at the Grand Staircase.[108] As a result, these areas collapsed earlier and were reconstructed with iron girders in 1905. The timber support frames of the corridor were left in position.[109]

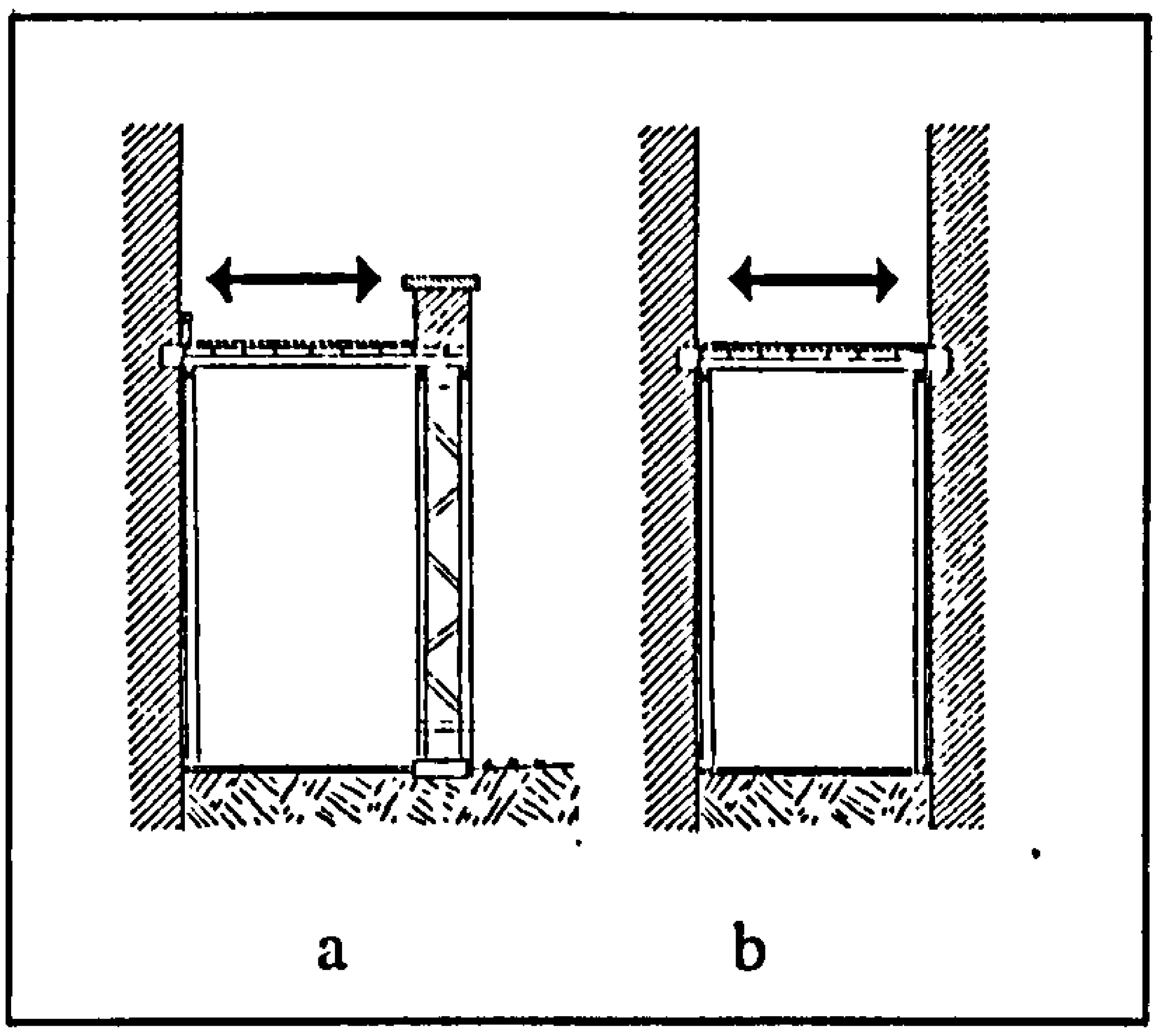

Figure 59 Schematic section of the northern portico of the Hall of Colonnades (a) and the East-West Corridor (b).

[106]See page 185 and 188 f.

[107]See plate 128.

[108]See figure 59 and compare page 223 ff.

[109]See plate 117 left margin.

The timber structures in the East-West Corridor were facing the same long term problems as the Grand Staircase and by 1908 the deterioration has proceeded to an extent that they needed to be replaced in a more permanent manner.[110] As discussed previously, the structural system introduced by Theodore Fyfe in the East-West Corridor diverged from the original Minoan system. In the original structure, the load of the upper floor was carried to the ground through the walls while in the new system the timber support work fulfilled this task.[111] This was now proposed to be altered.

Christian Doll once again began his work with a proper recording of the area. For the reconstruction work he employed the same system already used at other parts of the Domestic Quarter. The walls were elevated and strengthened, iron girders and brick vaults being used for the ceiling construction.[112] Two vertical slots, left by the rotten Minoan timber reinforcement beams, were strengthened with brick and limestone buttresses.[113] In contrast to the Queen's Megaron, the broken paving slabs employed by Theodore Fyfe were re-laid in cement on top of this construction[114].

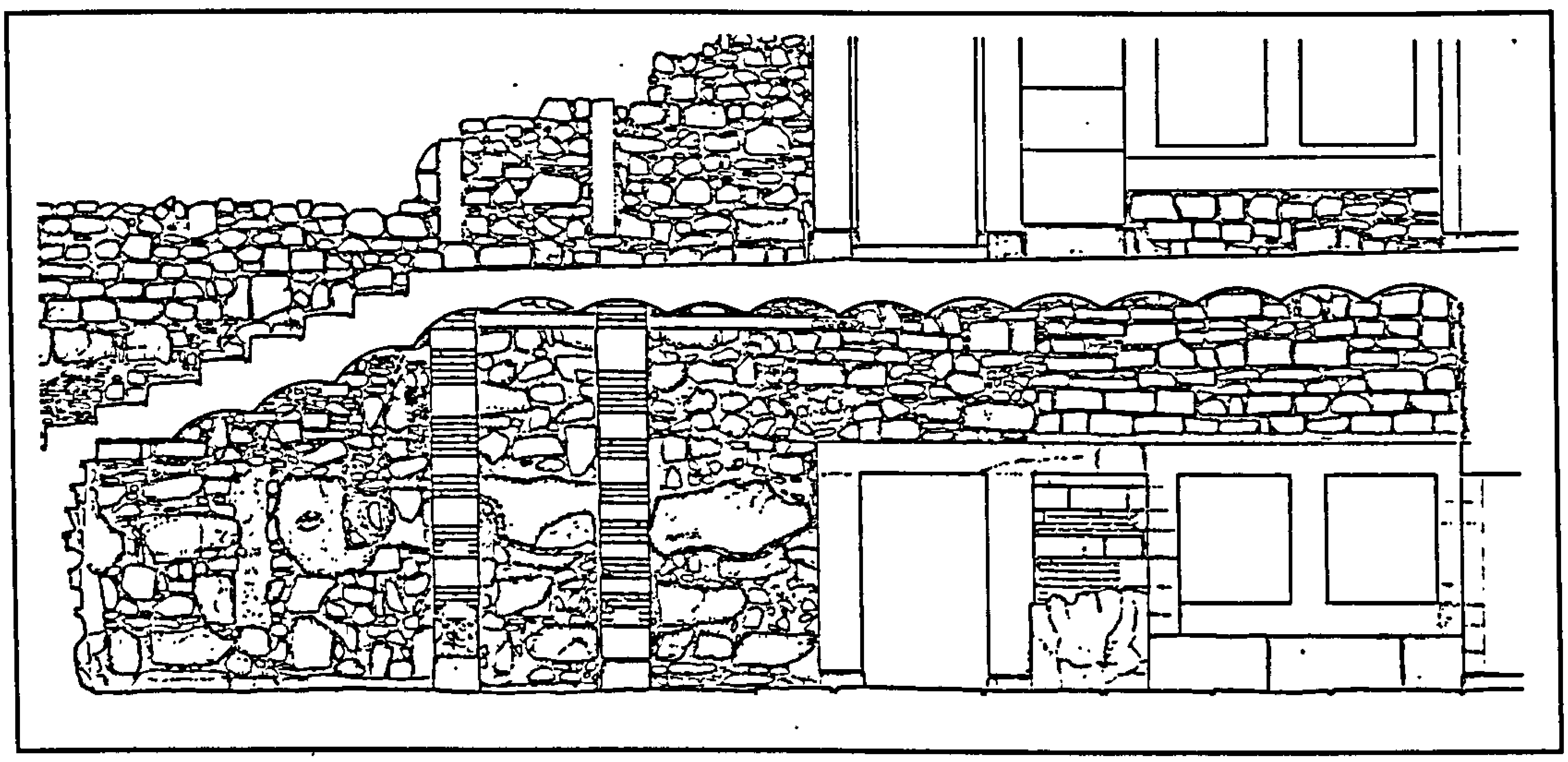

Figure 60 Section of the East-West Corridor looking south.

[110]*The Times*, 27 August 1908, p. 6.

[111]Compare plate 92.

[112]See Section B-B, Drawing 8.

[113]See Section B-B, Drawing 8 and Ground Plan, Drawing 6.

[114]See First Floor Plan, Drawing 7.

The door between the Lower East-West Corridor and the Hall of the Double Axes was already opened by Theodore Fyfe in 1902 but he did not address the window next to it. As part of the reconstruction of the upper floor of the corridor, the window was also opened again by Christian Doll in 1908.[115] Evans described this work:

> "The windows, especially, presented great difficulties, since owing to the carbonisation of their wooden posts and lintels, the great limestone blocks with which the beams were overlaid had sunk deep into their openings and had to be taken out stone by stone and replaced at their original level. Many tons of masonry had thus to be extracted and re-set, notably in the case of the lower window of the right wall of the Hall of the Double Axes, which had been almost entirely choked with sunken blocks."[116]

Doll started his work with a detailed recording of the individual ashlar blocks which formed the wall of the western light well of the Hall of the Double Axes. Both sketch recording and the completed detailed drawings survive in the Ashmolean Museum.[117] The masonry above the window was carefully removed, measured and stored away. An axonometric drawing of it can be seen in figure 61.[118] Another detailed plan shows the depth of the cavity left by the rotten horizontal timbers below the window sill. It is clearly visible how the actual depth of the cavity varies considerably along the window.[119] It was impossible to insert a new straight iron girder from the side and, thus, the overlaying masonry was taken down to this level. Subsequently, an iron girder was introduced and the masonry then reinstated. These careful recordings were made while the wall was dismantled and later facilitated the reconstruction process.

Doll reconstructed the window in the usual way - with iron girders as lintels and timber boards casing. At the north side of this wall, facing the East-West Corridor, one can clearly distinguish between the masonry above the door and the masonry above the

[115] *The Times*, Thursday, 27 August 1908, p. 6.

[116] Evans, 1927, p. 262.

[117] See: Doll's Folder No. 11a, 12 and 13, Ashmolean Museum, Evans Archive.

[118] Figure 61. Doll's Folder No. 14, Ashmolean Museum, Evans Archive.

[119] See figure 18.

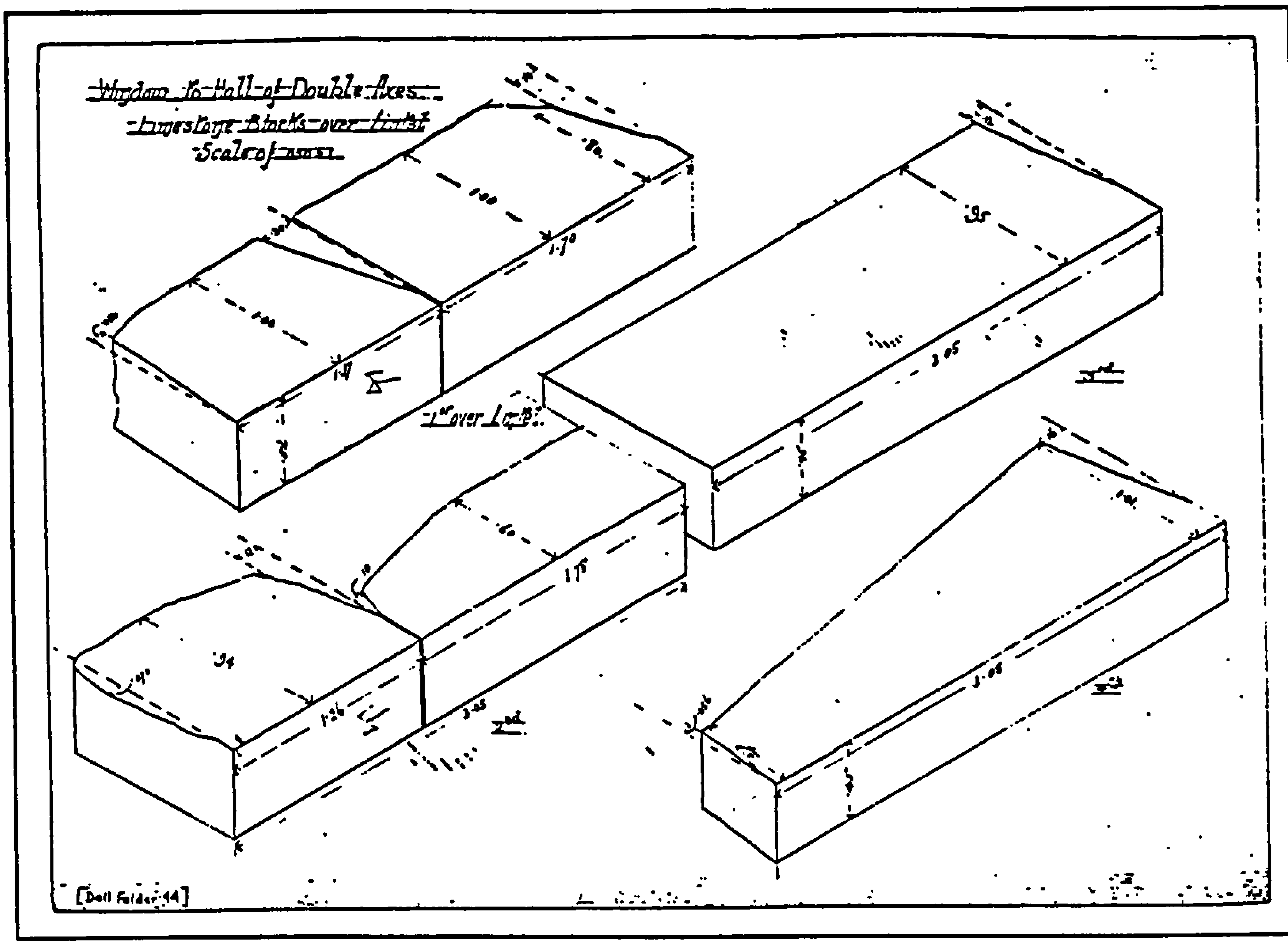

Figure 61 Limestone blocks above the window to the Hall of Double Axes. Christian Doll 1908.

window. The first one was basically left in position by Theodore Fyfe in his reconstruction of the door in 1902. He propped up the wall while he inserted a timber beam as a new lintel.[120] However, the wall above the window was removed completely and rebuilt after the insertion of new jambs and lintel by Christian Doll in 1908.[121] This, of course, is not exclusively due to the fact that both architects had a different approach to the site. The width of the door was much less than the width of the window and, consequently, the upper masonry collapsed into the window opening to a much larger extent than it did into the door opening. However, the situation was very similar to that of the window in the south wall of the Grand Staircase light well. Both sides of the wall were excavated and a heavy load of sunken masonry was discovered resting on the debris which filled the window. Obviously, this could not be a permanent solution and Christian Doll had to tackle the problem which had been left to him by his predecessor. As pointed

[120]See plates 139 and 140 and see Section B-B, Drawing 8.

[121]See figure 61. See also plate 108 which indicates the same procedure for the window in the light well of the Grand Staircase.

out earlier, another remarkable difference between the two architects was that Christian Doll re-used the old structural system and imposed the load of the upper floor on the original walls, while Fyfe frequently had introduced an independent load-bearing system.[122]

4.5 The Reconstructions of 1910

It seems that the campaign of 1909 was dedicated exclusively to research; no excavation work or conservation took place. However, in 1910 Christian Doll returned to Knossos to execute more reconstruction work in the Domestic Quarter and the roofing of the sunken basin of the Little Palace, located a few hundred metres east of the Palace[123]. The work in the Domestic Quarter focussed on two places: the re-roofing of the corridors at the Domestic Quarter and the reconstruction of the fourth flight of the Grand Staircase. Five years after Christian Doll started his work at Knossos at the Grand Staircase, he returned to this area in 1910 to add another flight of steps. These reconstructions were the last major undertaking before World War I interrupted the work on site.

4.5.1. The Fourth Flight of the Grand Staircase

In July 1908, Christian Doll spent time recording the surviving fragments of original plaster at the Grand Staircase and the East-West Corridor.[124] He also re-measured the remaining original steps of the Grand Staircase and subsequently drew a new plan of it; however, no work was undertaken at the area in 1908.[125] Prior to the discovery of the Grand Staircase, steps belonging to the fourth flight of the Grand Staircase, were found in the initial excavation of the Central Court . Their importance was not recognized and

[122]See plate 92. Fyfe did actually impose some of the load onto the historic walls (lintel of the door) but the main load was carried by an independent system.

[123]*The Times*, 16 September 1910, p. 4.

[124]See Doll's folder No 2, 3, 8 and 9. Ashmolean Museum, Evans Archive.

[125]Doll's Folder No 1. Ashmolean Museum, Evans Archive.

the steps were removed and laid along the edge of a trial trench where they were then covered with timber boards for protection. After this, they were forgotten and rediscovered only in 1910. The landing block at the second floor landing, featuring marks of the fourth and fifth flight, had been replaced in its original position on top of the reconstructed timber and rubble pillar by 1902.[126] Furthermore, the landing block of the second intermediate landing had been discovered earlier in the excavation process and was still on site, but it was not in its original position, as was the South-Eastern corner block of the third landing. Hence, the material for five steps of the fourth flight and all the landing blocks were on site. Consequently, it was decided to replace the fourth flight and all blocks to what was supposed to be their original position.[127]

Since much of the substructure of this construction had vanished, it was necessary to reconstruct columns and beams to place the three blocks in their former position. Christian Doll employed a different method for this work of reconstruction. Two new columns were erected in the socket of the lowest of the stepped balustrades of the third flight as well as at the second intermediate landing between the third and fourth flight. These columns were constructed in limestone and, in contrast to the columns in the ground floor, were not plastered.[128] The landing block at the second main landing was removed, and the timber and rubble pillar, previously executed by Theodore Fyfe in 1902, was replaced with an ashlar pillar. Ashlar masonry was also employed to build pillars at the south end of the intermediate landing and at the north eastern corner of the first main landing. Both these pillars were necessary to support the new beams which in turn carried the original blocks.[129] The walls between the flights and west of the fourth flight were reconstructed in rubble masonry with ashlar wall ends.

Similar to the ground floor reconstruction, Doll employed rolled steel joists and brick vaults for the load-bearing construction of the fourth flight. This construction was cut

[126]See plate 97.
[127]*The Times*, Friday, 16 September 1910, p. 4.
[128]See plate 119.
[129]See plate 119.

back alongside the landing block of the second intermediate landing to show the marks of the historic steps at its side. Iron-I-beams were also employed as the structural members of the reconstructed beams, but contrary to the reconstructions of the ground floor, these beams were not cased with timber boards. The newly reconstructed beams were exposed to the weather constantly on all four sides, while the earlier beams were protected to a certain extent by the overlaying reconstructions. As can be seen in plate 116, the timber casing failed a short time after their installation. Consequently, the newly reconstructed beams were cased with concrete rather than timber and a trip mould was formed at their lower side to control the rain water.[130]

Plates 119 and 120 show the finished state of reconstruction after the work in 1910. The original wall separating the two flights, which was rectified in 1902, is still visible at the lower end of the third flight. Clearly distinguishable, due to their much smoother surface, are the newly reconstructed parts. Certainly no structural reasons necessitated the work executed by Christian Doll at the Grand Staircase in 1910. The reconstructed fourth flight now protected the second flight of the staircase, but in return it exposed the fabric of the five newly discovered steps to the elements. The reconstruction of 1905 kept all elements firmly in position except for, perhaps, the third storey landing block on top of the timber and rubble pillar. Replacing the excavated elements in what is believed to be their former position is a work of presentational or didactic function. However, on the other hand, it must be asked what might have happened to these elements if they were not replaced?

This work shows the first use of concrete in structural members of the reconstructions at the excavation site of Knossos. These reconstructions were not reinforced concrete in a narrow sense. In a reinforced concrete structure tension is carried by the steel reinforcement, while pressure is carried by the concrete. In the reconstructions executed by Christian Doll, the iron girders are the only structural elements. They carry both tension and pressure. The concrete fulfills two other functions. It prevents the iron

[130]See plate 119.

girders from rusting and it re-creates the shape of the original beams. Iron and concrete form no structural compound as in a reinforced concrete member. Thus, this is the earliest instance of employing cement-based concrete in a structural function even though it is not the reinforced concrete of the later work by Piet de Jong.

4.5.2 The Corridors in the Domestic Quarter and the Service Stairs

Two areas in the Domestic Quarter, the Corridor of the Demon Seal and the area with the toilet east of the Room with the Plaster Couch, were roofed over by Theodore Fyfe in 1903. Parts of the Corridor of the Painted Pithos were already covered in 1902. It was described earlier how the new rectangular stone slabs covering parts of these corridors were not laid properly;[131] but also the broken stone slabs, laid in mortar, were not waterproof. Consequently water could penetrate and affect the timber support work beneath. But there were other reasons, stemming from Minoan building construction, that were responsible for the decay. As early as 1905 Duncan Mackenzie wrote in his Diary:

> "The condition in which we found the corridor going E.W. from the Queen's Megaron to the S. of this room [the treasury] showed how much the powers of disintegration is assisted by the presence of these wood intervals in the walls. Here the floor of the upper corridor had been replaced at a level lower than its original one. This original level, however, had the intervals for the original floor beams and the subsidence of part of the wall above there brought down the greater part of the wood construction set up by us as the new floor of the corridor. The decayed condition of our wood after an interval of five years showed how deadly is the effect of damp on this when the wood is not sheltered from this damp."[132]

Doll's first duty in 1905 was to tackle the even more serious problems at the Grand Staircase. In 1908 he dealt with the sensitive features of the Queen's Megaron, the Room of the Plaster Couch and the East-West Corridor. But meanwhile the decay of the timber support work in the remaining areas proceeded even further and it became urgent to

[131] See page 202.

[132] DM 19095, Wednesday, 1 March to Saturday, 11 March 1905. Apparently, the wooden frames had been in position for only 3 or 4 years.

replace the structures. Thus, Evans wrote in *The Times*:

> "Mr. Christian Doll was happily able again to come out to superintend some serious structural works that had become necessary in the Domestic Quarter of the Palace. The initial object was the resupporting of upper floors in a permanent manner, the woodwork of the original supports being already in a dangerously decayed state."[133]

Three areas were re-covered by Christian Doll in 1910: the Corridor of the Painted Pithoi in the southern part of the Domestic Quarter, which connects the Queen's Megaron with the Room of the Plaster Couch; the Corridor of the Demon Seal in the north, which connects the Room with the Plaster Couch with the Hall of Colonnades and, finally, the toilet area between these two corridors to the east of the Room with the Plaster Couch. After 1910, only the Treasury remained uncovered in the Domestic Quarter.

In 1908 Christian Doll had already recorded the Domestic Quarter when he re-roofed the Room with the Plaster Couch and the Queen's Megaron. He produced a plan for the ground floor and a plan for the upper floor, the first of which is dated 1910.[134] The on site records on which these plans were based survived in the Ashmolean Museum.[135] The original stone jambs and corner blocks of the upper storey were kept in position by Theodore Fyfe's timber support frames and are highlighted in his plans by cross hatching. Dashed lines indicate reconstructions while excavated remains were drawn in full lines. He also recorded the ashlar masonry of the east facade of the Court of Distaffs. The window in this wall, opening from the Corridor of the Demon Seals, was reconstructed by Theodore Fyfe in 1902.[136] However, in 1910 Christian Doll removed the overlaying masonry and Fyfe's timber frame, and recorded the wall including the dowel holes of the window sill.[137] He reconstructed the window in the same manner he employed in the adjoining southern wall two years earlier.[138]

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[133]*The Times*, 16 September 1910, p. 4.

[134]See figure 62.

[135]Doll's Folder No 15 and No 17. Ashmolean Museum, Evans Archive.

[136]See Evans, 1902a, p. 64.

[137]Doll's Folder No 22. Ashmolean Museum, Evans Archive.

[138]See plate 171.

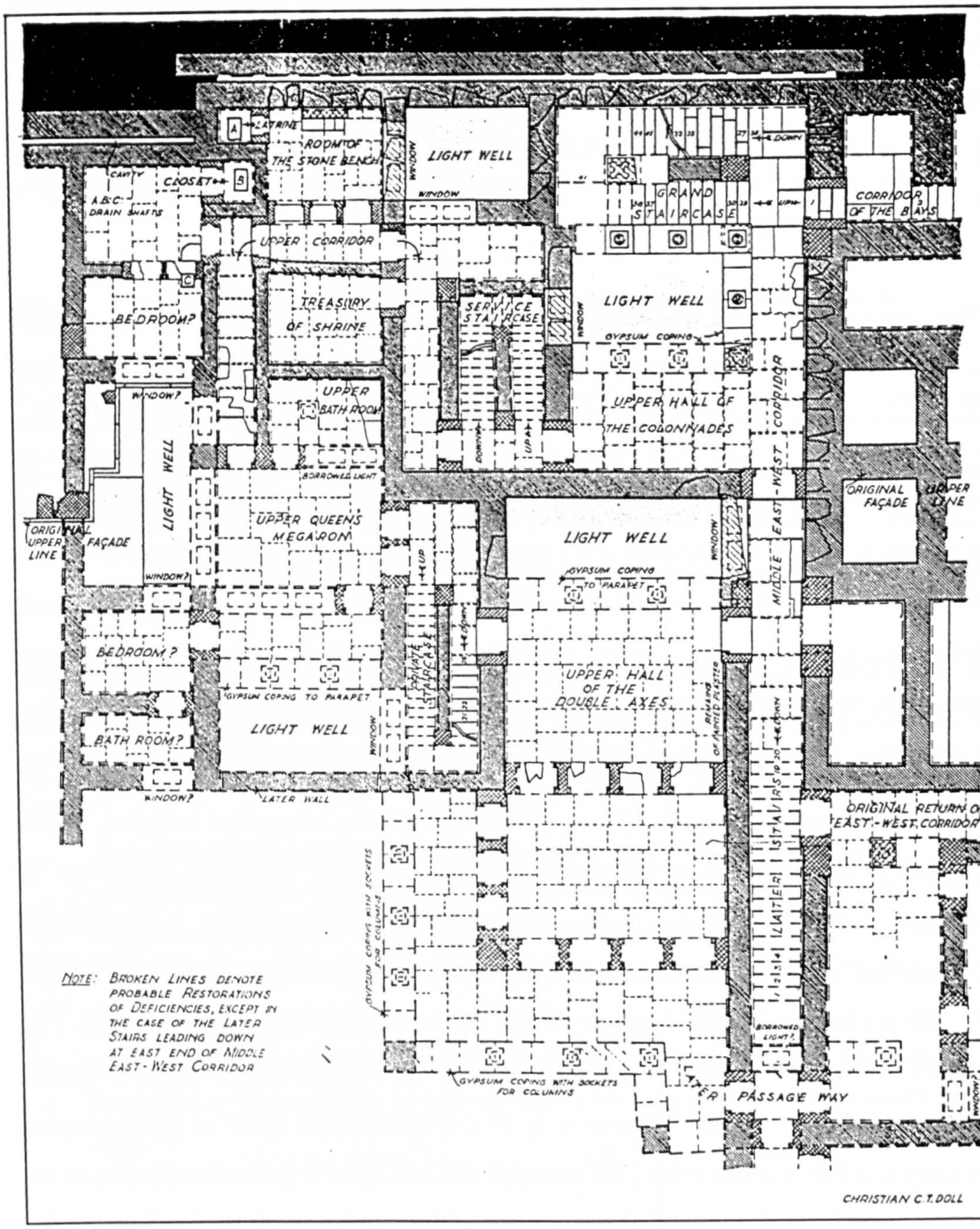


Figure 62 First floor plan of the Domestic Quarter. Christian Doll.

Christian Doll completely removed Fyfe's newly quarried rectangular paving slabs of the upper corridors as well as the timber structure underneath. The door jambs and corner blocks which had been replaced on massive walls in 1902 could be kept in position while other door jambs, which rested on the timber structure were removed.[139] He strengthened and elevated the walls and the corridors were roofed over with iron I-beams and brick vaults in a manner similar to that employed in the other areas. Thus, Doll again recreated the former structural system by imposing the load, which formerly was carried by structurally independent timber frames, on the historic walls. Noel Heaton, who visited Knossos in 1910 to research frescoes, took the photograph printed in plate 160. It shows the newly inserted I-beams for the Service Stairs and the last remains of the paving being removed from the timber sub-structure in the Corridor of the Demon Seals. The deteriorated state of the timber boards is clearly visible in the plate.

The brick vaults of the new structure were covered with concrete to provide an even surface, which was then covered with square Maltese stone slabs like the floor above the Queen's Megaron in 1908. Only the corridor to the east of the Room with the Stone Bench was repaved with the reused rectangular limestone slabs quarried by Theodore Fyfe. The area immediately south of the Upper Hall of Colonnades was paved with fragmented stone slabs in 1903.[140] In the new reconstruction this area was also paved with square Maltese stone slabs and the surplus original material was employed to pave the door sills. All door sills were paved with original floor slabs, despite the fact that this material could not be assigned to specific doors not even to door sills in general. For example, in the right margin of plate 167 is shown the door between the corridor east of the Room with the Stone Bench and the Upper Corridor of the Demon Seal. In this plate the door sill is paved with rectangular stone slabs quarried by Fyfe in 1903. In the author's recording of 1997 the same situation features fragmented stone slabs.[141] The same situation applies for the southern end of the same corridor.[142]

[139]Compare plate 160, top.

[140]See plate 158.

[141]See figure 63.

[142]Compare plate 167 and figure 63.

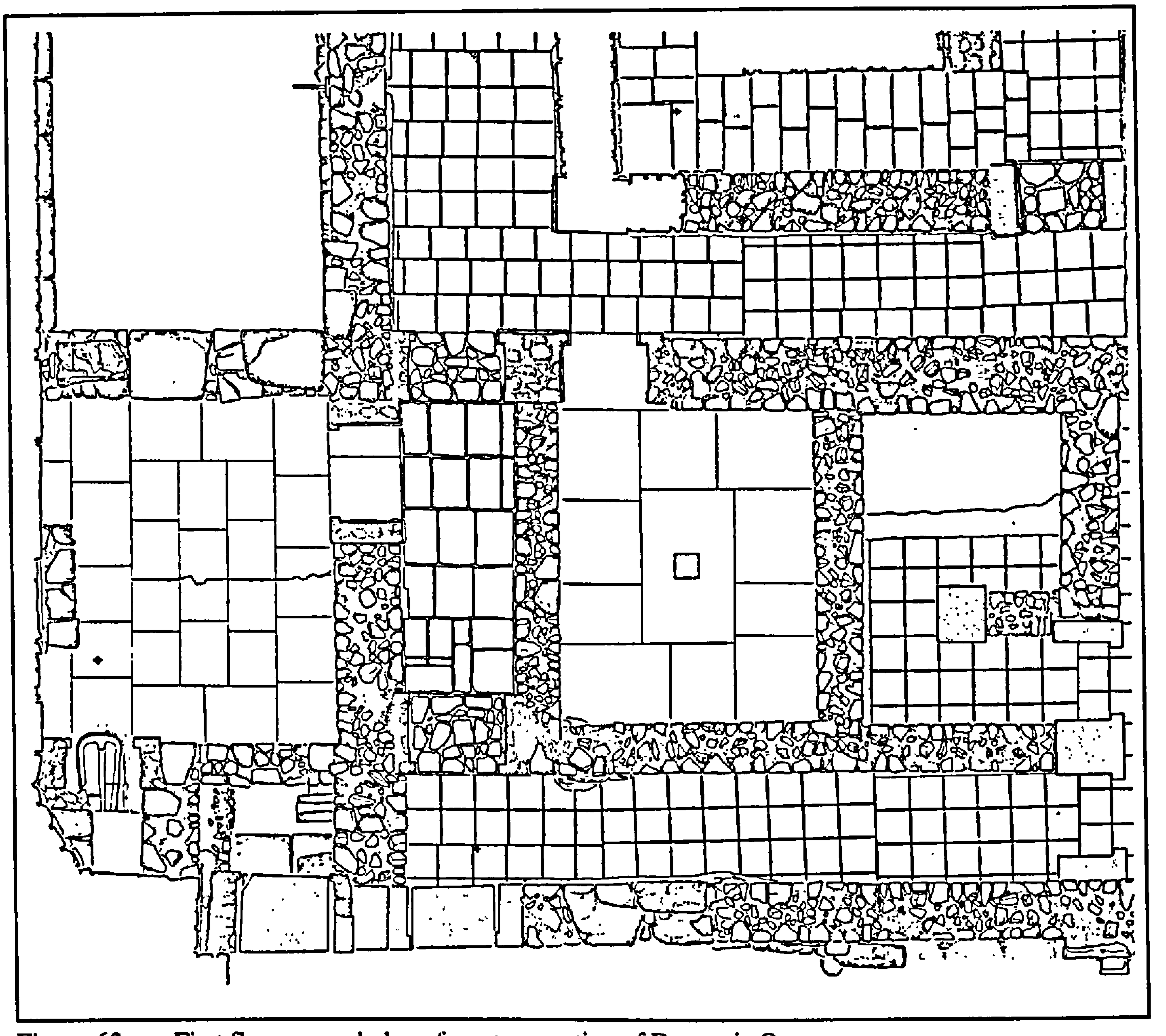


Figure 63 First floor ground plan of western section of Domestic Quarter.

It has been discussed in the previous chapter that the first floor paving material which was excavated at the Domestic Quarter did not suffice to pave the corridors. It is likely that Fyfe collected paving slabs from various areas to pave some parts of the corridor in 1902 but quarried new stone when he covered the corridors in 1903. Obviously, the broken original paving slabs had not been replaced to their former position but were liberally used. It seems that Doll felt no obligation to place the slabs at a specific position but preferred to create a system in which the square Maltese slabs cover the floors of the corridors and rooms while the remains of original slabs were used for door sills.

Another interesting detail can be found where the Upper Corridor of the Demon Seal turns north to lead to the Hall of Colonnades. The situation is depicted in the top right corner of plate 159. This shows the eastern jamb block with the projecting end at its northern side, but no block is visible at the western jamb of the door. The author's records made in 1997 show two jamb blocks with the projecting end at the southern side, the western block of which is made in limestone.[143] The eastern block is made of concrete but is distinctively different compared to the ones executed later by Piet de Jong.[144] Thus, the block positioned to the eastern jamb by Theodore Fyfe in 1903 was moved to the position of the western jamb in 1910, and a new western jamb block was cast in concrete. This is also documented in Doll's reconstruction plan for the this area.[145]

Doll also replaced the Service Stairs at the Corridor of the Daemon Seals. These had been reconstructed in timber by Theodore Fyfe in 1903. In May 1910 prior to the restoration work Doll recorded in two separate plans the situation he found in the area of the Service Stairs.[146] Subsequently, he removed the stairs and replaced them with limestone steps resting on a substructure of iron girders.[147] The wooden stairs were exposed to the weather for only seven years and, contrary to the corridors, they were not overlain by earth or paving material which trapped humidity. Thus, the stairs should not have deteriorated as much as the timber frames. However, the timber boards used for the construction of the stairs were thin and the stairs would not have lasted for a long time in an outdoor situation anyway.[148] All the surrounding areas were addressed by Christian Doll, and related to the bad experience with timber in the first instance, Doll and Evans might have decided to replace the stairs at that moment while they worked in this area rather than returning in a few years time. However, it is significant to Doll's approach that the stairs were replaced in longer lasting limestone, instead of timber, which according to Evans was the original material.[149]

[143]See First Floor Plan, Drawing 7.
[144]See plate 176.
[145]See Doll's Folder 17.
[146]See Doll's Folder, Nr. 23 and Nr. 24.
[147]See plate 160.
[148]See plate 158.
[149]Evans, 1902a. P. 75.

4.6 After Knossos

In 1910 Christian Doll, at the same time as his Brother Mordaunt Henry Caspars Doll,[150] became a partner in his father's office which was then renamed *C. Fitzroy Doll & Sons.*[151] However, even before this date he must have worked with his father, since most of the plans executed for Arthur Evans at Knossos were labelled *C. C. T. Doll, 5 Southampton Place, Bloomsbury, London*, the address of his father's office. His father, Charles Fitzroy Doll was also mentioned in connection with ordering goods for the Villa Ariadne. Thus we might assume that, at least to a certain extent, Charles Fitzroy Doll influenced the architectural ideas of his son at Knossos. Christian Doll became fellow of the Royal Institute of British Architects and succeeded his father as surveyor to the London Estates of the Duke of Bedford but, it seems that he did not design many buildings of outstanding architectural merit worth mentioning in relevant literature. However, he carried out some restoration work at Winchester College following war damage in World War II.[152] In 1913 Doll became member of the Society for the Promotion of Hellenic Studies.[153]

Christian's father died in 1929 and one year later he started his political career. He became a member of Holborn Borough Council in 1930 and was elected to the Aldermanic Bench in 1949. This culminated in his becoming Mayor of Holborn in 1950 - 51 and deputy Mayor in 1951 - 1953.[154] Christian C T Doll died 5 April 1955 and was buried 13 April at Kensall Green Cemetery.[155] It seems that Doll's interest in architecture was maintained predominantly through his father and after his father's death he became more interested in politics than in building work.

[150] Anon, 1923, p. 78.
[151] Gray, 1985, p. 166.
[152] *The Builder*, 6 May 1955, p. 761.
[153] See *Journal of Hellenic Studies*, Vol. XXXIII, 1913.
[154] *Holborn Council Minutes*, 27 April 1955.
[155] *The Holborn and Finsbury Guardian*, 15 the April 1955.

4.7 Conclusions

Christian Doll's predecessor, Theodore Fyfe, executed reconstruction and conservation work at Knossos between 1900 and 1904. His work was determined by the principle of minimal intervention and the search for building materials as similar as possible to the original ones. However, his work failed in many aspects. For example, the untreated softwood which was in contact with damp earth decayed, and his misinterpretation of the excavated structures led to the use of wrong support frames for the Grand Staircase. The principle of minimal intervention turned out to have been intervention below the necessary minimum.

Christian Doll was much more rigorous in his approach; and he was driven predominantly by technical and engineering issues. It seems that he was never able to escape his father's architectural influence in his professional life, but his technical knowledge was good enough to allow him to construct firm and permanent support for the collapsing ruins. The structural system he employed was based on the common techniques used in the inner city of London at the turn of the century, where he had worked with his father prior to his arrival in Knossos. He replaced Fyfe's reconstructions where they failed, and he tackled the areas his predecessor had not attended to, because he was concerned about the progressing deterioration on site. He expressed his views in both the discussion after a paper given by Arthur Evans in 1926 and in another given in 1928.[156] He was quoted in the report on the discussion after the 1926 paper:

> "Mr. DOLL emphasized the necessity to cover over parts of the site as so much gypsum had been used in the buildings, nearly all the pavements being of that material. It expanded on exposure to the summer sun and broke up into thousands of pieces. The dadoes had buckled and were tied up to keep them on the walls."[157]

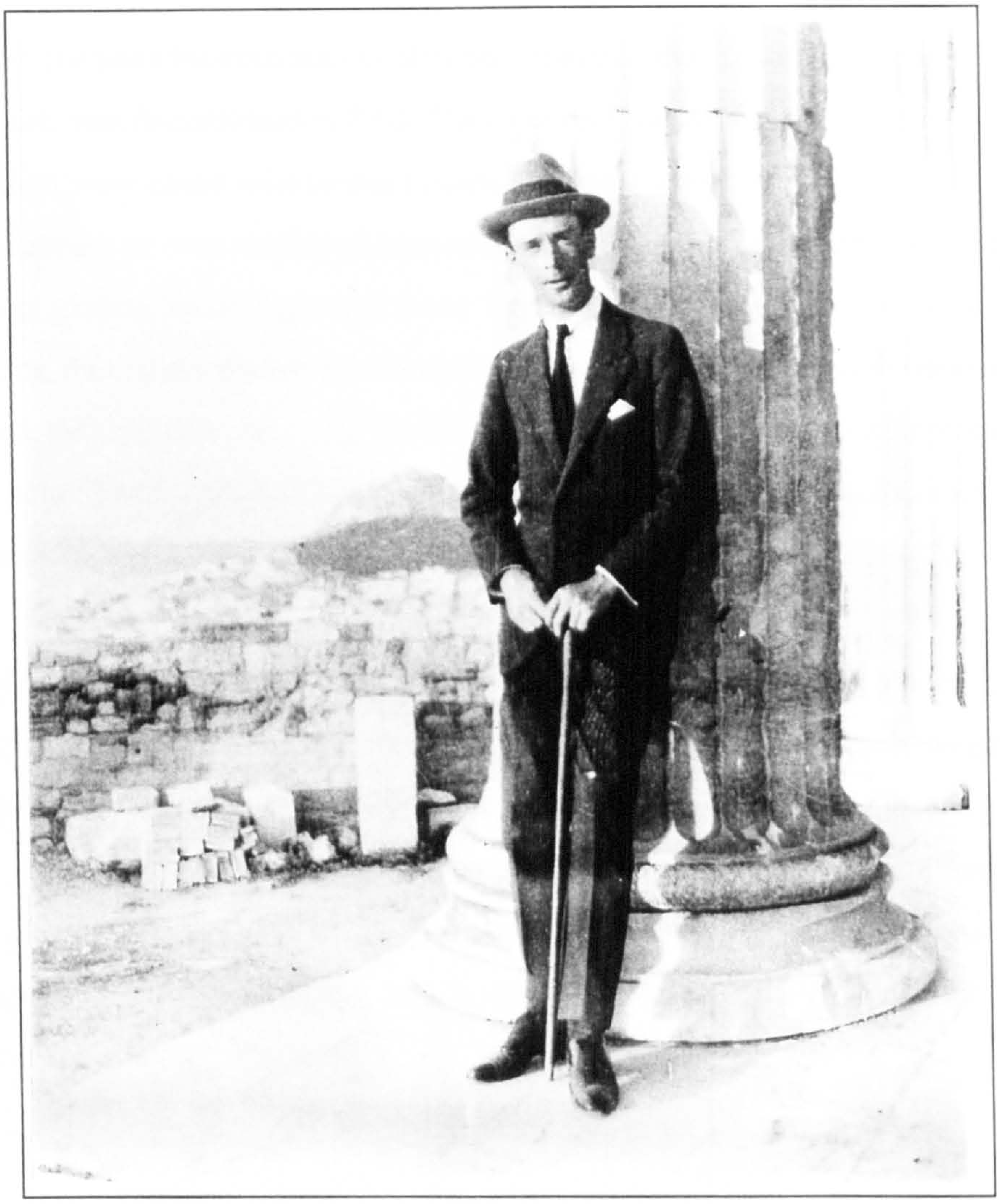
[156]Evans, 1927, p. 267 and Evans 1928, p. 101.
[157]Evans, 1927, p. 267.

However, the unity between structural system, material and appearance, achieved by Fyfe in his work, was discontinued by Doll. The structural system was executed in iron girders which then were cased with timber boards to appear as beams. In his later work at the Grand staircase he even employed concrete to represent the timber beams. Both cement and iron girders were imported from Britain at high expense for Arthur Evans. Obviously, these materials were deliberately chosen despite this obstacle because, on the one hand, the materials chosen by Theodore Fyfe had been rejected as inappropriate, and on the other hand, Doll was confident in the durability of the materials, with which he was familiar.

Christian Doll's approach to the conservation problems on site were technical. Excavated material had to be protected and masonry, some of which of considerable weight, had to be supported. To achieve these objectives he employed standard engineering methods which were covered with timber boards. Construction and appearance were two different issues to him. Furthermore, Doll addressed the problems on site with a vigorous energy, frequently mentioned by Evans, which stands in contrast to Fyfe's careful, and even sometimes hesitating, approach.

Chapter 5

The Works by Piet de Jong 1922 to 1930



Piet de Jong

Beauty will result from the form and corerespondence of the whole, with respect to the several parts, of the parts with regard to each other, and of these again to the whole; that the structure may appear an entire an complete body, wherein each member agrees with the other, and all necessary to compose what you intend to form.

(Palladio, 1570, book 1 Chapter 1)

Chapter 5

The Works by Piet de Jong 1922 to 1930

5.0 Introduction

Piet de Jong was the third and final architect employed by Arthur Evans at Knossos for recording work as well as for conservation and reconstructions. He was already a well established conservation architect and draughtsman at archaeological sites in Greece when Evans employed him. Unlike Theodore Fyfe and Christian Doll, he did not return to Britain after the completion of his work at the site but remained in Greece and later became Curator at Knossos. After Evans's death he planned and supervised more conservation and reconstruction work in Knossos for the Ephor Nikolaos Platon. Out of the three architects employed by Arthur Evans at Knossos, he was the only one who continued working in the field of archaeology in Crete.

The site of Knossos, as it presents itself today, is predominantly the result of Piet de Jong's work. He not only executed large new reconstructions on site, but also remodelled some of the earlier work carried out by Doll and Fyfe. The use of concrete as a material for the reconstructions is commonly linked with his name; but, as we have already seen in the last chapter, it was Christian Doll who introduced this material to Knossos. Nonetheless, it was Piet de Jong who designed almost all of the reinforced concrete reconstructions. Since much of the criticism of Knossos is focused on concrete, this certainly becomes an interesting point to study.

During the period of Piet de Jong's work at Knossos the site was donated to the British School at Athens. In 1922 Arthur Evans, then 71 years old, initiated the idea and two years later, on 11 January 1924, the Deed of Gift was signed in Oxford. He also added an endowment to pay for the salary of a curator.[1] From this point on, Evans was nominally no longer the owner of Knossos; but he still continued working in his accustomed way. In the same year Piet de Jong was employed as the official School architect of the British School at Athens. Consequently, Piet de Jong's work in Knossos falls in two sections: first, the work he executed for Evans in 1922 and 1923, when Evans was owner of the site as well as de Jong's employer; and then after 1924, when de Jong worked for him while the British School was owner of the site.

5.1 Before Knossos

Despite the fact that he is the most recent of the three architects, little information about him survives. Much of the information on his life comes from Rachel and Sinclair Hood, who knew de Jong personally.[2] Piet was born on 8 August 1887 in Leeds; his mother was from Yorkshire and his father was of Dutch origin. Piet grew up in Yorkshire and studied architecture at the Leeds School of Art. In 1911 Piet de Jong designed a guild hall to compete for the Soane Medallion: in January 1912, the prize awarding committee found itself unable to award the Medallion to either William Friskin or Piet de Jong and, consequently, awarded a Honourable Mention and half the prize money to each of them.[3] In *The Builder*, de Jong's proposal, submitted under the motto "Antæ", was described:

> "The scheme by Mr. Piet de Joug [sic] is more compact, better arranged for the circulation of the public at receptions, more "practical," worked out better, perhaps and if there is anything to choose between them on this score it may possibly show more technical accomplishment; but in its general lay-out, massing and grouping, and scale of feature it makes no special effort to take advantage of the character of its site or to express the influence of its environment. It is not altogether a solution of the exact problem involved."[4]

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[1]Waterhouse, 1986, p. 83.

[2]See Sinclair Hood's obituary of Piet de Jong in *The Times*, 27 April 1967, p. 12.

[3]*The Builder*, 26 January 1912, p. 85.

[4]*The Builder*, 26 January 1912, p. 86. The spelling of Piet de Jong's Name was corrected in *The Builder*, 2 February 1912, p. 123. See also: Journal of R.I.B.A. 27 January 1912, p. 228 and 237.

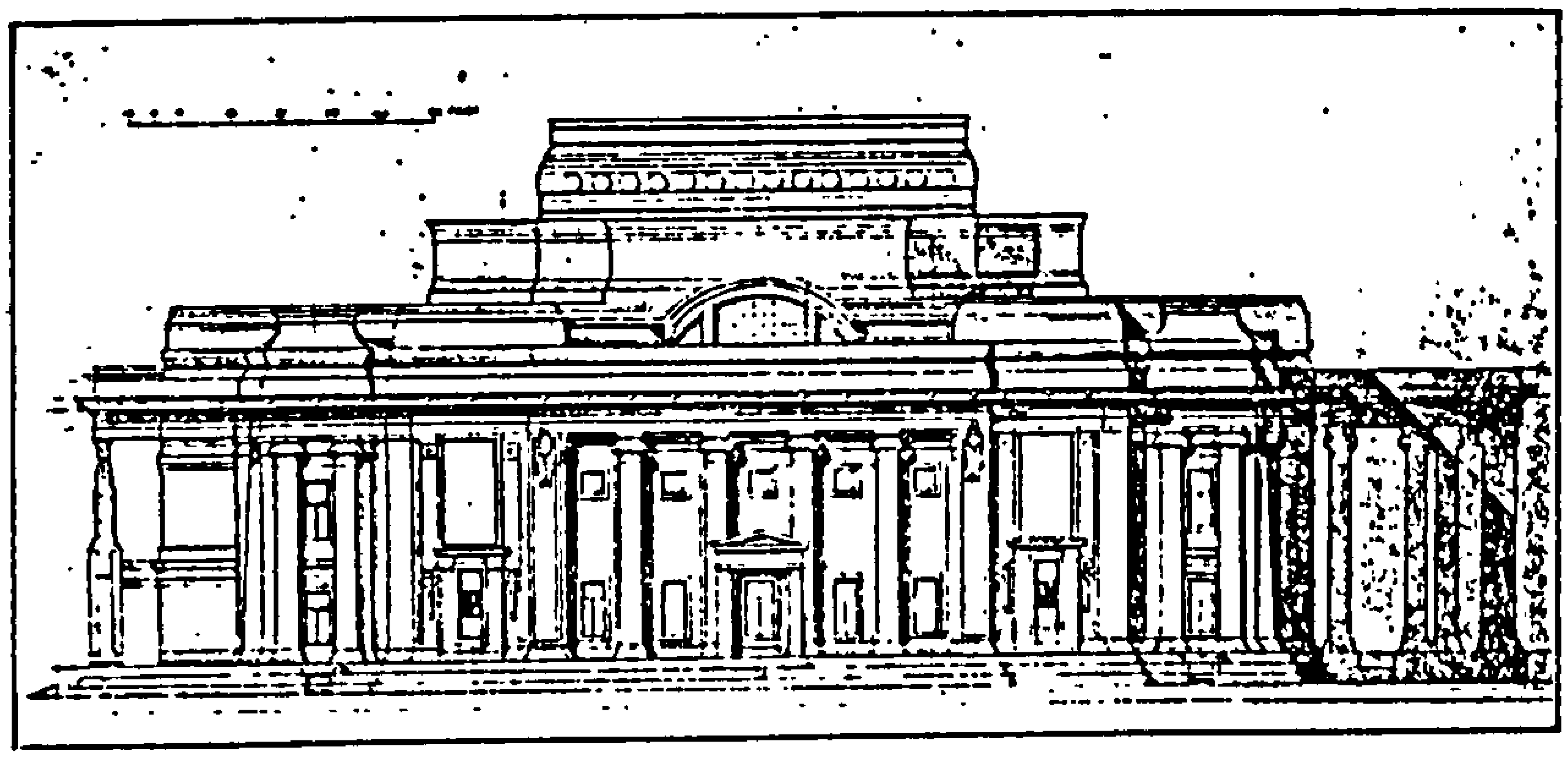

Figure 64 Side elevation. Design for a Guild Hall. R.I.B.A. Soane Medallion. Design by Piet de Jong.

The price money allowed Piet de Jong to join his friend Herbert Foggitt travelling to Italy to study historic buildings. He was admitted as an architectural student to the British School at Rome for the season 1911/1912. De Jong and Foggitt travelled widely in Italy studying architecture in Rome, Florence, Perugia, and Siena.[5] He made architectural drawings, some of which have been published in the Architectural Association Sketchbooks of 1912 and 1913. Together with Foggitt he recorded the Bramante's Tempietto di San Pietro in Montorio in Rome.[6] Interestingly, at this time the AA Sketchbook was co-edited by Theodore Fyfe.

Piet de Jong returned to Britain and it seems that he worked for the practice of his friend, Chorley, Gribbon and Foggitt.[7] The Church of Christ Scientist was planned by the architectural practice of Schofield and Barry but the execution was left to Chorley, Gribbon and Foggitt. De Jong produced a watercolour of the proposed church in 1913. He served as a soldier in World War I, probably for the entire period between 1914 and 1919.[8] After the war he joined the East Macedonian Reconstruction Service which was

[5]Annual Report, British School at Rome, 1911/1912.

[6]*AA Sketchbook 1912*, plan 65 and 66. For information on Bramante's Tempietto see: Murray, 1989, p. 67.

[7]On Chorley, Gribbon and Foggitt see: Felstaed, 1993, p. 170. This information was provided by Rachel Hood.

[8]A photograph showing Piet de Jong in uniform is dated 1916. In ownership of Rachel Hood.

run by the British Architect Austin Harrison. He stayed in Greece where he met Effie, his future wife. Born in Scotland she lived in Greece where she taught English. They married in Saloniki in 1921 and settled in Greece.[9] Piet de Jong had worked for Alan Wace in Mycenae after World War I and produced plans of the acropolis. Evans had been impressed by these plans and invited de Jong to work for him at Knossos.[10]

5.2 The Reconstruction Work in 1922 and 1923.

In 1910 Christian Doll designed his last major reconstruction work at Knossos and after this date another excavation campaign took place in 1913; but it seems that no conservation or restoration work was executed at this time. After the outbreak of World War I, access to Crete became difficult and neither Arthur Evans nor Duncan Mackenzie visited the site again until 1920. In September 1920, Evans sent Mackenzie to Knossos to see if it was safe to resume work. He reported in a letter to Evans:

> "It was dark when I got to Knossos but I could realize that I had entered a grove of tall trees enclosing Villa Ariadne on every side. Both the house and the garden I found in quite good condition and indeed quite different from the various tales (mostly Cretan lies) that had been arriving in England from time to time.
>
> I cannot say the same thing about the condition of the Palace which I found a perfect wilderness of weeds a metre high. This was true of the whole palace with the exception of the covered part of the Domestic Quarter, and the Queen's Megaron, owing to its roof-pavement of Maltese slabs, was quite intact. The blame for this condition of things rests with Hajidakis who is responsible for Knossos whereas the other sites in charge of Xanthoudidis are in quite good order."[11]

[9]Information in personal communication by Rachel Hood.

[10]Report in BSA, XXVI, p. 318 and Cottrell, 1953, p. 192.

[11]Letter from Mackenzie to Evans, 14 September 1920. Evans Archive, Ashmolean Museum. Nicoletta Momigliano, who is researching the life and work of Duncan Mackenzie, has provided me with this information. Joseph Hadjidakis (Hazzidakis) was a medical doctor and president of the Syllogos in Herakleion, a local organisation interested in archaeology. Stephanos Xanthoudides was secretary and deputy of the Syllogos.

A negative outfall of World War I was Evans's inability to gain access and to arrange care for the site during this lengthy period. In this period he wrote the first volume of *The Palace of Minos* and, in the writing process, he discovered several lacunas in his research but he could not return to Knossos to clarify these details.[12] Furthermore, the lack of maintenance for over seven years emphasised the differences between the covered areas and the exposed areas at Knossos. It could hardly have been more visibly obvious to the excavators how the reconstruction of ceilings protected the structures underneath. As a result it is not surprising that Evans more decidedly favoured further reconstructions at the Palace of Knossos.

5.2.1 The Magazines South of the Throne Room

In 1922 Evans and Mackenzie resumed work at Knossos excavating the Magazine of the Arsenal at the north border of the palace and at the south front. The excavations at the south front led to a new understanding of how the original approach in Minoan times might have been. Evans wrote in *The Times*:

> "The corridor, with the remains of processional frescoes to which this state entrance, as it existed in later times, gave access, had originally taken a turn east to a propylaeum on the south, from which again a broad flight of steps led to the great columnar hall of this section of the Palace. Many new evidences of this approach were brought to light by the present investigations, but it was on the north borders of the hall that the most surprising new development took place. Here the *"piano nobile"* consisted of an elongated space, approached from the central court by a stepped portico of which the remains of a second column base now came to light belonging to its uppermost steps. Blocks and slabs, either ledged on the wall tops or sunk into the basements, showed that the portico had led on the left to a corridor giving on the great hall and on the right to what had been the main staircase of the West Palace wing; slightly broader than that of the "Domestic Quarter" on the East. The elements of reconstruction were indeed so full that I have been able to restore twelve steps of the first flight, so that with the upper steps of the portico also completed, the whole has become one of the most prominent features of the site. For the first time we have direct evidence of a second storey to the West

[12]Evans, 1922, p. 319.

Wing and so full are the materials that Mr F. G. Newton has been able to draw a detailed elevation of this section of the façade, overlooking the Central Court and bordering the Room of the Throne."[13]

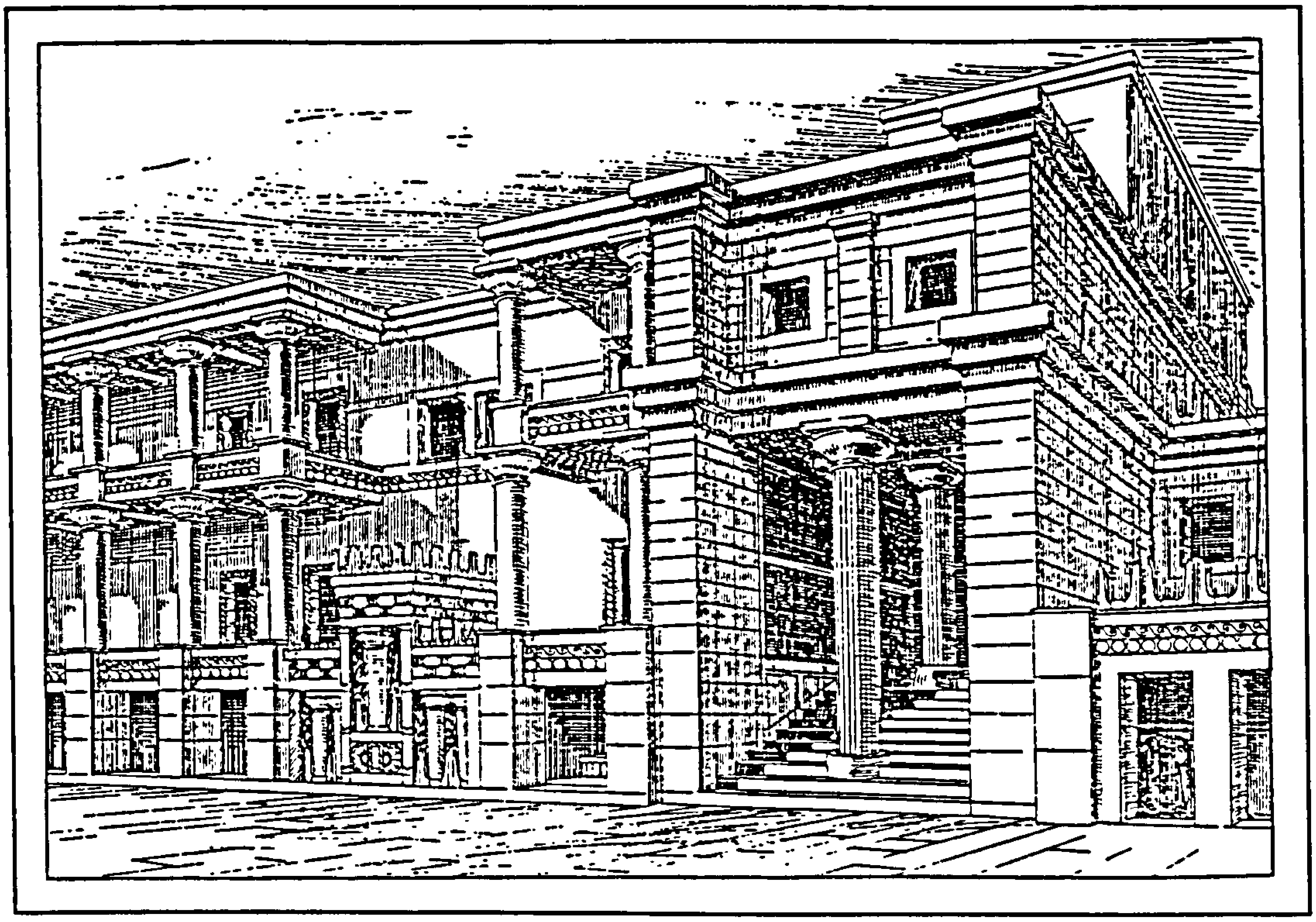

Figure 65 Restored view of a section of the West Wing. F.G. Newton

The new research altered the understanding of this area which can be seen in a comparison of the earlier plan of 1901 with the executed reconstruction of 1922 and 1923. The first flight of stairs consists of only 8 steps in the earlier plan and features only one column, while, in the later reconstruction, 12 steps were executed and a second column placed at the upper end of the stairs.[14] The upper flight is missing completely and only the identification of two stone blocks with step marks at their side, facilitated the reconstruction of a second flight upwards in 1922.[15]

[13]*The Times*, 14 July 1922, p. 11. See figure 65.

[14]Evans, 1901, p. 21 f.

[15]*The Times*, 14 July 1922, p. 11.

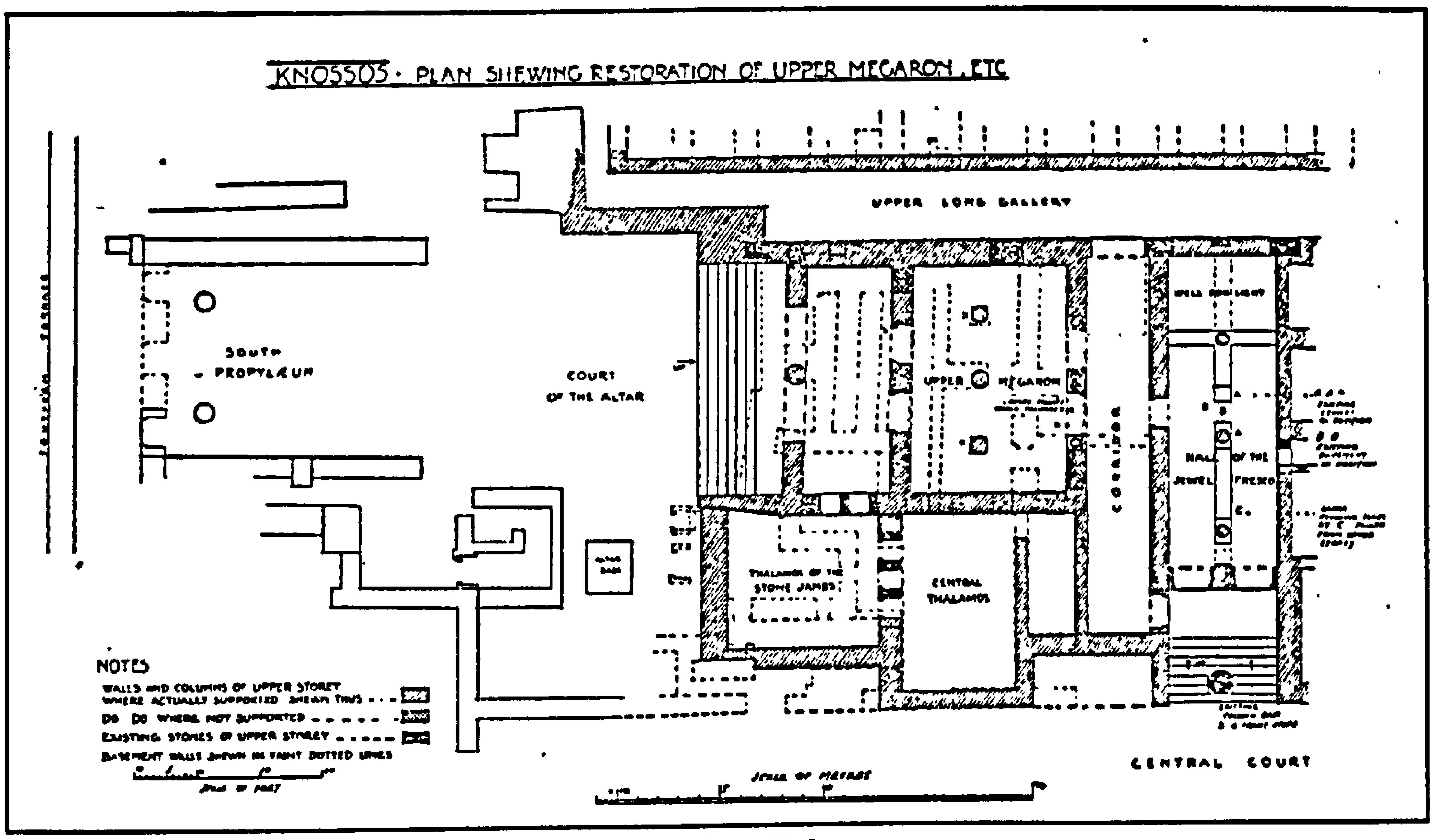

Figure 66 Plan of the West Wing in 1900. Theodore Fyfe

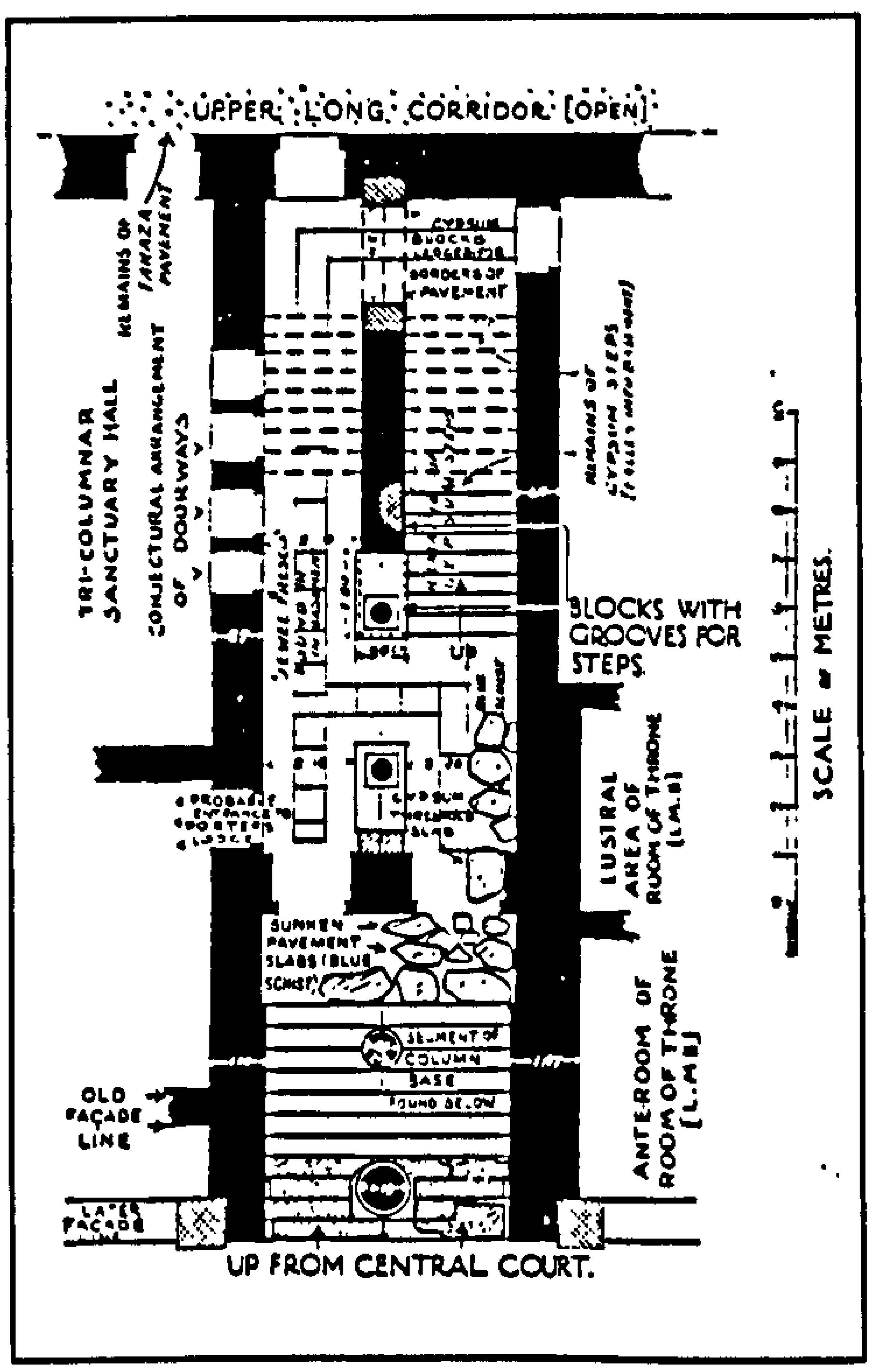

Figure 67 Restored plan of the Stepped Portico. Probably Piet de Jong.

The substructure of the lower flight of stairs of the Stepped Portico was formed by the Middle Minoan III Magazine while the first floor corridor was located above two magazines, south of the Throne Room.[16] The southernmost of these magazines was named the Magazine of the Vase Tablets in Theodore Fyfe's plan of 1902, but this name never gained wide acceptance and is normally referred to as the Magazine of the Jewel Fresco.[17] The northern Magazine, parallel to the Magazine of the Jewel Fresco, was not named by Evans. Both magazines are aligned east to west with their western end bordering the Long Corridor. The Middle Minoan III Magazine, located towards the Central Court at the eastern end of the two

[16]Compare Ground Plan, Drawing 1 and First Floor Plan, Drawing 2.

[17]See Hood and Taylor, 1981, p. 17.

long magazines, was built, as the name suggests, in the Middle Minoan III period and, consequently, is not contemporary to the other magazines which were build in Late Minoan I.[18] After an earthquake at the close of Middle Minoan IIIb, the entire area was remodelled. This was referred to by Evans as the 'Great Rebuilding'.[19] The eastern facade of the West Wing was pushed towards the Central Court, which allowed for the construction of the Stepped Portico.[20] To provide a firm support for the steps, the Middle Minoan III Magazine was filled in. Later, in Late Minoan II, the Throne Room area was completely remodelled.[21] Hence, the structures in this area originate from different Minoan periods and not all of them were used at the same time.

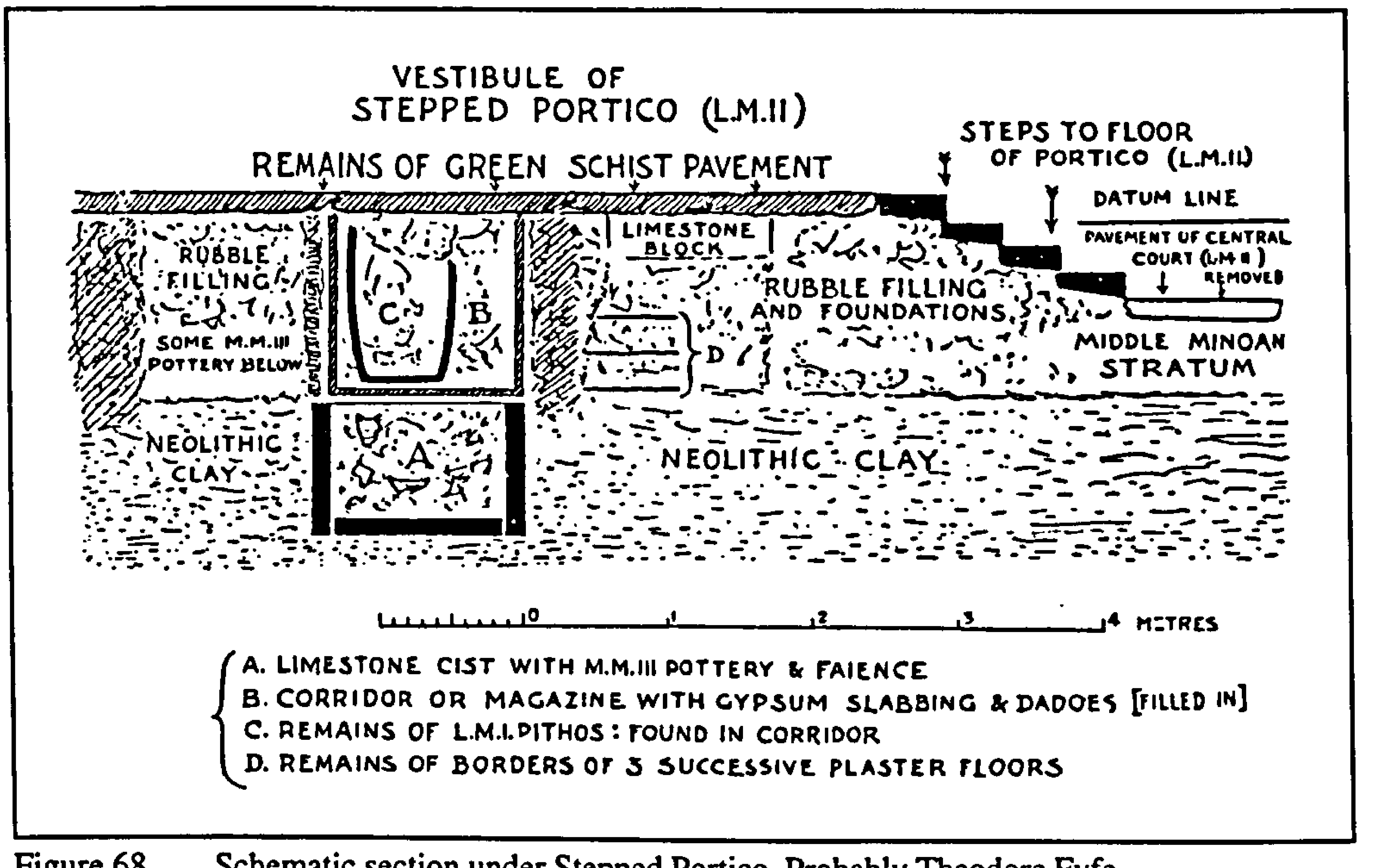

Figure 68 Schematic section under Stepped Portico. Probably Theodore Fyfe.

In 1922 Piet de Jong roofed over the Magazine of the Jewel Fresco and the magazine to its north and reconstructed the first flight of stairs of the Stepped Portico above the Middle Minoan III Magazine.[22] Employing rubble masonry, he elevated the walls to the projected ceiling height which he derived from Fyfe's reconstruction of the Throne Room

[18]Evans 1904, p. 30 ff and PM I p. 453 f.
[19]PM IV, p. 872 f.
[20]PM IV, p. 873.
[21]PM IV, p. 902.
[22]*The Times*, 14 July 1922, p. 11.

in 1901. The original walls had survived to a height of approximately 1.50 metres and the reconstructed new walls, resting on the excavated structures, had exactly the same thickness as the ancient walls. The line of reconstruction is only recognisable by the more regular masonry style of the rubble walls and details like the discontinued slot for vertical reinforcement beams.[23] The reconstruction of the walls with the same thickness as the originals was necessary in order to provide a firm base for the planned walls of the upper storey. The brick pillars, which had been erected by Theodore Fyfe during the roofing of the Throne Room in 1901, were incorporated in the new reconstruction. A natural difficulty was encountered at the junction of the wall with the pitched roof of the Throne Room, which rested at its south side on the north wall of the newly reconstructed Stepped Portico. In the upper part of this wall a recess was created to allow a firm lateral support for the pitched roof.[24] However, a way had to be found to drain away the rain water which collected at this point.[25] A window was created in the reconstructed south wall of the Magazine of the Jewel Fresco which allowed air circulation and light. This enabled the magazine to be used for storage purposes.[26]

According to Fyfe's plan of 1902, access to the Magazine of the Jewel Fresco originally was from the Long Corridor at the West; but this was blocked later. The northern magazine was only accessible from the Throne Room and no door connected the two magazines.[27] There was also no door connecting the long magazines with the Middle Minoan III Magazine. The cists in this magazine were discovered in 1904 and only then was the function of this space as a magazine fully understood.[28] It then became clear that the Middle Minoan III Magazine originally extended north but, had been cut off by the construction of the Throne Room area in Late Minoan II.[29]

[23]See figure 69.

[24]Compare plate 59.

[25]See plate 33. Unfortunately, the photograph does not indicate how the rainwater disposal was organised.

[26]See plate 41.

[27]See Fyfe's Plan 1902, plate 8.

[28]Evans, 1904, p. 30 f.

[29]Evans, 1904, p. 30 f.

In the first reconstruction of 1901 the door, which linked the Throne Room with the magazines had no lintel; however, the rafters of the flat roof fulfilled this function.[30] In 1922, iron-I-beams were employed for the lintels above the door. These were laid at a distance just wide enough to place bricks between them.[31] The other two doors, which were not recorded in Fyfe's plan of 1902, were reconstructed in 1922.[32] However, in plate 54 both doors can be detected. The door leading to the Middle Minoan III Magazine seems to have existed near the first brick pillar; but this door was not recorded in 1901 and it is rather unlikely that the two non-contemporary magazines had ever been linked with doors. Rather it is more likely that this part of the wall was cleared in 1901 to provide enough space for the erection of the brick pillar.[33] In 1922 Piet de Jong utilised this cleared area to give access to the Middle Minoan III Magazine, which then was covered by the reconstructed steps and could not be accessed in any other way. Brick and limestone were employed for the jambs and the lintels were made in the same way as for the door to the Throne Room. The other door between the two long magazines is marked in the photograph by the large rectangular block close to the fourth brick pillar from the right.[34] In contrast to the other doors, this one was bridged with three square wrought iron rods and covered with limestone blocks.[35]

The ceiling was constructed using the method, employed by Christian Doll in his reconstructions several years earlier. When work was resumed at Knossos after World War I, Evans, Mackenzie, and de Jong could see that this system had successfully protected ancient fabric. In individual systems for each magazine, iron girders and brick vaults were employed for the construction of the ceilings. De Jong also restored the first flight up from the Central Court to the Hall of the Jewel Fresco at first floor level.

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[30]See plate 49.

[31]See Ground Plan, Drawing 1 and Section B-B, Drawing 3. Door between MM III Magazine and magazine north of the Magazine of the Jewel Fresco.

[32]Compare Ground Plan, Drawing 1 and Plan 1902 in Plate 8.

[33]See plate 54.

[34]See plate 54 and compare the same block in the Section B-B, Drawing 3.

[35]See Section B-B, Drawing 3.

Material survived only for the first four steps of the stairs, the other eight steps and parts of these four steps had to be restored with new material.[36] Remains of a second column base were found in this area which was supposed to have originally been located in the middle of the uppermost steps of the Stepped Portico. This reflected a similar situation at the bottom steps.[37] These remains were incorporated in a new limestone column drum which was placed at this level.[38] The lower eight steps rest on a massive substructure while the upper four steps were above the Middle Minoan III Magazine. Here a new wall was built which continues the line of the separating wall between the two long magazines.[39] A brick arch spans from the wall end to the eastern wall of the magazine, separating the room in two halves. The northern area is roofed with the usual iron-girder and brick vault technique and lines the vaults parallel to the ones in the two long magazines. The ceiling construction for the southern part of this room is much more complicated. An iron girder was laid north-south, with its northern end terminating at the spring of the brick arch. The south-eastern quarter was left open and the south-western quarter was covered with brick vaults aligned east to west.[40] This construction allowed the visitors to see, while on the stairs, the cists in the Middle Minoan III Magazine below.[41]

In 1922 Piet de Jong also completed the first eight steps of the second flight. This reconstruction includes the under-construction of three vaults similar to the ones employed by Doll for the restoration of the Grand Staircase. Furthermore, he reconstructed the middle wall in this area to a height of approximately 1.60 metres above the first floor level and also the bases of the division wall to the east of it.[42] This was the full extent of his 1922 campaign

[36]See plate 54 and First Floor Plan, Drawing 2.

[37]*The Times*, 14 July 1922, p. 11 and the sketch drawing of original fragments in figure 70.

[38]See plate 33 and compare with plate 54.

[39]Compare plate 54 and plan Fyfe 1902, plate 8, without the wall.

[40]See Section B-B, Drawing 3.

[41]See plate 32 , First Floor Plan, Drawing 2.

[42]See plate 32.

Piet de Jong left Knossos on 12 June 1922 to work for Alan Wace in Mycenae.[43] The original elements, mentioned by Evans, were reinstated at their original positions in the reconstructions.[44] Perhaps Piet de Jong and Evans considered the work completed at this stage, but reconstruction work was resumed one year later. The early departure of Piet de Jong, who probably had contractual obligations to work for Wace, might account for the incompleteness of this restoration work. But a much more serious problem may have caused de Jong to interrupt his reconstruction work at this point, and continue it later. As can be seen in figure 69, approximately three metres west of the doorway between the two long magazines, the ceiling construction sags but the concrete floor above it remains horizontal. This subsidence only occurred at the middle wall between the two magazines, and not at the northern and southern wall. As can be seen in plan 1, the middle wall clearly shows irregularities in this area which do not occur at other parts of the wall. The outer and inner face of this wall detached and bulged, causing the subsidence.

There are three possible explanations why this had happened. First, this subsidence might have occurred during the winter 1922 to 1923 and was not responsible for the interruption of the work. It being only discovered in 1923 when work was resumed. Second, Evans reported that an earthquake hit Crete on 20 April 1922 but he mentioned no damage to the palace or the reconstructions.[45] The dissection of inner and outer face of masonry is a typical earthquake damage but it can also originate in standard subsidence situations.[46] Third, the subsidence occurred because of the construction of the first floor middle wall in this area, which not only imposed its own weight upon the structures below but also placed upon it half of the load of the upper stairs which received lateral support from this wall. Piet de Jong constructed this wall to the height of only approximately 1.60 metres above the first floor level. He then may have been forced to stop the reconstruction work in order to consolidate the middle wall in the ground floor

[43]Report, Annual of the BSA, No. XXV, p. 3.
[44]*The Times*, 14 July 1922, p. 11 and compare with the sketch drawing. Original parts are hatched.
[45]Evans, 1922, p. 327.
[46]Binda and Anzani, 1997, p. 117.

before returning to the completion of his work at the first floor level a year later. Whatever reason caused the subsidence in this area; it changed the situation for Piet de Jong considerably when he resumed work in 1923.

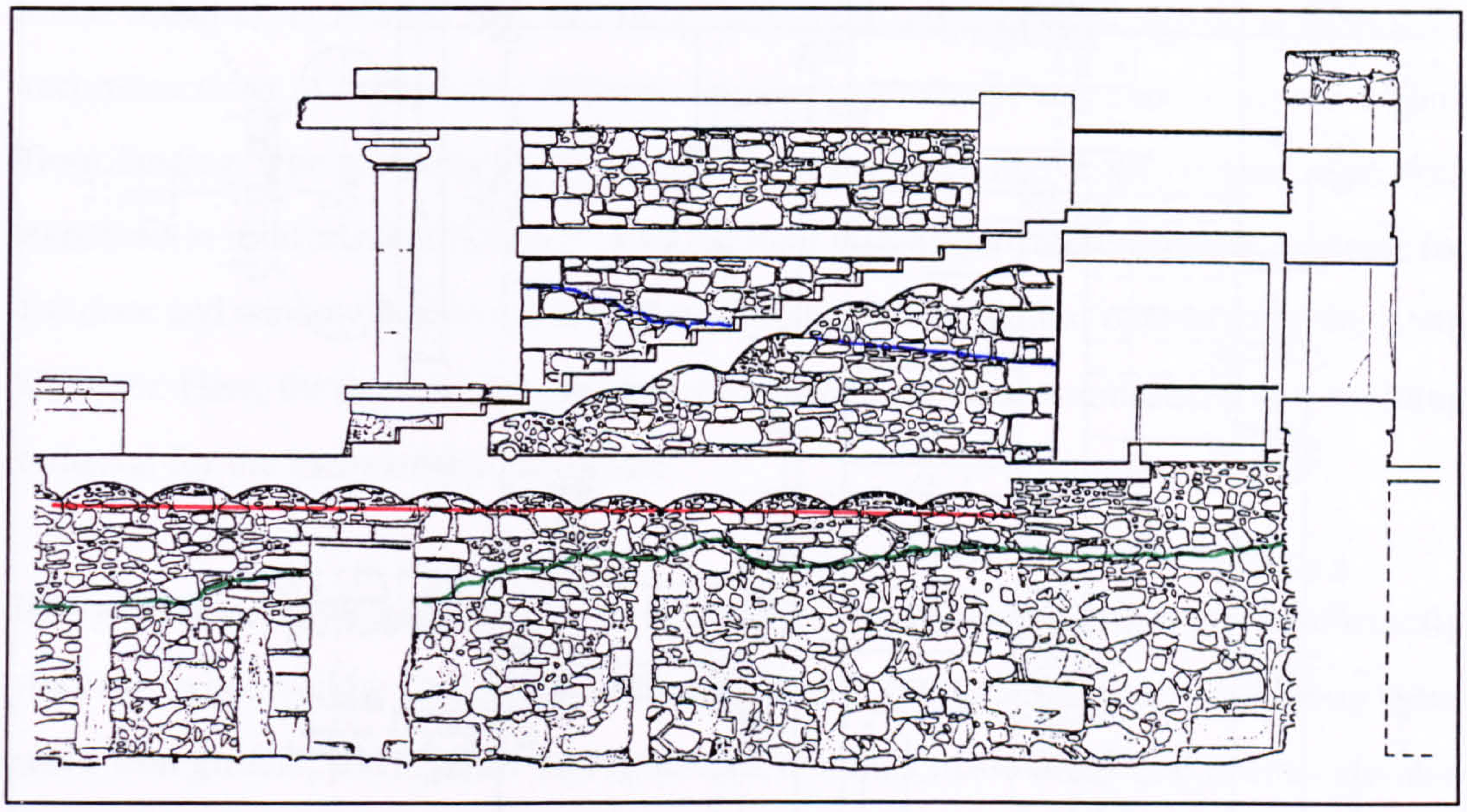

Figure 69 Section of the Stepped Portico and the Magazine north of the magazine of the Jewel Fresco looking south. Original remains below green line. Reconstruction work of 1922 below the blue line. Red line indicates horizontal line and shows subsidence.

5.2.2. The Stepped Portico

Piet de Jong returned to Knossos on 12 May 1923 to resume reconstruction work at the Stepped Portico. This work lasted until August, when he left to join Alan Wace again at Nauplia.[47] The second flight of stairs, which had already been executed to the eighth step, was continued with another ten steps; a second floor landing was also reconstructed. The middle wall and the northern wall of the upper corridor were elevated to serve as lateral support for the upper flight of steps and a limestone column was placed at the eastern end of the middle wall and superimposed by a concrete beam.[48] A horizontal concrete beam was inserted in the middle wall at lintel hight, two metres above the floor.

[47]Report, Annual of the BSA, No XXV, p. 5.

[48]See plate 37.

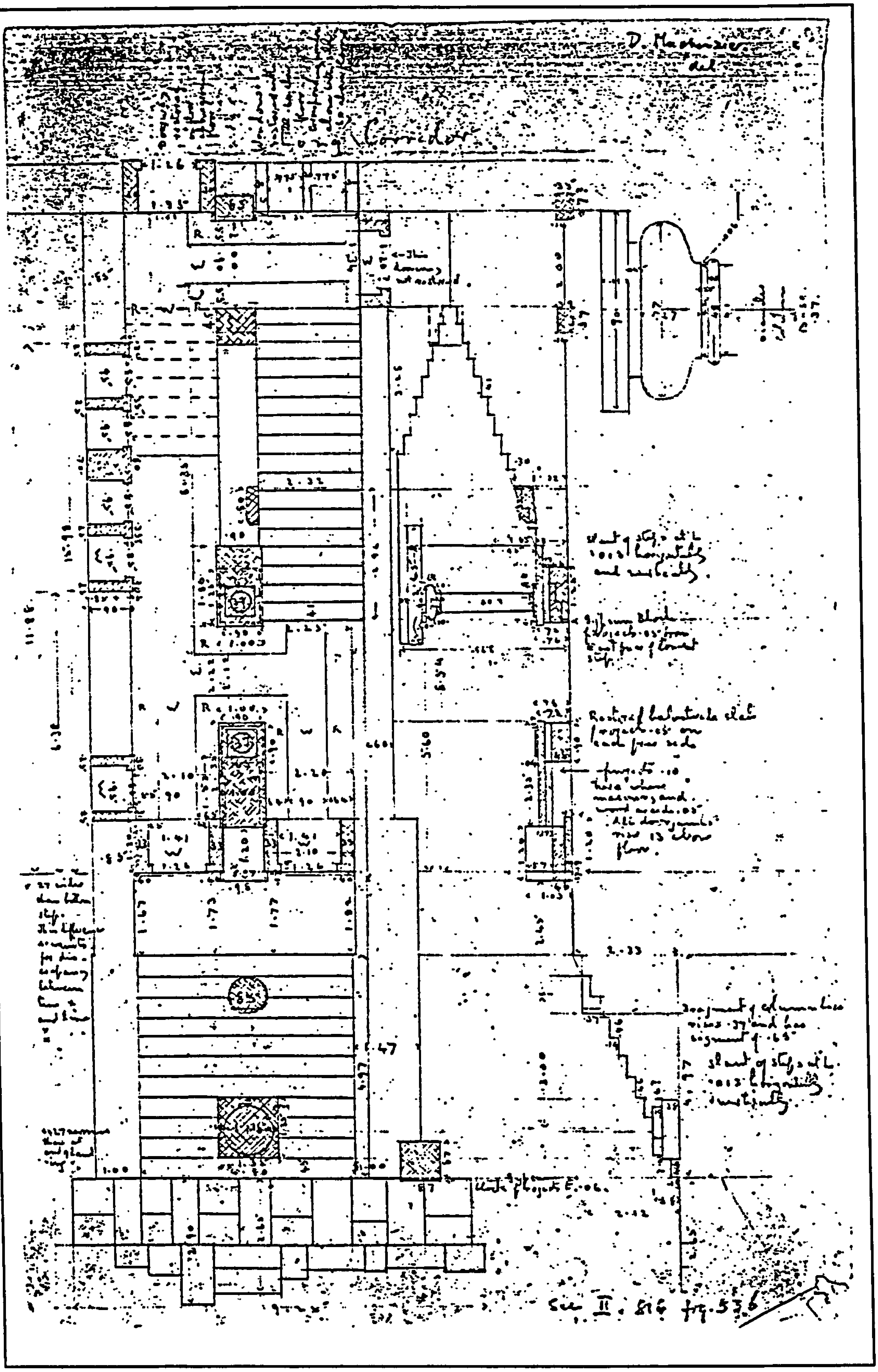

Figure 70 Plan for reconstruction of the Stepped Portico. Original Remains are hatched. Piet de Jong [?]

The reconstruction plan for the Stepped Portico shows that no beam was planned in this area and its construction must be regarded as reaction to the subsidence problems.[49] The column was executed in limestone - the same technique employed by Doll at the Grand Staircase in 1910. The substructure for the upper part of the stairs was built using the same method employed by de Jong one year earlier and copied from Doll's reconstructions. A completely different approach, however, was chosen for the second floor landing. The platform for this landing and the beam above the column were both executed in reinforced concrete.[50] Piet de Jong also employed reinforced concrete for the door and window frames at the west wall of the reconstruction overlooking the Long Corridor. Here, for the first time genuine reinforced concrete was employed as a building material for the reconstructions on site.

Many of the materials and techniques employed for this reconstruction work were exactly the ones employed by Doll in his reconstruction at the Grand Staircase. Among them were iron girders, brick vaults and limestone columns made of several drums. He also copied Doll's system of leaving a gap between original stone blocks with step marks at their side and the new steps. The first three steps, as well as steps number six and seven of the second flight, were not extended to the middle wall but reveal the marks of the original steps at their side.[51] However, photographic and literary evidence date the work to 1922 and 1923 when Piet de Jong and, for a short stay, F. G. Newton were the architects in Knossos and Doll was not in Crete. The work, obviously, was executed by de Jong and, in 1922, he almost exactly reproduced the methods and materials employed by Doll. In 1923 he seems to have suddenly switched to reinforced concrete. Three possible explanations might be advanced. First, the material for the earlier part of the

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[49]See figure 70. The plan was labelled by a staff member of the Ashmolean Museum '*D. Mackenzie del.*' (top right corner) and '*see II. 816, fig. 536*' (bottom right corner). However the handwriting on the plan diverges considerably from Mackenzie's writing. Furthermore, Mackenzie almost never commented on reconstruction work in his diaries. It seems illogical that he would produce reconstruction plans while an architect works on site. I assume the plan was made by de Jong or, perhaps by Newton. The plan is definitely not a later record of the situation after the restoration because it diverges in many details from the executed work such as the light well at the western end of the magazine north of the Magazine of the Jewel Fresco. Compare with plan 2.

[50]See plates 34 and 36.

[51]See plate 33 , sketch drawing and real drawing.

reconstruction work had already been organised and provided on site by Doll before World War I brought the works to a standstill in 1913. Piet de Jong may simply have utilised material that had already been provided. Second, the obvious success of Doll's reconstruction work at other areas of the Palace might have led de Jong to copy his design. After a forced absence of seven years, the difference between the well-preserved areas which had been roofed over and the exposed areas became clear. It is a logical course of action to repeat what had proved to be successful, not only in principle but also in technique and material. Third, Arthur Evans might have asked Piet de Jong to repeat Doll's system without allowing him freedom to express himself architecturally. This explanatory model is rooted partially in the previous explanation, and assumes that Evans felt Doll's system was successful. The third explanation is rather unlikely, since Evans allowed Piet de Jong considerable architectural freedom one year later. However, the most likely explanation is, that Evans and de Jong decided together to continue the reconstruction work in the techniques and methods, employed by Christian Doll.

This changed in 1923 when de Jong returned to Knossos to continue the work he had begun the previous year. He was forced to reproduce the brick vaulted substructure under the second flight of steps for technical reasons. A continuation of the stair in reinforced concrete would have caused severe technical problems. At the second floor level, however, he was able to employ his own architectural ideas. But what provoked these changes? Certainly the most likely explanation may be found in the sagged ceiling construction of the ground floor. The brick vaults rested on iron girders which are, structurally speaking, linear members. The lateral support for these members was provided by the outside walls and the middle wall which, as we saw earlier on, had failed. This resulted in the deflection of the ceiling in this area. A reinforced concrete ceiling is, structurally speaking, a disc where the same failure of the wall would not have resulted in deflection because the load is much more evenly distributed. Concrete ceiling discs are more forgiving to inhomogeneous support than the brick vault and iron girder ceilings of Doll, and employing the original walls meant providing inhomogeneous support. Thus, reinforced concrete ceilings seemed to solve the problems.

5.3 Discourse: Reinforced Concrete

Reinforced concrete at Knossos has always been linked with Piet de Jong's work. As discussed in the previous chapter, it was Christian Doll who introduced cement-based concrete in Knossos for the reconstruction work of the Grand Staircase in 1905, but it was exclusively used as binding agent for the mortar and to fill the spandrels above the brick vaults - not as structural concrete.[52] Concrete was also used to cover the iron girders in Doll's last stage of reconstruction of the Grand Staircase in 1910, but here again it was not used as a structural material.

Concrete as a building material had been known since Roman times. Roman concrete, a mixture of stone, gravel and mortar, has many advantages: it was cheap, could easily be handled and shaped, was resistant to fire and strong in compression. Vitruvius mentions the ability of *pozzuolana* to make concrete water proof.[53] The disadvantage of Roman concrete was that it could not withstand tension. It was only in 1824 that Portland cement was introduced. This improved the tensile strength slightly.[54] Nonetheless the use of concrete was limited to structures under compression, for example foundations or relatively thick walls or to non-structural decorative elements. In 1875 a patent was granted to William Lascelles for a precast system, which he employed at the Central Buffet at the Royal Albert Docks, London. Here he designed columns with bases and ornamental capitals which were attached to the structural frame[55].

Mass concrete cannot be employed for structures under tension or bending since, in a bending member, some areas are under tension. It was known from early-on that the tensile strength must be provided by another material incorporated in the concrete member. Christopher Wren employed iron chains embedded in lime-based concrete when

[52]See plate 104, brown matter above brick vaults.

[53]Vitruvius, Liber secundus, VI.

[54]Jones, 1913, p.1.

[55]Hurst, 1996, p 292.

he constructed St. Pauls Cathedral in London (1675 - 1710).[56] In 1867 a patent was granted to the French gardener Joseph Monier for concrete reinforced with a mesh of rods and wires. He was a manufacturer of garden tools and appliances and his primary intention was to reinforce his brittle planting tubs. However, he created the basic elements of reinforced concrete structures. Of course, this patent must be seen as part of a long evolution of inventions concerning reinforced concrete. It was not until the end of the century that two Frenchmen facilitated the rise of reinforced concrete to be the pre-eminent building material of the twentieth century. Edmond Coignet applied the existing knowledge of mechanics and structural engineering to the new material while François Hennebique commercially exploited the patents and turned his business into an international enterprise.[57] In 1897 Hennebique built Britain's first reinforced concrete building, Weaver & Co.'s provender mill in Swansea. In the same year L. G. Mouchel became General Agent for Hennebique in Britain. However, the knowledge of how to build with reinforced concrete only remained in the hands of few.[58] Concrete became widely popular after the presentation of buildings by Edmond Coignet and François Hennebique at the International Exhibition in Paris in 1900.

In 1913 Bernard Jones described the advantages and disadvantages of reinforced concrete.[59] He explained how the disadvantages of concrete are compensated for by the steel reinforcement and vice versa. Concrete is a relatively cheap material and, while strong in compression, it is very weak in tension. Steel is a rather expensive material and very difficult to shape, but it is strong in tension. Both materials show almost identical coefficients of thermal expansion and, therefore, are highly compatible. Small amounts of steel provide the tensile strength of building members while the cheap concrete forms the actual shape of the member. Steel, which oxidises rapidly in the air, is protected by the alkaline environment of the cement. These two materials complement each other

[56]Whinney, 1971, p. 122.

[57]Jones, 1913, p 9.

[58]Cusack, 1987, p. 63.

[59]Jones, 1913, p 4. Jones' book is only one out of many books and articles written on reinforced concrete at this time. Numerous articles in *The Builder* and the *Journal of R.I.B.A.* discussed this topic between 1900 and World War I. It is not known which of these publications Piet de Jong knew but, being a young architect who just completed studies, he must have read many of these publications.

perfectly and make an ideal building material which is strong, durable, fire and water resistant, has low maintenance expenses, can be shaped in almost any form, is comparatively cheap and, in contrast to Roman concrete, provides tensile strength.

On the one hand it seems that Doll, whose education was completed before reinforced concrete became common, did not embrace the new material while he worked in Crete. However, there is no indication that cement was generally rejected by either Evans or Doll. On the other hand it seems that it was difficult to obtain cement in Crete and, consequently, it would have been difficult to find trained craftsmen using the material. Geographically and politically speaking, Crete had a marginal location within Greece and Europe; and, because of this, cement-based concrete, which started to become popular in central Europe in the first decade of this century, arrived in Crete much later. Thus, when Piet de Jong started his work in 1922, cement-based concrete had been a common building material which was not only known to the architect but also to the executing craftsmen in Crete. Furthermore, since Crete had become part of Greece in 1913, cement which was produced in Athens became widely available in Crete.

5.4 The Work between 1924 and 1927

As previously noted, in 1924 Piet de Jong became the official architect of the British School at Athens. In the same year Evans handed the site to the School.[60] Early parts of the campaign of 1924 were dedicated to the quest for a Minoan road system in order to place the site of Knossos into a wider context. Arthur Evans, Duncan Mackenzie and Piet de Jong were travelling in Crete in order to discover the ancient road network, which covered the island in Minoan times.[61] As a result of this research, the Caravanserai and the Minoan Viaduct were found at some distance south of the palace, and it seems that the excavation of these structures and their reconstruction occupied a major part of the latter half of the 1924 season. No major work was undertaken at the palace in this year.

[60] Waterhouse, 1986, p. 31 and p. 83.

[61] *The Times*, 17 October 1924, p. 15 - 16.

In 1925 Piet de Jong started the reconstruction work which was to change the appearance of the Palace completely. In this year, he began to employ reinforced concrete as the main building material for the reconstruction work on site. He had gained considerable experience with this building technique by reconstructing the Caravanserai in the previous year. While walls were still executed traditionally in rubble masonry, the ceilings and stairs were produced in reinforced concrete. Piet de Jong also started to employ cast moulds to reproduce in concrete large quantities of columns. The first undertaking in the palace with this new material was the reconstruction of a part of the West Wing.

5.4.1 The Reconstruction of the West Wing in 1925

The work in the West Wing was the logical continuation of the reconstruction of the Stepped Portico in 1922 and 1923. The steps gave access to the first floor, but there was nowhere to go at this level.

> "With the aid of such evidence as could be obtained from fallen column bases, the sunken blocks and steps of stairs and the guide supplied by carbonised beams and posts, the whole central section of this wing has been now effectively restored to such an extent that the plan of the Propylaea and the central hall above the pillar crypts below, with the steps and staircases that served them, has been recovered in all its essential features. Where the floor itself had to be relaid the use of reinforced concrete has proven invaluable and a kind of bridge has thus been constructed from south to north, by means of which the visitor will henceforward be able to obtain an intelligible insight into the whole palace system on this side."[62]

The new concrete roof covered the Room of the Chariot Tablets, the Room of the Stone Vases, the Steatite Vase Room and the Gallery of the House tablets. This also included the construction of the Grand Staircase close to the South Propylon.[63] However, other

[62] *The Times*, 9 October 1925, p. 15.

[63] Evans employed the term 'Grand Staircase' for both the stairs in the West Wing north of the South Propylon and the Quadruple Staircase in the Domestic Quarter. To distinguish the two stairs Palmer (1963) introduced the term Stepped Way for the stairs in the West Wing.

rooms with sensitive gypsum paving, for example the Court of the Altar, the Hall of the Column Bases, the Room of the Tall Pithos and the Temple Repositories, were not attended to. Also not included in this work were the West Magazines which were roofed over in the same technique in 1929.[64]

The excavated walls were raised with new rubble masonry walls to ceiling height which was adopted from the already reconstructed part at the Stepped Portico. The reinforced concrete ceiling stretched from the Grand Staircase at the South Propylon to the previously reconstructed Stepped Portico south of the Throne Room. Similar to the already completed second floor landing of the Stepped Portico, the margins of the concrete ceiling were designed in a fringed fashion. Normally, a vertical timber board is fixed at the end of the shuttering to provide a barrier for the liquid concrete but de Jong constructed this barrier of stone and - probably - mud mortar. After the concrete solidified, the dam was removed and a fringed edge was left to indicate the theoretical continuation of the floor. It looks as if the floor is broken off at this point.

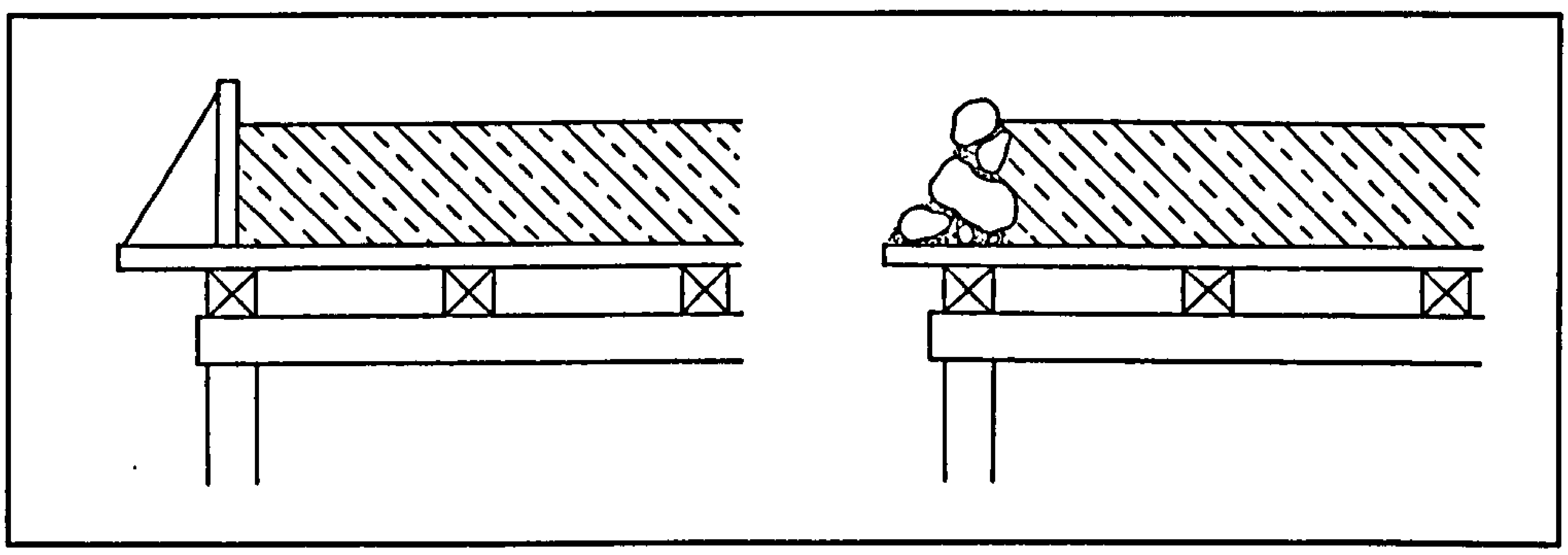

Figure 71 Shuttering for edges of reinforced concrete ceilings. Standard vertical boarding (left) and de Jong's method at Knossos (right).

The door jambs were executed in concrete, in the same method which had already been used at the Stepped Portico. The core of the jambs was built in limestone rubble masonry and was then cased with shuttering and concrete cast in the cavity. The areas of the corners and, depending on the thickness of the wall, one or two vertical posts in the

[64] *The Times*, 5 August, 1929, p. 11

middle represented the former timber frame.[65] The areas between these timber beams had been plastered in Minoan times and this was reflected by the reconstructions.[66] These areas were receding slightly and cement mortar was employed to plaster them. Thus, the surface recreating the beams was very smooth and showed the impressions of the timber shuttering while the surface of the plaster areas in between showed a rougher plaster surface.[67] The lintels were executed in concrete reinforced with iron rods which were, as was common in early reinforcement, round steel bars.[68] The door and pillar wall south of the Room of the Column Base, which was reconstructed with iron girders by Piet de Jong in 1922, was incorporated in the new reconstructions. The pillars and lintels were redone in the same way employed for all other doors in the area.[69]

Further excavations to clarify the entrance situation and the original approach to the palace were undertaken in the south west area of the palace.[70] The South Propylon was the end point for the access route to the palace from the West Court, and from there led to the Grand Staircase and the upper floor. As a result of this research and as the logical continuation of the reconstructed first floor level and the staircase, the excavated remains of the South Propylon were elevated to a height of approximately 60 centimetres.[71]

Both the wall tops of the excavated structures and the sensitive gypsum paving in this area required urgent attention to prevent them from deteriorating completely. The walls were repaired and strengthened in small scale non-documented work in the period between 1900 and 1922.[72] However, gypsum material has been excavated in both the rooms covered with the new concrete ceiling and in the rooms not attended to. For

[65]See sketch provided by Theodore Fyfe for Evans's report in 1900 (BSA, p. 55) and the more detailed drawing for his own paper in 1902. Compare with Section A-A, Drawing 3, right end or Section C-C, Drawing 9, left end.

[66]Compare figures 75 and 100.

[67]See for example plate 61.

[68]Compare with Reynolds, 1945, p. 93.

[69]See plate 34.

[70]*The Times*, 9 October 1925, p. 15.

[71]See plate 34.

[72]Compare plate 54 (1903) and plate 32 (1922). For example see walls west of the Room of the column base (centre right in the plate).

example, the Long Corridor which featured large areas of gypsum paving, was not attended to. This selection of only a few areas seems to have been rather arbitrary and cannot be argued for from the conservation point of view. It seems that the main objective was to replace some of the architectural fragments from the upper storey which had been found in the area. These architectural elements, such as door jambs, column bases and stair blocks have sunken or fallen to lower levels. Unlike elements at the Domestic Quarter, they have not been in their original position or slightly sunken. They were the key to Evans's theoretical reconstruction of the first floor plan and also became focal point for its criticism.[73] For example, two blocks in the reconstructed first floor middle wall of the Stepped Portico show impressions of steps and thus indicate the second flight up but plate 54 shows that they were not found in situ.[74] Replacing them in their position, or in at least what Evans believed to have been their original position, facilitated the reconstruction of the second flight.[75]

However, replacing these elements to their former position, presented to the visitor the otherwise invisible theoretical reconstruction of the important rooms of the upper floor. Thus, it seems that the need for protection started a process which responded in a limited way to the need of preservation, but which was clearly linked to presentation of the site.[76]

5.4.2 The Reconstruction of the Pillared Portico

The Pillared Portico and the Verandah above are located in the West Wing of the palace at the south-west corner of the Central Court. This structure is directly connected with the other parts of the West Wing which were reconstructed in 1925, but they were not executed together.[77] Unless two distinctive construction phases are assumed to have

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[73]See Evans, 1901, p. 21 f. Compare Hitchcock, 1994

[74]Compare figure 70 and page 408.

[75]For a full discussion of these problems see page 407 ff.

[76]Compare with Evans's statement in *The Times*, 9 October 1925, p. 15; quoted above.

[77]See PM II, p. 351.

occurred in 1925, the photographic evidence contradicts Evans's statement.[78] Thus, this work was either executed in late 1925 or in one of the later campaigns. The structure consists of a portico with concrete pillars, lintels and a balustrade overlooking the central court. To the west of the back wall of this portico a narrow flight of steps, which provided access to the verandah at the first floor level was reconstructed in concrete. This floor level was identical with the previously reconstructed level at the West Wing; and the reconstructed floor above the door and pillar wall, south of the Room of the Column Base, connected the two areas.

The portico and the verandah above overlook the south west part of the Central Court. Above the lintel a horizontal band of discs in four colours has been painted on the outer face of the balustrade, as was suggested in Newton's reconstruction drawing in 1922.[79] The bands of discs were a recurring element in Minoan representations of architecture.[80] However, the conservation aspect of this reconstruction is very limited. No original material which would have required urgent attention had survived in this area and no material supported the design of this reconstruction. It is very interesting, however, that this was the first work which featured a distinctively designed, reconstructed facade at a prominent part of the palace. Here, the presentational aspect of the work seems to have been much more important than the conservation aspect.

5.4.3. Work at the South Front

In 1925 extensive supplementary research was carried out at the south front of the palace. This area slopes towards a small stream, the Vlychià, and was largely destroyed in an earthquake at the end of MM IIIb.[81] In addition, a subterranean structure, the Early Hypogeum, was responsible for further subsidence.[82] Due to these facts, the

[78]Compare Hood and Taylor, 1981, p. 5.

[79]See plates 29 and 30 and Newton's drawing in figure 65.

[80]See page 415 ff.

[81]PM II, p. 288, 347 f and 758 ff.

[82]Evans, 1928, p. 95.

archaeological evidence in this area was muddled and prior to his publication of the second volume of *The Palace of Minos* in 1928, Evans, in 1925, researched the south front in more detail a second time.[83] The result of this research was an improved understanding of the entrance system to the palace from both the West Porch and the South Corridor.[84] The road from the south coast of the island had crossed the Vlychiá stream on a viaduct and then split into three roads, the easternmost of which would have ascended under the Stepped Portico.[85] The final end point of this access was the South-North Corridor at the southern border of the Central Court.[86] The access from the West Porch led through the Corridor of Procession which initially led south but turned left twice and finally ended at the South Propylon.

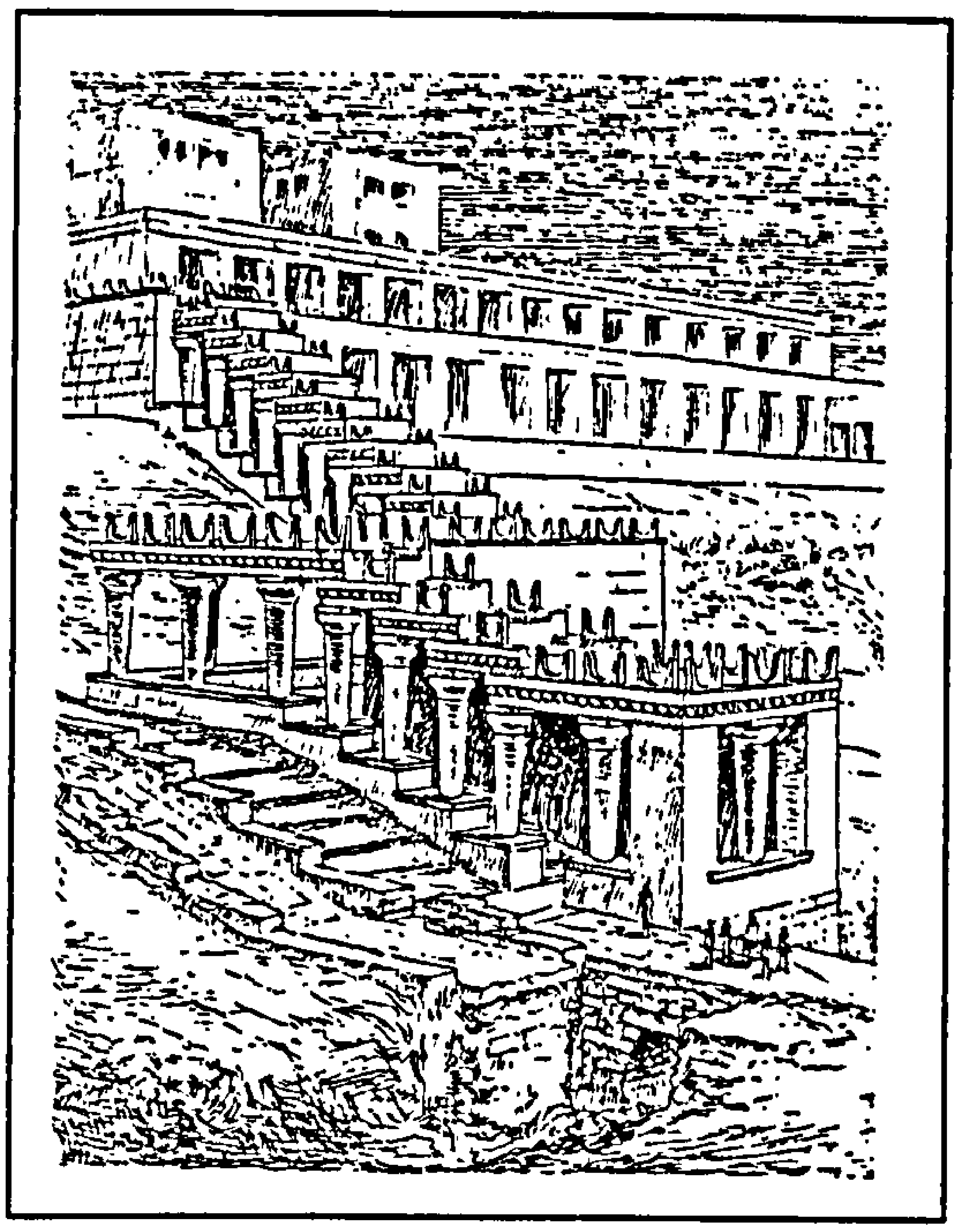

Figure 72 Sketch of the Stepped Portico south west of the palace. F.G. Newton, completed by Theodore Fyfe.

The new understanding of these heavily disturbed areas at the south front led to the reconstruction of the South-North Corridor in 1925 and the South Propylon in 1926.[87] Both structures do not serve an immediate conservation purpose. No material has been excavated at these areas which would have been more endangered than at other areas in the palace. The reason for these reconstructions were explained by Evans in 1927:

> "The painted relief of the Priest-King with a crown of lily crests and peacocks' plumes that had fallen from the wall of a corridor leading up to the Central Court from the South has been replaced by a

[83]*The Times*, 9 October 1925, p. 15.

[84]Compare with Evans's statement in Evans, 1928, p. 91 and p. 94.

[85]See figure 72. This structure is not identical with the Stepped Portico south of the Throne Room.

[86]Evans, 1928, p. 91 f.

[87]See Evans, 1927, p. 266 and Hood and Taylor, 1981, p. 5.

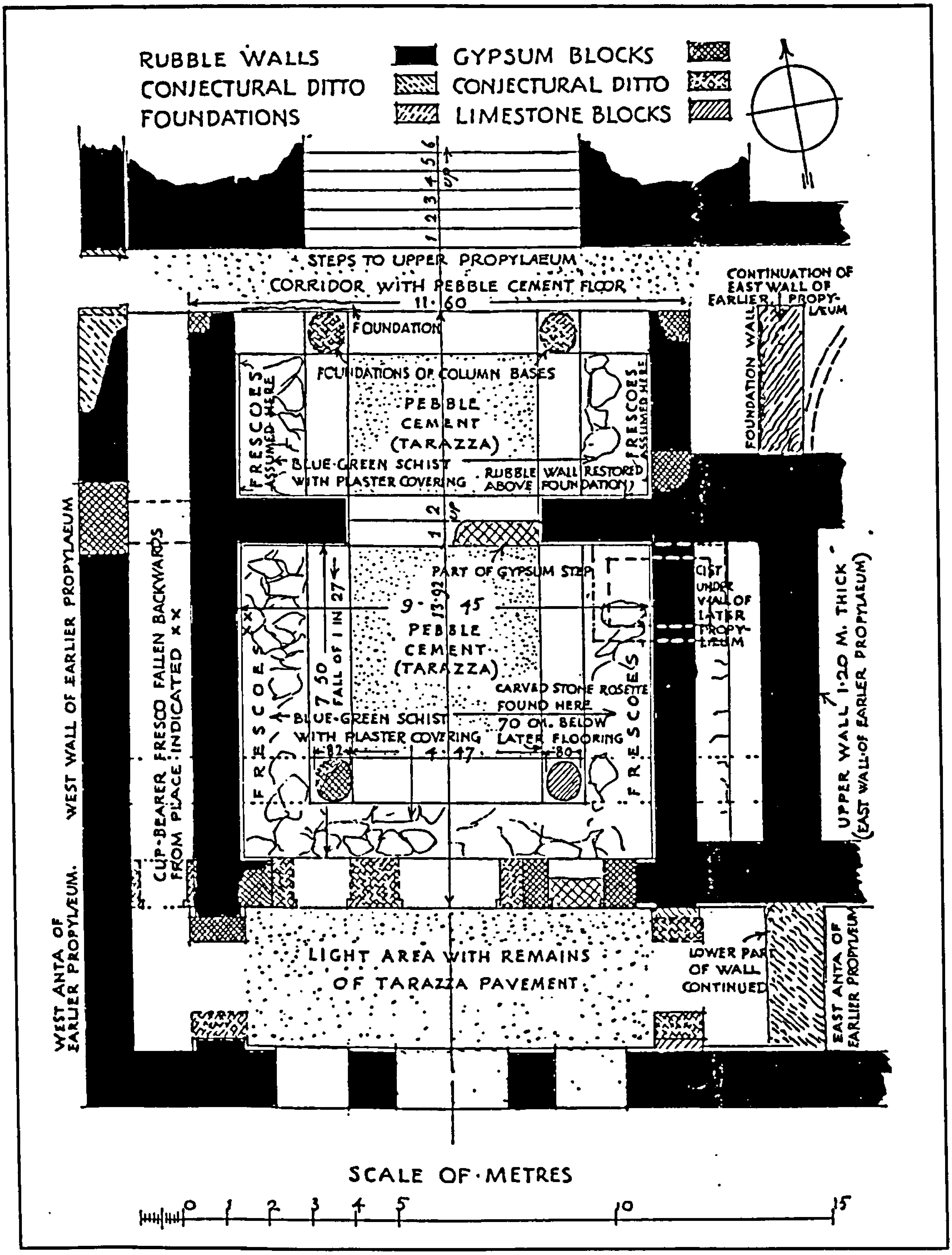

Figure 73 Plan of the South Propylaeum indicating excavated remains, conjectural reconstructions and where fresco remains were found. Probably Piet de Jong.

> painted stucco facsimile in the place that it had occupied. This in turn had been roofed over for protection, as had already been done in the case of the Room of the Throne with its restored Griffin guardian
>
> In the area immediately West of this, these renewed investigations have thrown much fresh light on both the earlier and later form of what had been the principal entrance hall on that side, the South Propylaeum, which now proves to have had four columns and to have supplied on a grander scale the prototype of those of Tyrins. The interior of this hall in its final shape had been adorned with a great processional wall-painting, continued in the adjoining corridor, and the well-known Cup-Bearer fresco, which belonged to this, was found fallen from the West wall of this structure. A careful copy of this and of part of a similar subject which had occupied the frieze above, executed for me by Monsieur Gilliéron, fils, has now been replaced in its original position. To protect this, one of the great columns and part of the entablature and roofing have been restored, and the visitor approaching the Palace from that side can now obtain something of the original effect of this monumental entrance hall."[88]

Obviously, the main agenda was not to protect architectural elements which were still in position and in danger, but to display replicas of fresco restorations. The original fresco fragments which have been found in these areas were employed by Gilliéron to reconstruct large fresco panels which are now on display in the Museum in Herakleion.[89] These reconstructions in themselves are questioned by several scholars.[90] It is certainly debatable whether the display of replicas of frescoes justify the reconstruction of architectural structures. However, the final sentence of the quotation above also indicates how Evans wanted to recreate the effect of the former architecture in itself.

5.5 The Reconstruction Work of 1928

In the three years spanning 1928 - 1930, Piet de Jong executed the majority of his reconstruction work which determines today's appearance of the site. It seems that no

[88]Evans, 1927, p. 266.

[89]See Sakellarakis, 1994, p. 113 ff and also PM II, p. 704.

[90]See for example Castleden, 1990a, p. 178 and Farnoux, 1996, p. 128 f.

reconstruction work was executed in 1927 but one year later the reconstruction work gained unprecedented impetus. The results of the earthquake of 1926 were certainly one of the driving factors which contributed to this momentum. It was described by Evans:

> "Thanks largely to the ferro concrete of the floors, the reconstituted parts of the palace itself held out well, only a few columns being split in the middle. But the hill villages, especially, suffered terribly, and some, like Voutes, were largely destroyed."[91]

These positive experiences with the reinforced concrete reconstruction, specifically when seen in contrast to the massive destruction in the neighbouring villages, certainly contributed to the increased effort of reconstruction.[92] Another factor was the forthcoming publication of Volumes III and IV of Evans's book on the Palace, for which he had to clarify details at several parts of the site. When Evans returned to these particular areas with his old excavation notes, he could see clearly the progressive deterioration of the architectural elements. This, of course, created the desire to preserve as much of the structure as possible. The re-investigation of specific areas generated new knowledge of Minoan architecture which was employed to make the reconstructions as accurate as possible.[93] Thus, the obvious need for protection, the improved knowledge of Minoan architecture and the positive experiences with reinforced concrete resulted in an increased effort of reconstruction.

5.5.1 The Loggia and an Overhaul of Earlier Work at the Grand Staircase

The area of the Grand Staircase was attended to numerous times. As part of the excavation process, Theodore Fyfe introduced the first timber support frames in 1901. These then had to be replaced with better structures later in the same year. In 1905 Christian Doll reconstructed the stairs with iron girders and brick vaults and in 1910 he

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[91] *The Times*, 20 September 1926, p. 15 and see also PM II, p. 316.

[92] See also PM III, p. xii.

[93] See PM III, p. vi f. and Hood and Taylor, 1981, p. 4.

added another flight. However, Piet de Jong addressed the same area again in 1928, and reconstructed the first floor above the eastern portico of the Hall of the Colonnades, the so-called Loggia, and the second floor above both the northern and eastern portico of the Hall of the Colonnades.[94]

Three factors led to a renewed attention at the Grand Staircase area. First, the ceiling above the Hall of the Colonnades had already been proposed by Christian Doll in his plans for the reconstruction of the Grand Staircase, but this proposal was never executed.[95] The gypsum paving of the Hall of Colonnades was of the same fine quality as the paving of the adjoining corridor and both pavings were in the same excellent state of preservation when excavated in 1901. While the paving slabs of the corridor were never exposed to the weather for long periods of time, the slabs of the hall had been deteriorating for 27 years. To preserve the remaining parts of the historic fabric, the Hall of the Colonnades had to be roofed over. Second, the broken floor slabs, which were employed by Fyfe in his first timber reconstruction of the northern Portico of the Hall of Colonnades and the upper East-West Corridor and were re-used later by Doll for his work, also needed attention. This paving, laid in mortar, was not water proof and the historic slabs were exposed to the weather. To Evans and de Jong, roofing over the northern portico of the Hall of Colonnades seemed to be a good solution to the problem. Third, the reconstruction of the fourth flight of the Grand Staircase in 1910 ended with its last step at the height of the Central Court. However, since no bridge crossed the gap between the retaining wall of 1902 and the stair and the landing at this level was not reconstructed, no access was possible from the court to the steps.[96]

All these problems were addressed by roofing the northern portico and by building a connection between the Central Court and the new second floor landing. In addition, the Loggia, the new structure above the Hall of the Colonnades, would provide a connection between the upper East-West Corridor and the reconstructed upper floor in the southern

[94]Evans, 1928, p. 97.

[95]See page 233.

[96]See plate 120.

parts of the Domestic Quarter. Thus, the reconstructions of 1928 provided a better system of access within the Domestic Quarter. This is clearly of presentational rather than conservation nature. However, this does not justify the reconstruction of the second floor reconstruction above the Loggia.[97]

The reconstructed Loggia differs considerably from the proposal in Christian Doll's plan. He suggested colonnades facing the light well at the ground floor level, but the upper storeys were reconstructed in his drawing as massive walls with windows.[98] Doll also suggested a massive wall between the Loggia and the first floor northern portico of the Hall of Colonnades.[99] The reconstruction executed by Piet de Jong 18 years later features colonnades in all storeys. Furthermore, the formerly massive wall between the Loggia and the upper northern portico is missing, despite the fact that both Fyfe and Doll placed a Minoan door jamb block at this place in their physical reconstructions.[100] The back wall of the Loggia also forms the back wall of the western light well of the Hall of the Double Axes. This wall was restored with blocks of concrete cast in wooden cases to match the Minoan ashlar masonry in the light well.[101] No conservation reason necessitated the reconstruction of this wall, but it was necessary to elevate and strengthen the wall in order to provide a firm base for the reconstruction of the ceiling above the Hall of the Colonnades. One year later the west face of this wall, inside the Loggia, was decorated with a fresco, recreated by Gilliéron fils.[102] A sketch proposal in Evans's notebook for 1929 shows the fresco.[103]

[97]See First Floor Plan, Drawing 7 and Section C-C, Drawing 9.

[98]See drawing GS/HC 3.

[99]Piet de Jong's reconstruction is, however, closer to Theodore Fyfe's first reconstruction printed in BSA 1901, p. 106, who suggested timber pillars for the upper storeys. Evans mentions the balustrade of the Loggia of the Shields in the same article, p. 107, and again in the description of the reconstruction work in PM III, p. 301.

[100]See plate 98 and compare page 233.

[101]Evans, 1928, p. 97.

[102]Evans, 1928, p. 97.

[103]See figure 74 and compare plate 122.

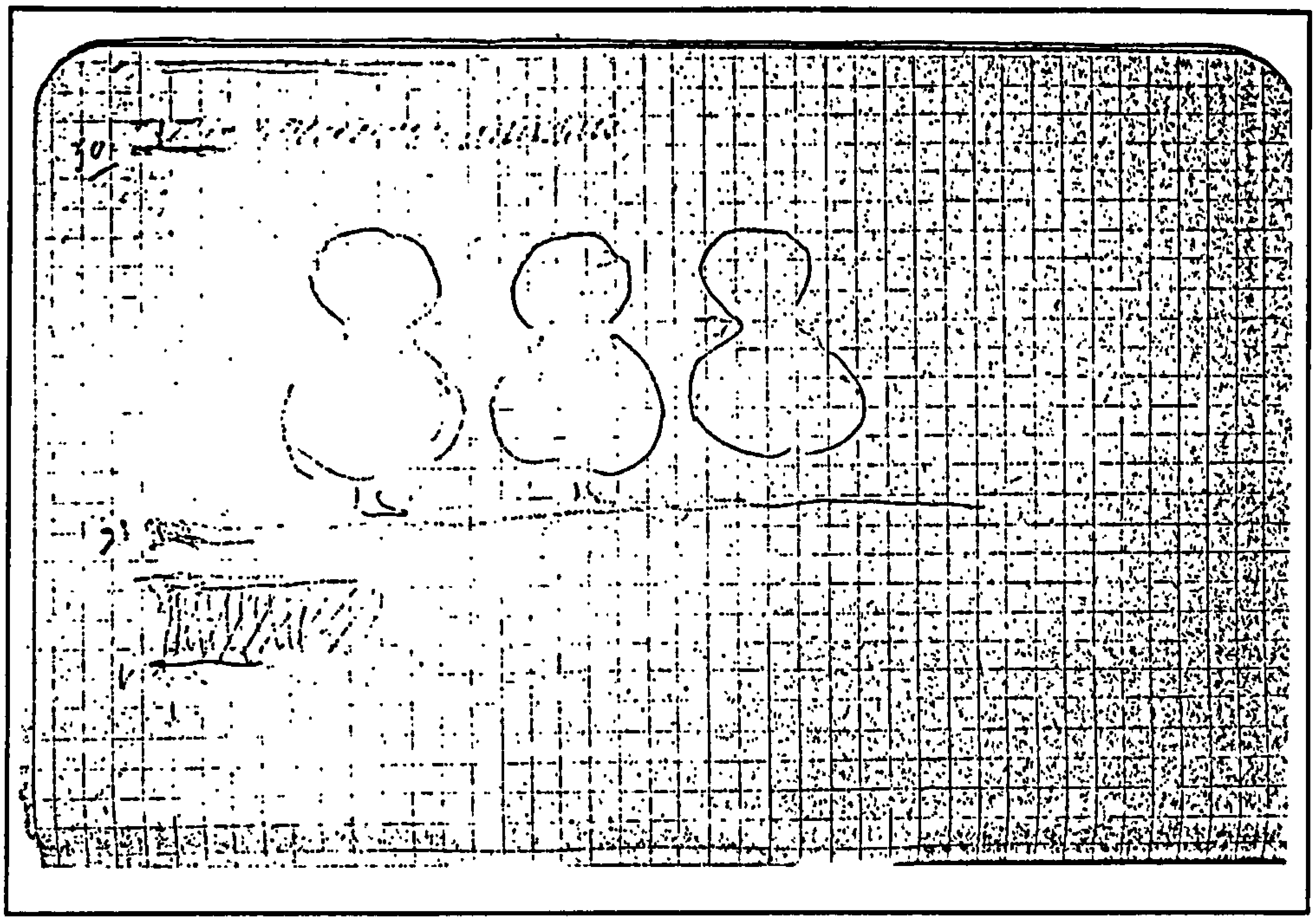

Figure 74 Sketch proposal for decoration in the Loggia. Evans, 1929.

The reconstructed second floor level above the Hall of the Shields rises 8.30 metres above the excavated ground floor level and 4.10 metres above the reconstructed first floor level. To cover these height differences, all support walls terminate in a stepped decline towards the eastern slope. This provided a moderate rise rather than an abrupt wall. This approach is different from that of Christian Doll who employed ashlar pillars for support in the 1910 reconstruction of the Grand Staircase, and also differs from the approach of Fyfe who employed small rubble masonry with a horizontal top course. Piet de Jong's wall tops are irregular, ragged and sloped. They were intended to match the excavated ruins.

Piet de Jong also overhauled the earlier reconstruction work executed by Theodore Fyfe and Christian Doll in the area of the Grand Staircase. The timber beams employed by Fyfe in the opening of the door in the southern part of the Hall of the Colonnades were replaced with concrete. He also removed the timber board casing of the iron girder lintels and door and window frames constructed by Christian Doll in 1905.[104] As discussed

[104]Compare page 232 f.

earlier, the thin timber boards employed by Doll to case the metal girders, warped and disintegrated due to the effects of the weather and to the lack of maintenance.[105] An efficient protection from rust could not have been guaranteed by the timber casing. As a result, Christian Doll cased the beams of the fourth flight reconstruction in 1910 with cement. Obviously, the most logical reaction for Piet de Jong was to remove the timber boards and to case the iron I-beams in cement. He attached additional reinforcement rods and cased the lintels and jambs with a timber shuttering in which concrete was cast. This not only protected the iron girders much better with less maintenance effort but also matched his reconstruction work.

5.5.2 The Hall of the Double Axes

The Hall of the Double Axes was excavated in 1901 and as part of this work Theodore Fyfe constructed a timber support work to keep the door jamb base stones of the upper Hall of Double Axes in position. In 1902 these timber supports had been replaced with a more permanent construction of timber frames and rubble masonry.[106] Doll reconstructed the lower East-West Corridor in 1908, but apart from this, the area of the hall was not attended to until 1928. For twenty-seven years from its first exposure in 1901 up to 1928, the sensitive gypsum pavement was subject, without protection, to heat, weather and visitors. At the time of the excavation some of the paving slabs were broken, but otherwise they were in good condition.[107] Twenty-seven years later the same paving slabs were fragmented into numerous small pieces and the plain floor had become uneven.[108] In 1928 John Pendlebury took a photograph of the situation before the removal of the timber and rubble pillars which had been erected by Fyfe in 1902. It shows that the pillars were affected by the weather and by lack of maintenance but seem

[105]It seems most logical that no maintenance was executed between 1913 and 1921 when Evans and his team have not been on site. See Letter Mackenzie to Evans, 14 September 1920. Compare p. 272.

[106]See page 191 ff.

[107]See plate 136.

[108]Compare plates 135 and 139 with 144 and 145. Also, compare the well preserved gypsum slabs of the East-West Corridor and the Hall of Colonnades with the fragmented remains of the Hall of the Double Axes in Ground Plan, Drawing 6.

otherwise in a reasonable good state.[109] It might be possible that Fyfe's work had decayed and demanded some attention; but it was certainly the main intention of Piet de Jong and Arthur Evans in 1928 to arrest the further decay of the sensitive gypsum floor slabs in the Hall of the Double Axes. Evans wrote in 1928:

> "In the course of a five month campaign undertaken during the spring and summer of the present year, in which Mr. Piet de Jong, the architect of the British School at Athens, acted under my direction, it has been possible to carry out a very extensive scheme of reconstitution in the Domestic Quarter. The greatest of all the Palace Halls - the "Hall of the Double Axes" - has in this way been entirely roofed over, the gypsum slabs of its floor and dadoes being thus permanently rescued from rapid disintegration due to the exposure to the weather. The upper floor here, the original height of which had been somewhat miscalculated, has been restored at its original level, together with that of the adjoining spaces, so that the whole original plan of this level is actually accessible."[110]

In the original Minoan layout of the Hall of the Double Axes, three walls were constructed of pillars with doors between them. In 1902 Theodore Fyfe reconstructed the wall between the inner and outer hall and a part of the southern wall in order to keep paving slabs and the door jambs of the upper storey in position. Piet de Jong dismantled these timber and rubble pillars in 1928 and put aside the paving slabs and the door jambs for later reuse. All three pillar and door walls were reconstructed in reinforced concrete cast on site in a shuttering made of timber boards. The timber for the shuttering was deliberately left rough. This enabled the cast concrete members to recreate the appearance of the original timber construction. This shuttering did not distinguish between the areas in the Minoan door construction that represented the timber frame and the plastered panels between the frame. The entire surface of the pillars was treated equally and only the paint scheme produced any distinction in the end.[111] This was the most economic solution because the uniform shuttering could be re-used for both the doors and the windows above them. However, at a later point the recess for plaster in the middle of the reveal was created and rendered.

[109]See plate 145.

[110]Evans, 1928, p. 97.

[111]See plates 146, 147 and 149.

The plan of the pillars - the typical I-shape - was determined by the position and the shape of the Minoan limestone jamb blocks on which the new pillars were placed.[112] The elevation of these pillars varies considerably from the rubble and timber pillars erected by Fyfe in 1902, as well as from the elevation employed by Christian Doll in other parts of the Domestic Quarter. Fyfe's reconstruction simply featured pillars, above which a lintel carried the Minoan door jamb blocks of the upper storey. The new concept of Piet de Jong suggested a lintel above the doors, two metres above ground, and a window above the door with another lintel at a height of 3.10 metres.[113] The height of the lower lintel was derived from the cavity left by a rotten reinforcement beam in the north wall and in the south wall of the inner hall. On top of the higher lintel masonry would elevate to ceiling height at four metres above ground. He sketched his proposed section in his note book of 1928.[114] This idea of window openings above the doors was derived from examples at the Faience Tablets.[115]

As discussed previously, the horizontal cavities left by the rotten timber reinforcement beams affected the structural strength of the wall. Above this horizontal recess the wall were only able to carry a minimal load. Consequently, the recreation of the upper storeys with the aid of heavy concrete ceilings necessitated strengthening the fragile walls. The cavities left by the rotten timber had to be filled with a load bearing material. Concrete presented itself as the most logical choice. It could be cast in the irregular cavities without any problem, and the visible surface could be cast in a timber shuttering so that it reproduced the appearance of this material. Evans described in 1928:

> "In the walls above and below [the ceiling], the sockets left by the wooden skeleton of the fabric, and which in nearly all cases contained the carbonised remains of the wooden posts and beams, have been filled in with ferro-concrete, painted to show a conventional wood colour."[116]

[112]See plates 144 and 146.
[113]See plate 147.
[114]See Piet de Jong Sketchbook 1928 BSA Archive Athens.
[115]See PM I Fig 266 B. See discussion in chapter 7.
[116]Evans, 1928, p. 97.

Evans points out in the same article that the walls thereby regained much of their original strength, and this enabled them to carry the load of the concrete ceiling which now covered the Hall of the Double Axes. Piet de Jong also overhauled the reconstruction work by his predecessors Theodore Fyfe and Christian Doll in a similar manner to the work he had done in the area of the Grand Staircase. Furthermore, he cast concrete in the horizontal cavity in the light well of the hall, covering the chip stone infill of Fyfe.[117] Thus, the reconstructions of the Hall of the Double Axes, regardless of their original construction, received an uniform visual appearance.

Eight cast concrete columns, identical in shape, length and diameter, were produced for the reconstructions. Two of these columns were placed at the light well at the west end of the hall, while the remaining six columns, together with another two pillars, form the outer portico. A flat concrete ceiling, resting on the elevated walls, covered the entire structure including the door and pillar partitions and the reconstructed columns. Lines were incised in the floor at first floor level, in order to recreate the pavement pattern of the hall underneath. De Jong incorporated into this concrete ceiling the remains of the first floor door jambs and the paving of the sills, which had been, until that time, resting on the timber framework. The missing door jamb bases were recreated in concrete. Metal pipes were fitted into the upper floor balustrade for the draining of rain water.[118]

5.5.3 Other Work in 1928

The two major reconstructions of 1928 were accompanied by minor work in their surrounding areas. The Lobby of the Wooden Posts was also reconstructed together with the work at the Hall of the Double Axe. The remains of a first floor block had been found almost in original position and was supported with wooden props in 1901. In 1902 the props were replaced with an ashlar pillar.[119] Evans wrote in 1930:

[117] Compare page 192 f.

[118] Compare First Floor Plan, Drawing 7.

[119] See page 202 f.

> "As this block has served as an early landmark on the East slope, being one of the few remains of the original structure visible at the time when its excavation work was first undertaken, it had at first been supported at the exact level in which it was found. The more complete reconstitution of the upper storey elements in this area undertaken in 1928 made it advisable, however, to restore the block, with the underlying lime-stone slabs on which it rested, to the level that it had originally occupied."[120]

The techniques employed for these reconstructions are similar to the ones already described.[121] The stone block above the pillar is supported from below and a gap was left so that the concrete ceiling would not touch the stone block.

Piet de Jong also reconstructed the third flight of the Private Staircase between the Hall of the Double Axes and the Queen's Megaron. This protected the lower flight which clearly had suffered from nearly thirty years of exposure. Together with this work he probably removed the pitched roof above the light well of the Queen's Megaron and erected the balustrades. Also probably in 1928 he covered the Treasury west of the Bath Room with a concrete ceiling after supplementary excavations had been conducted some years earlier.[122] Furthermore, the broken slab paving above the northern part of the Bath Room, first installed by Fyfe in 1902, was now replaced with a concrete floor.[123] Evans's statement that he employed 100 carpenters and masons and their assistants for nearly six months might be an exaggeration in respect to the work executed on site. Nevertheless, it certainly reflects the fact that large areas of the palace were reconstructed in 1928.

5.6 The Reconstruction Work of 1929

Both the North Lustral Basin and the North Entrance Passage had already been excavated in the second campaign of 1901.[124] The ground plan for both areas was easily

[120] PM III, p. 271 f.

[121] See plate 132.

[122] Evans Notebook 1922 - 1926. The entry is not dated.

[123] See plate 161 and compare with First Floor Plan, drawing 7.

[124] Evans, 1901, p. 60 f. and p. 68 f.

derived from the excavated structures, but the interpretation of the structures was rather uncertain.[125] At the time of excavation both structures left a somewhat unclear picture of their function. When Arthur Evans published his first volume of *The Palace of Minos* in 1921 he discussed the North Entrance Passage and the North Lustral Basin in detail.[126] Unfortunately, due to the turmoil of World War I, Evans had no access to the site during the writing up process for this book. Later on, it became clear that his account was not sufficient and further research in the area was necessary. Thus, Evans decided in 1928 to conduct supplementary excavations which had to be set against the background of almost thirty years of research in Minoan archaeology. In comparison, his research of 1901 must be set against a barely existing knowledge of Minoan archaeology.

The new research produced results which enabled Piet de Jong to produce reconstruction drawings for the North Entrance Portico and the North Lustral Basin. These reconstructions were not only based on the detailed results of the excavations of 1928, but also on the increased confidence that the Minoan style could now be understood more clearly. Regarding the North Entrance Passage, Evans wrote:

> "Something more, too, should if possible be done to restore at least some part of the upper elements of the adjoining North Entrance Passage, the most public and at the same time in many ways the grandest of the avenues of approach. Researches recently carried out in this area, and now embodied in plans and elevations by Mr. de Jong, show that here above the triple bastions on either side ran porticoes backed by magnificent friezes of painted stucco reliefs of bull-hunting and bull-catching scenes resembling those shown in repoussé work on the Vapheio cups."[127]

This statement of intention, given in a lecture to the Royal Institute of British Architects in 1928 was put into effect one year later. Thus, in 1929, one year after the supplementary excavations, Piet de Jong reconstructed both the North Entrance Passage and the North Lustral Basin. However, two different reasons acted as the driving forces behind the two reconstructions. At the North Lustral Basin, decaying sensitive gypsum

[125]Evans, 1901, p. 62 and p. 70.
[126]PM I, p. 392 - 405 and p. 405 - 410.
[127]Evans, 1928, p. 99.

elements demanded attention; while the work at the North Entrance Passage focused on presentation. Arthur Evans wrote in *The Times*:

"My own special object has been , while carrying out completion - with the effective aid of Mr. Piet de Jong, the architect of the British School at Athens - a series of works of ***conservation*** and of ***explanatory reconstruction***, to undertake the many new investigations that were necessary on the northern and eastern borders of the site with particular reference to my forthcoming third volume on "the House of Minos."[128].

5.6.1 The North Lustral Basin

After its excavation in 1901, the North Lustral Basin was left exposed to the weather. Only a few new coping stones were provided to protect the sensitive wall tops of the stepped balustrade alongside the stairs downward. This work, to the credit of Theodore Fyfe, was executed even before the excavation work was completed.[129] Besides this minor work, the Lustral Basin was left unprotected for 27 years. Prior to the supplementary excavation work in 1928, John Pendlebury took a photograph of the basin which clearly shows the deterioration of the gypsum dado and steps.[130] Even the new gypsum coping stones, which were plain and crisp in 1901, by that time were fractured and bent.[131] The gypsum slabs which lined the basin also suffered from the weather. The author's record of 1997 shows the amount of material which is left today. By contrast, Fyfe's record of the situation shows the amount of material still in situ in 1902. Thus, it is not surprising at all that in 1928 it was decided to have the basin roofed over. The work began in 1928 and was completed the following year. In a short note provided for the Annual of the British School at Athens, Arthur Evans wrote:

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[128]*The Times*, 5 August 1929, p. 11. Emphasized by me.

[129]See plate 71. The area at the top right corner was still not excavated when the new coping stones were positioned.

[130]Plate 73.

[131]See plate 73 and compare plate 71.

> "On the north-west, the small columnar lustral area connected with the Minoan Goddess in her chontic aspect, and with stairs leading down into the bosom of the earth, has been rescued from its parlous condition, the columns have been replaced and the whole roofed over so as to protect its fine gypsum casing. The sombre colours of the fallen plaster, some of them imitating a dark speckled stone, have also been reproduced on the walls."[132]

Piet de Jong had a mould constructed to cast six identical concrete columns, three of which he placed at a newly constructed balustrade at the east and south sides of the new structure. The remaining three columns were placed at the base stones excavated at the stepped balustrade. The height difference between the lowest base and the middle base and between the middle base and the upper base were not identical. To compensate for this difference, Piet de Jong had to introduce *abaci* of different height.[133] Above ground, he constructed a rubble masonry building with closed north and west facades which feature three small windows at a high level. These windows were placed between a reinforced concrete reproduction of a timber framework, which was executed in slightly projecting beams and painted in a way to represent the original timber.[134] The walls were plastered with cement render and on it thin lines representing regular ashlar courses (*opus isodomum*) were incised.[135]

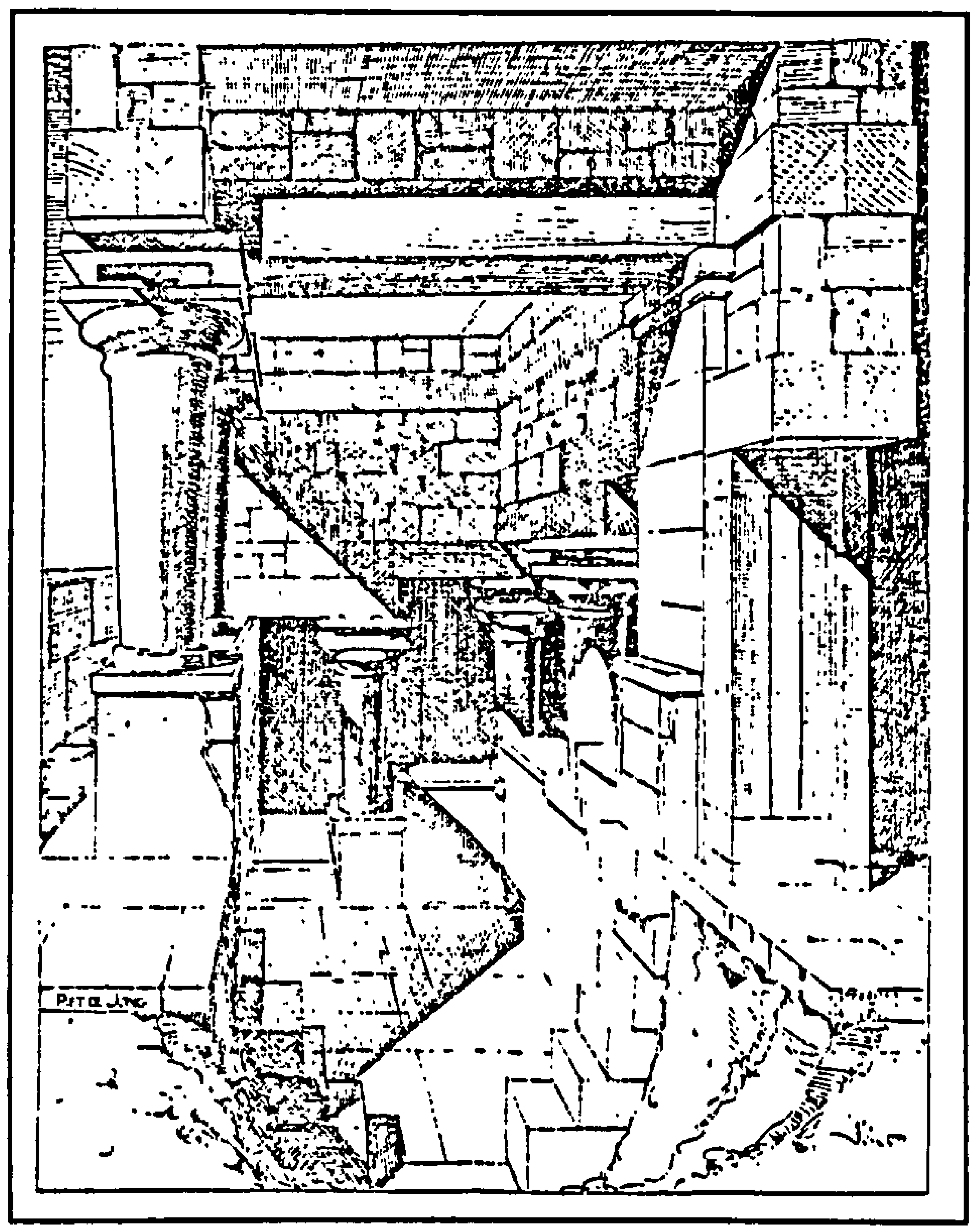

Figure 75 View of the North Lustral Basin. Piet de Jong.

[132]Evans, 1929, p. 269.

[133]See plate 76.

[134]See plate 75.

[135]See north, west and south elevation in Drawing 5.

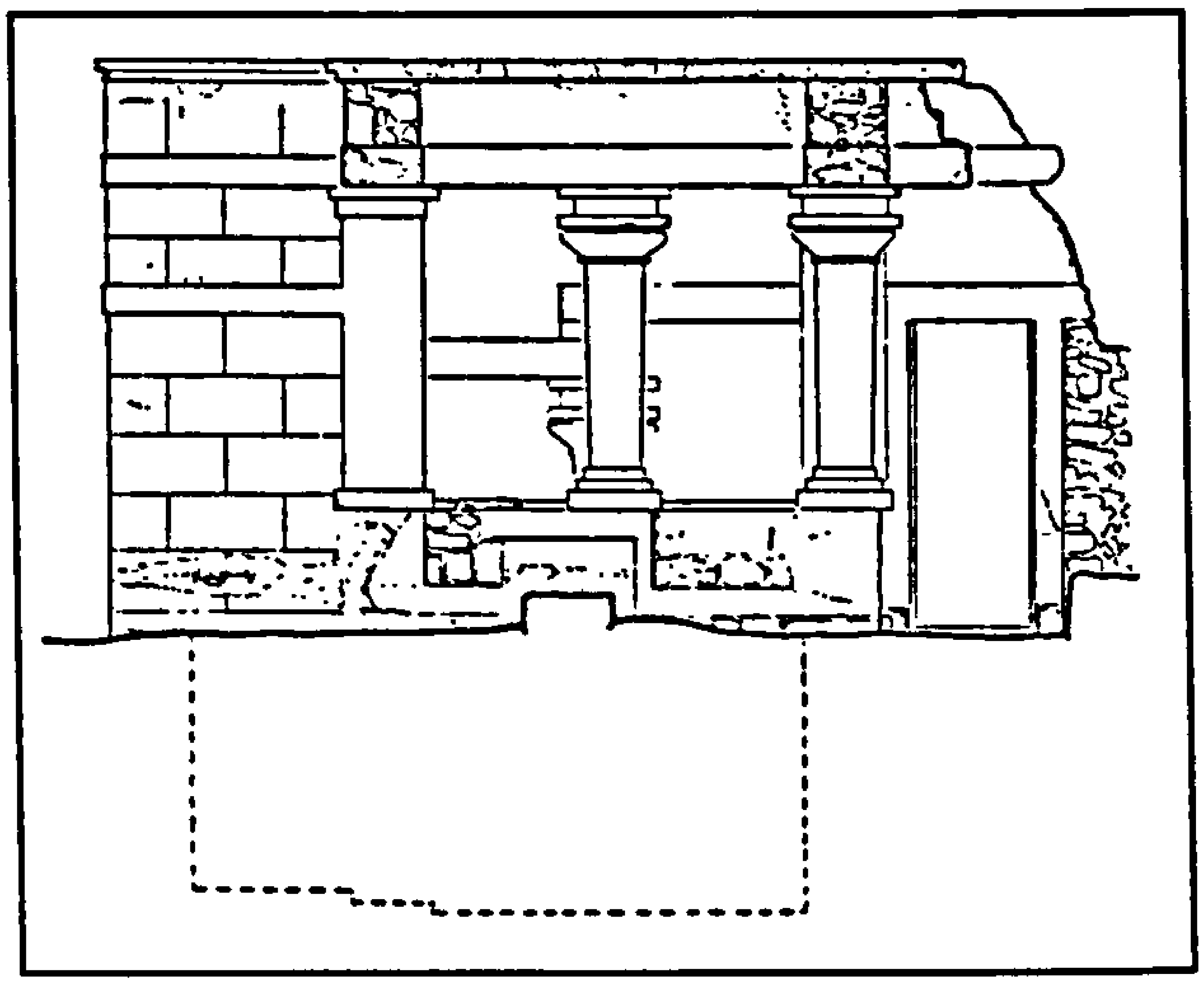

Figure 76 North Lustral Basin, south facade.

On its left part, the south wall features massive masonry, similar to the west and north facade, while the right part of this facade is occupied by a colonnade which continues around the south-east corner to the east facade. The remaining northern part of the east facade is occupied by the door opening to the steps which descend to the sunken basin. A flat concrete roof covers the building; the western part of which is designed with proper eaves while the eastern part of the roof ends in a broken edge, thereby indicating the theoretical continuation of the roof in this direction.[136]

The inside of the building is plastered completely apart from two 'windows' which allow a view on the construction of the wall behind the surface.[137] This, of course, is not the original construction, but once again, the recreation of what was believed to have been the original Minoan building technique. The 'window' at the west side features the original Minoan wall construction at its lower part while the concrete beam, aiming to represent the original timber reinforcement, and the upper masonry were executed in 1929.[138]

The reconstruction of the North Lustral Basin in the shape of this individual building was based on the latest interpretation of the function of the area, as published by Evans after his additional research in 1928.[139] Arthur Evans's reconstruction of this area proposed a walkway for votaries who would have surrounded the building prior to descending into the lustral basin.[140] According to Arthur Evans, this area was destroyed already in the

[136]See elevations and sections in Drawing 5.

[137]See section B-B in Drawing 5.

[138]See plate 76.

[139]PM III, p. 8 f.

[140]See figure 77 and PM III, p. 8 f.

MM IIIa period and never reconstructed. The basin was filled in and later Minoan structures overlaid the area.[141] These later Minoan constructions certainly disturbed the stratigraphy of the area and, thus, the proposed reconstruction above ground is somewhat suspect.

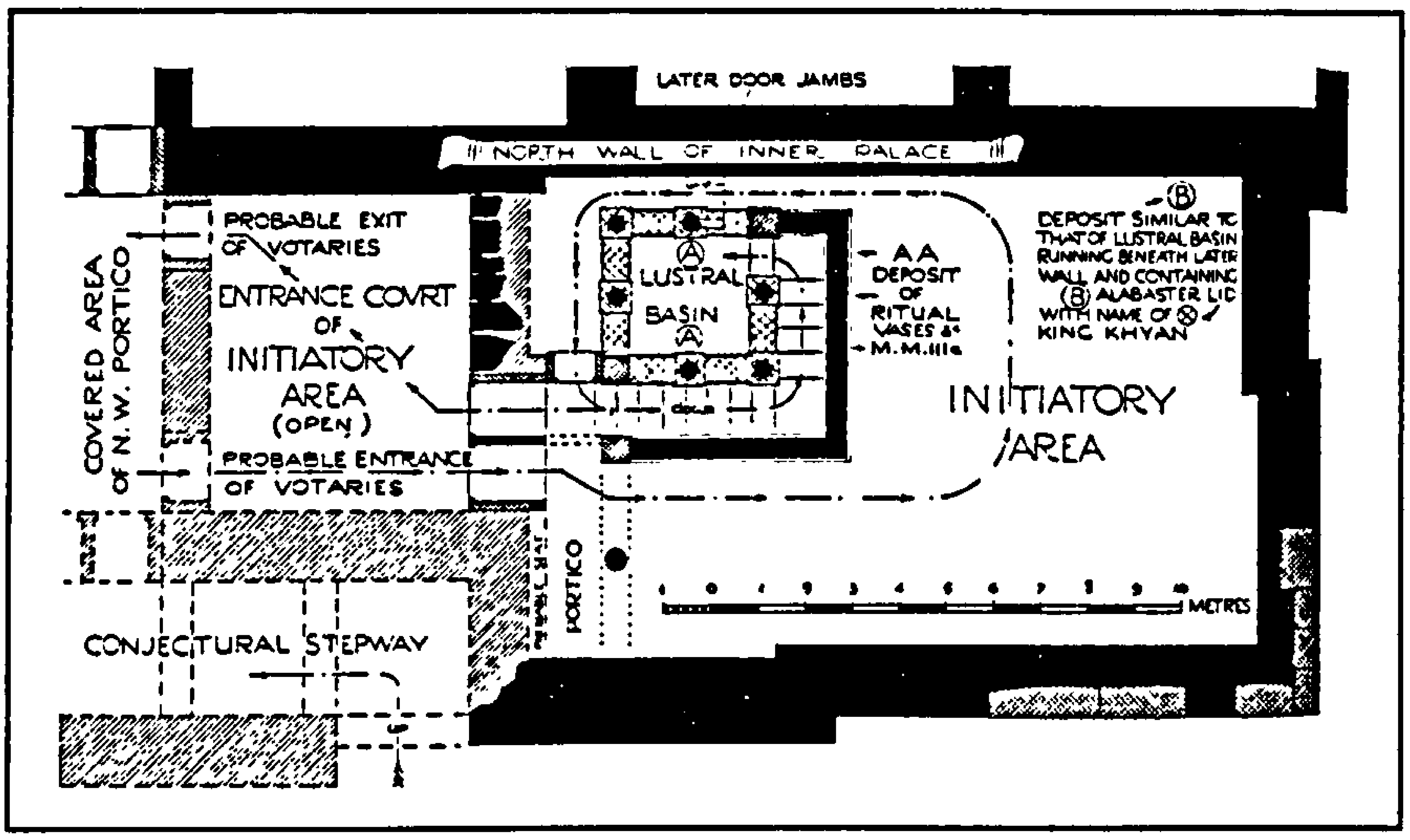

Figure 77 Initiatory area and Lustral Basin according to Evans' later interpretation.

It was necessary to protect the sensitive gypsum lining of the North Lustral Basin, which had already decayed considerably. Thus, the roof was necessary for conservation reasons. However, the shape of the entire building, which stands like a solid block in the ruined landscape, is a reflection of Evans's latest understanding of the function of the site. It was built in this form for didactic reasons, or, as Evans put it, it was an explanatory reconstruction. Thus, the need for conservation and the wish for presentation was combined in this reconstruction.

5.6.2 The North Entrance Passage

The North Entrance Passage is the ramp which connects the North Pillar Hall, located at a lower level at the northern border of the palace, with the Central Court. The inclined

[141]PM III, p. 12.

passage was flanked by bastions on either side which were excavated first in 1901.[142] A reinvestigation of this area took place in 1929, the results of which were published in Volume III of *The Palace of Minos* in 1930. The drawing provided by Piet de Jong indicates the different levels where deposits of different periods were found.[143] However, when Piet de Jong executed this drawing, the site had been excavated for 28 years and the depicted levels must have come from either Evans's notebooks or memory.

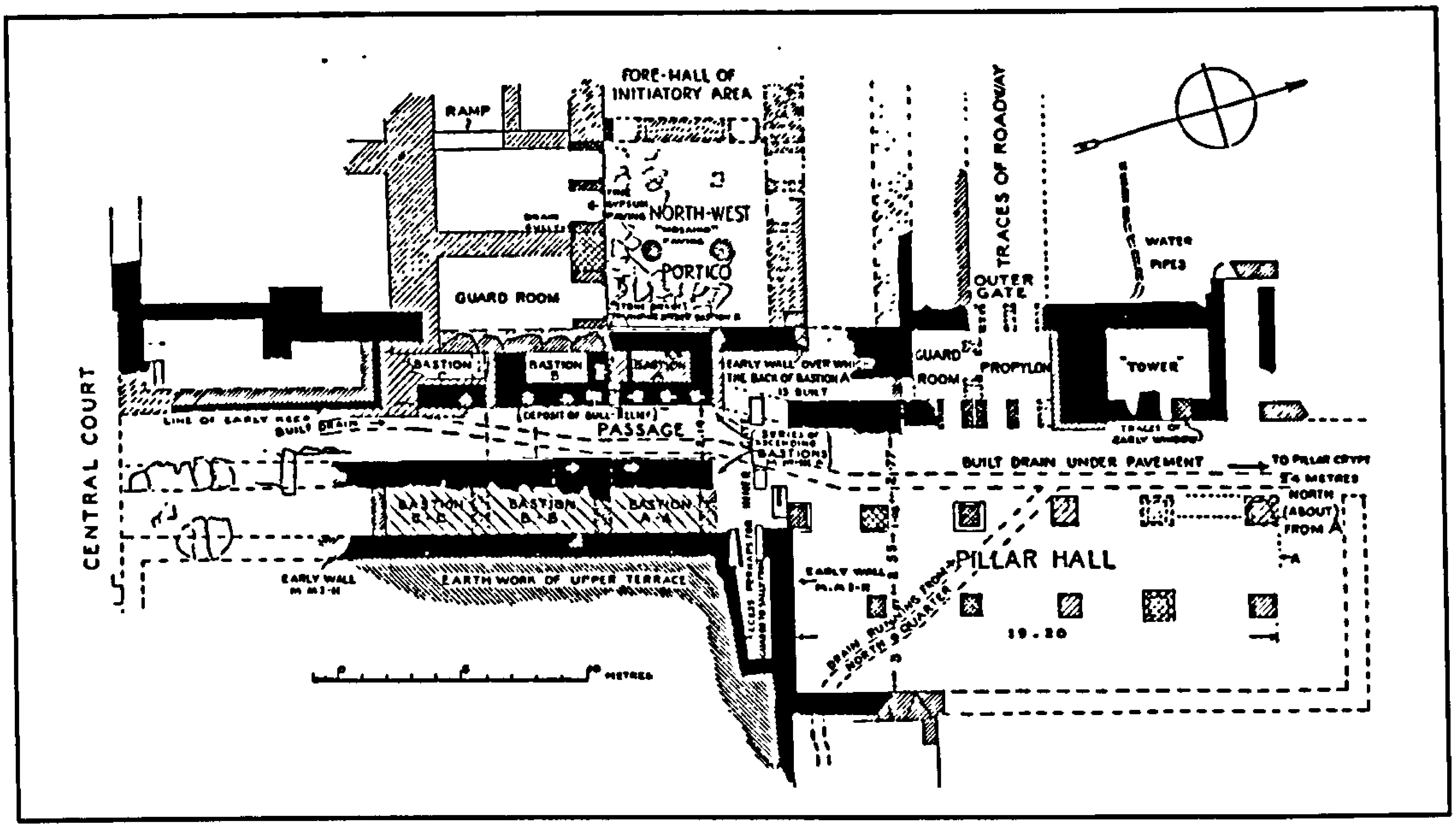

Figure 78 Plan of the northern entrance system of the palace. The restored western portico of the North Entrance Passage is marked Bastion A, B and C (centre of the plan). Plan probably by Piet de Jong.

Piet de Jong produced an ink drawing of the situation as it was supposed to have looked in Minoan times.[144] Based on this drawing the northern part of the western bastion was reconstructed to floor height in 1929.[145] Three columns were reconstructed to a height of approximately 60 centimetres and parts of the back wall were constructed. The base of one of these columns was found in a fallen position in the passage which suggested this reconstruction but a definitive proof is missing. Evans wrote in 1929:

[142]Evans, 1901, p. 68 f. Then still called the Northern Entrance Way.

[143]See figure 25.

[144]See figure 79.

[145]*The Times*, 5 August 1929, p. 12. See also plate 81.

"....and the upper terrace of the Portico over the northern entrance on that side has been reconstituted. It is proposed to replace on its back wall, as a reminiscence of the "Vapheio" reliefs that once decorated it, the noble head of a charging bull in painted plaster. Some idea of the original magnificence of this approach may thus be conveyed."[146]

The proposed reconstruction of the back wall and the installation of a reconstructed bull-grappling relief was executed one year later. However, this reconstruction work, even in its incomplete state, was of purely presentational function. No conservation needs necessitated this work.

5.6.3 Roofing over the Magazines in the West Wing

Another work executed in 1929 was the roofing of five magazines in the West Wing. This work certainly responded to the necessity to protect the magazines and their content. The gypsum paving had suffered considerably in the period between its excavation in 1900 and then,[147] as had the wall plaster which was depicted in a drawing by Theodore Fyfe.[148] In addition, the open cists in the floor and the open storage jars were vulnerable and exposed to damage. Being open to the sky, they collected rain water which then remained without drying because the sun could not reach the container's bottoms. Dirt and dust had gathered in the vessels and cists, thereby providing soil for the growth of weed and plants. To prevent further damage, the area had to be covered with a roof. In 1928 Arthur Evans expressed his plan to roof the magazines. Thus, in 1929 five of the magazines were roofed with a concrete ceiling:

"On the west a long needed protective measure was the roofing over of five of the magazines, containing - just as they were uncovered - the long rows of store jars. It has been possible, moreover, with the aid of existing architectural elements, to give some idea of the concrete flooring above of two of the great upper halls on this border."[149]

[146] Evans, 1929, p. 269.
[147] See plate 27.
[148] Compare figure 20.
[149] *The Times*, 5 August 1929, p. 11.

Of course, exposure to the elements of nature was not limited to these five magazines, rather the same conditions were faced by all the magazines. However, the quotation above suggests that the selection of only five magazines was not arbitrary. By roofing over these five magazines, it was possible to present elements of the two major upper floor halls, which Evans reconstructed in this area.[150]

Buttresses in Magazine VII and in Magazine IX were built in Minoan times to support the high load at these points of the upper level. According to Evans's and Fyfe's reconstructions of the first floor, a hall was located above the Magazines VI - X.[151] It featured two columns to support the roof, which were located above the buttresses. This logical reconstruction was supported by the stone column base which had been found in this area. Immediately north of this two- column hall Evans reconstructed a hall featuring two rows of columns above the division walls between Magazines XI and XII and Magazines XII and XIII respectively. Again, this reconstruction was supported by the discovery of stone column bases in the magazines of this area. The reconstruction covered Magazines VIII to XII and included the buttress in Magazine VII with an appendix.[152] This concrete roof protected not only the wall tops but also the gypsum slabs; and the wall plaster and the jars were rescued from further decay. Furthermore, reconstructed concrete column bases were placed above the buttresses. While the buttress in Magazine IX was no longer visible to the visitors, the replaced column base above the buttress in Magazine VII showed the visitor how the reconstruction of the upper halls was based on logical conclusions.

This reconstruction work included the construction of a part of the west facade of the palace which dominates the West Court and, thus, the view of any visitor approaching the palace today. The reconstruction was executed in rubble masonry covered with a thick cement plaster to recreate the effect of massive ashlar blocks. While clear evidence survived at the Palace of Phaistos for a horizontal reinforcement beam above the

[150]PM, VI, p. 648.

[151]Compare general plan in Volume II.

[152]See plate 14.

orthostat course, only one dowel hole survived at Knossos.[153] Nonetheless, a horizontal beam was reconstructed with ashlar masonry placed above it.[154] There was little but yet existing evidence for the reinforcement beam but there was absolutely no evidence for the ashlar masonry above the beam. The reconstruction of ashlar blocks in the west facade of the palace is questioned by many scholars and Evans and Fyfe, in their first theoretical reconstruction in 1902 suggested timber framing and panels rather than massive masonry.[155] In the first floor level of this facade the sills of two window openings were reconstructed which have also been questioned by later scholars.[156]

The most likely explanation as to why only five of the magazines were roofed over are the costs involved in a complete roofing. But it is also possible that Piet de Jong and Evans wanted to maintain the view of the ruined landscape. The roofing of the entire West Wing would inevitably have demanded an architectural solution of the west facade which would have had an impact on the appearance of the palace towards the West Court. Since Piet de Jong sloped the walls in the domestic quarter to recreate a ruined appearance, the second argument cannot easily be rejected. While roofing was necessary to protect a number of pithoi and some of the architectural details, the specific selection of five of the magazines was made for didactic reasons. The reconstruction work was based on the idea of providing more information about the ground plan of the halls in the first floor.

5.7 The Reconstruction Work of 1930

The last major reconstruction work at the Palace of Minos was executed in 1930. It had been Evans's intention to dedicate the 1930 campaign exclusively to conservation and reconstruction work, but new discoveries at the West Court demanded a full scale

[153] Shaw, 1973, p. 88.

[154] See plate 9.

[155] Shaw, 1973, p. 90 and Evans, 1900, p. 10 and Fyfe, 1902, p. 114.

[156] Pendlebury, 1963, p. 99 , Graham, 1960a, p. 329 and Cadogan, 1980, p. 65.

excavation. However, the main objective of the campaign was the completion of the reconstruction work at the North Entrance Passage and the roofing of the Throne Room area.

5.7.1 North Entrance Passage

The first work executed in 1930 was the completion of the reconstruction work at the North Entrance Passage as proposed one year earlier. The main objective of this work was to replace the replica of the bull-grappling relief at the back wall of the portico. Evans wrote in 1930:

> "The Western terrace above the Northern Entrance passage has not only been completed to its original level, but part of the portico has been reconstructed and a section of the great painted relief shewing [sic] an olive tree and the forepart of the charging bull has been replaced in replica, so that to visitors approaching the Palace from the north must appear much as it did to the first Greek intruders."[157]

The relief fresco fragments found in this area were reconstructed by E. Gilliéron, fils in accordance with a similar gypsum relief found at Mycenae and brought to England by Elgin.[158] The size of the reconstructed bull-grappling relief determined the height of the back wall and, thus, of the entire Portico. A sketch of the proposed work survived in Piet de Jong's notebook. This sketch shows the ground plan with the passage's paving (left) a section of the portico indicating the height of the ashlar masonry courses and the columns (top right) and the plan of the portico with fix point for the bull's eye (bottom right).[159] The sketch indicates that both the bastion and the colonnades above were planned at the same time and executed in two successive years.

[157]Evans, 1930, p. 290.
[158]PM IV, p. 10.
[159]Notebook Piet de Jong, Archive of the British School at Athens.

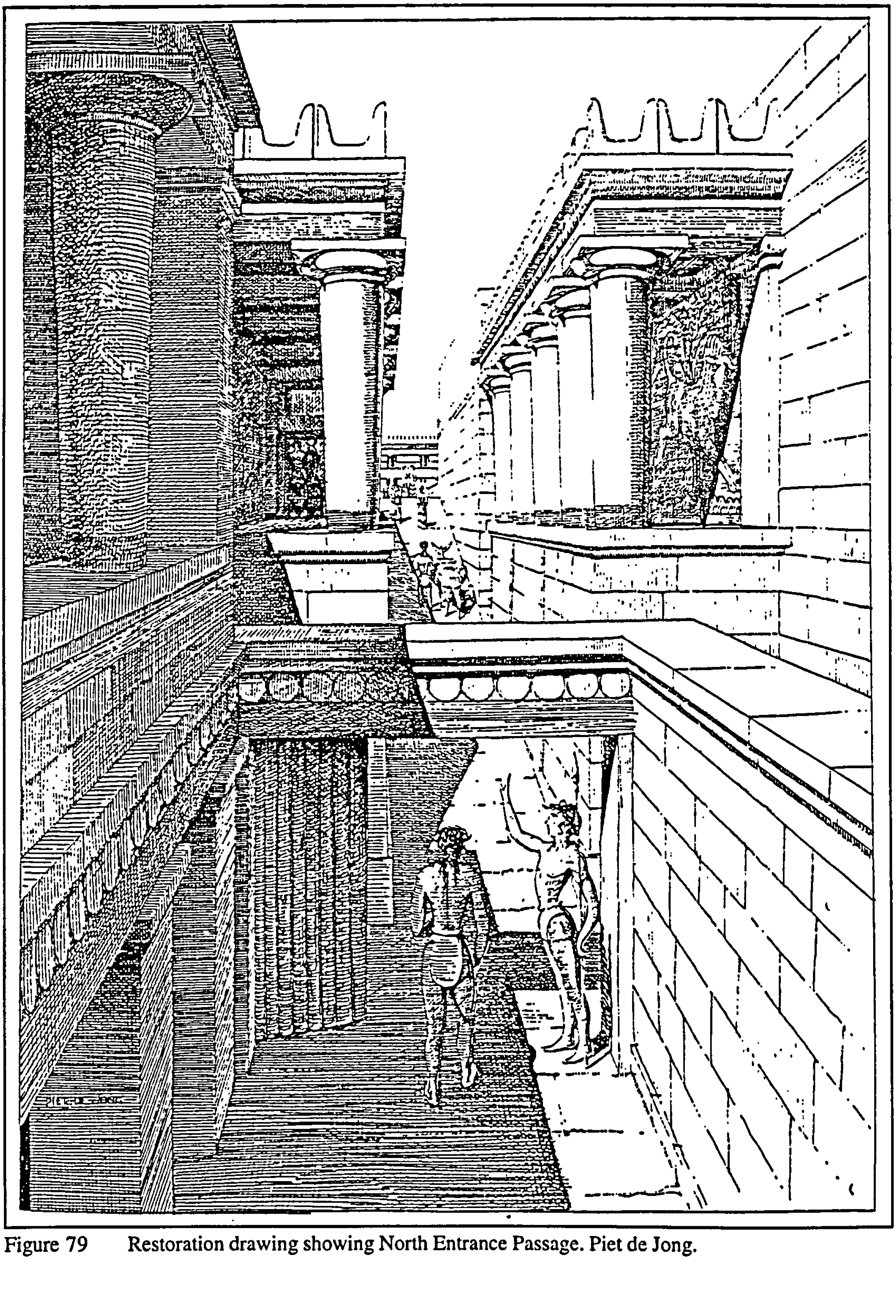

Figure 79 Restoration drawing showing North Entrance Passage. Piet de Jong.

The walls were built in rubble masonry and plastered with cement render in which lines were incised to imitate *isodomic* ashlar masonry. The concrete columns, already begun in 1929, were elevated to full height.[160] The entire portico was roofed with a flat concrete ceiling, the eaves of which were decorated with round discs. These discs were similar to the ones executed in paint at the Pillared Portico, but this time they were made three-dimensionally in concrete.[161] At the back of the structure a cross-wall was constructed which rose almost to the portico's ceiling height, in order to secure it against earthquake damage.[162]

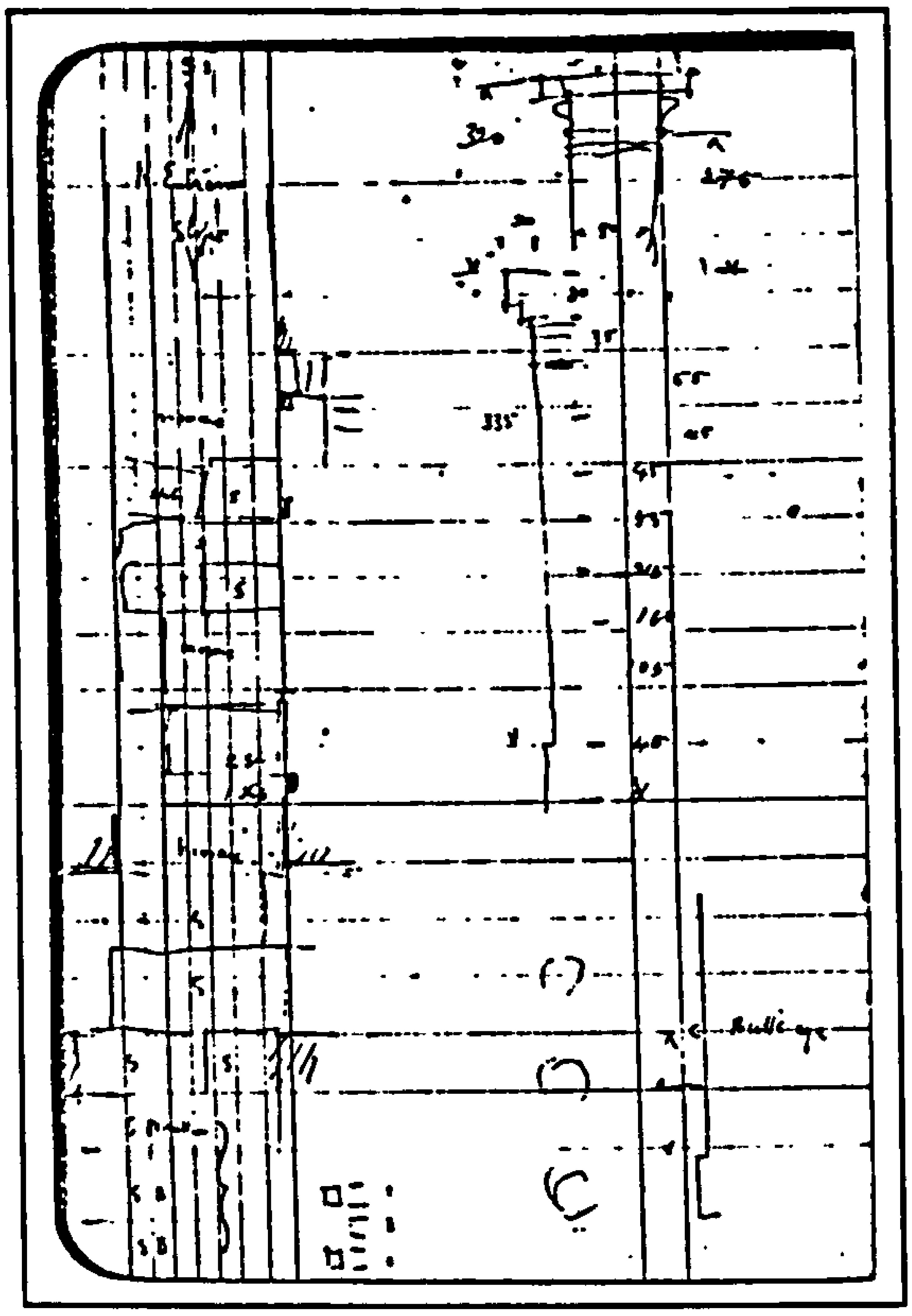

Figure 80 Sketch plan and section of the proposed reconstruction of the western portico of the North Entrance Passage. Notebook Piet de Jong.

This work was of a purely presentational nature as can be seen in the quotation above and from Evans's statements in his book 'The Palace of Minos'.[163] There certainly was no need for conservation work in this area. Rather it relied much more on the desire to display the reconstructed bull-grappling relief in the place where it was found. However, both the reconstruction of the relief in itself as well as the reconstruction of the portico are based on too little evidence to be seen as faithful reconstructions.

[160]PM IV, p. 13.
[161]Compare page 292 and plate 82.
[162]PM IV, p. 11.
[163]PM IV, p. 7.

5.7.2 The Throne Room Area

Today the Throne Room area, as it was reconstructed in 1930, dominates the appearance of the Central Court. The Throne Room and the Inner Sanctuary had already been roofed over in 1901, one year after their excavation.[164] A pitched roof was constructed in 1904 and was extended later by Christian Doll to cover the Service Section at the west.[165] However, the Anteroom and the staircase in the round corner were not covered and were left to the destructive forces of the weather, despite the fact that these rooms featured the same sensitive gypsum slabs as the Throne Room. After being exposed to the weather for twenty-nine years, most of the paving material had deteriorated beyond repair and, as a result, the Ante Room today predominantly features new replacement slabs.[166]

Immediate action was necessary to preserve the already heavily affected features in the Anteroom. Piet de Jong faced two options. He could design an extension to the existing roof or he could remove the old pitched roof and replace it with a new construction. There is no indication whatsoever that the pitched roof had not fulfilled its function properly, even if the gutter at the south roof seemed to be a unfortunate detail.[167] However, from an aesthetic view, the pitched roof of 1904 was an alien element in the otherwise very uniform landscape of ruins and reconstructions.[168] In the Domestic Quarter de Jong replaced the earlier door and window frames by Fyfe and Doll with his own systems to achieve an uniform appearance. It seems to be logical that he wanted to replace the much bigger alien element in the ruined landscape of the West Wing. Furthermore, the joint between the necessary roof structure above the Ante Room and the existing roof above the Throne Room would have been a problematic point unless the

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[164]See page 173 ff.

[165]See page 236 ff.

[166]Compare pavement of the Throne Room with that of the Anteroom in Ground Plan, Drawing 1.

[167]Compare plates 33 and 59.

[168]At this time the Magazine of the Giant Pithoi has already been roofed with a flat concrete roof. The only surviving pitched roofs were at the Corridor of Bays and at the Shrine of the Double Axes. Compare with plate 6.

pitched roof was extended. Thus, the pitched roof was removed and the entire area was roofed over with a new concrete construction. Once again, the presentational element on site played a dominant role. Arthur Evans wrote in the Annuals of the British School:

> "Meanwhile, thanks to the structural work of Mr. Piet de Jong and the artistic skill of E. Gilliéron, fils, the works of restoration and reconstruction on which I had embarked have been successfully completed. The "Room of the Throne" and its Antechamber have not only been roofed over, but the upper system, including a clere-storey and lantern, has been reconstructed in such a way that the ancient system of lighting has been recovered. The original effect of the ceremonial chamber has been further attained by the restoration of the frescoes of three more of the guardian Griffins."[169]

The walls of the Ante Room were elevated with rubble masonry and the pillars at the west front were cast in concrete similar to the ones of the Hall of the Double Axes. The pitched roof of 1904 and the underlying flat timber ceiling of 1901 were removed, but Fyfe's reconstructed columns were left in position. Concrete ring beams were cast *in situ* on top of the elevated walls. An important detail can be seen in the photographs taken by John Pendlebury during the construction process.[170] The ring beams feature mortices. The concrete ceiling was cast in one piece with the supporting cross beams and rested in these mortices but was not firmly connected with the ring beams and the walls. The new ceiling stretched from the Central Court to the reconstructed Upper Long Corridor. An upper storey, the so called Loggia, was reconstructed which was modelled on Newton's plan of 1922. The reconstruction of the Loggia did not incorporate a single original element, but a few door jambs were reused in the western part of the upper Throne Room area.

Mass production facilities were employed to reproduce the architectural details of the upper storey reconstruction in the Throne Room area. All walls in the upper storey were reconstructed approximately seventy-five centimetres wide and the cast concrete door or window jambs in these walls were made exactly eighty centimetres wide. There is one exception to this rule - the wall immediately north of the reconstructed Loggia which is

[169] Evans, 1930, p. 289 f.
[170] Plates 59 and 60.

only sixty centimetres wide - but this wall featured neither a door nor window.[171] The reason for this uniform thickness of the walls is that the repeated use of the same concrete cast moulds naturally required all walls to be of identical thickness. The wall which encloses the area on its west side, the former west gable of the earlier reconstruction by Christian Doll, is ninety-five centimetres thick and the doorjambs are hundred-and-four centimetres wide. This is due to the fact that it incorporated Doll's gable and that the southern part of this wall was already constructed as part of the Stepped Portico in 1922 and 1923.

Altogether, seven columns were produced for the area of the Loggia above the Throne Room. Five columns were positioned at the balustrade around the light well and another column was placed at the window overlooking the Central Court. The seventh column was only half cast and was placed at a window west of the Loggia.[172] They are identical in shape and were cast in reusable moulds. The construction of cast moulds is one of the most expensive parts of concrete construction, and this process becomes even more costly, if spherical forms must be produced as with the column capitals. Thus, it was an economic advantage if several columns could be produced in one mould, as Piet de Jong has done.[173]

In the Throne Room, E. Gilliéron reconstructed three more griffins to complete the decorative scheme as suggested by himself earlier.[174] These griffins were painted on boards, probably plywood, and mounted to the wall while the areas above and below these boards were plastered. Many fresco fragments were found at Knossos in various places, some of which were restored by both Gilliéron, père, and Gilliéron, fils. The originals were placed in the Museum at Candia (Herakleion), but replicas were made for display on site. Since their original find context could not be reproduced, they were displayed at the Loggia above the Throne Room.[175] The design of this Loggia seems to

[171] Compare First Floor Plan, Drawing 2.
[172] See Section A-A, Drawing 3.
[173] Compare Reynolds, 1945, p. 156.
[174] See plates 69 and 70.
[175] PM IV, p. 924.

be very arbitrary and Evans admitted that it was 'conjectural'.[176] The reconstruction featured a first floor verandah overlooking the Central Court which, unlike all other reconstructions, was not fitted with a pillared portico. This basic design idea clearly was taken from F. G. Newton's reconstruction drawing and was not from Piet de Jong.[177]

A number of reconstructions by Piet de Jong at Knossos, such as the East Bastion, the Magazine of the Giant Pithoi, the South-East Stairway and the South-East House are not mentioned in this chapter. The techniques employed in these reconstructions were identical to the ones described and most of these areas underwent only one restoration phase. Thus, in regard to the limited space available, these have not been discussed in detail. Piet de Jong executed some restoration work at the Little Palace in 1931, but since this is outside the scope of study, it will not be discussed either.

5.8 After Knossos

When Piet de Jong executed his early work in Knossos, he was a private architect employed by Arthur Evans for this specific job. This changed after 1924 when de Jong became the official architect to the British School at Athens. At the Annual Meeting of Subscribers of the British School at Athens it was announced that:

> "...Piet de Jong, formerly a Student of the British School at Rome, and now residing in Athens, has been officially appointed Architect to the School, and it is hoped that for many years to come the school will continue to have the benefit of his gifted services for its excavations. The merit of Mr de Jong's work at Mycenae and at Knossos is already well known, and his help at Sparta, in planning the site of the Theatre, proved invaluable."[178]

In the same year he executed repairs to the Director's house at the British School at Athens, where dry rot had affected the roof structure. Piet de Jong suggested that the

[176]PM IV, p. 924.

[177]Compare drawing of Newton, figure 65.

[178]BSA, Vol. XXVI, 1923-24/1924-25, p. 318.

house's pitched roof be stripped completely and replaced with a flat concrete roof.[179] His suggestions were endorsed and finally executed. It is interesting to see that Piet de Jong, in a context where he did not work for Evans, suggested a solution similar to the one at Knossos. From 1922 and later as the School's architect, Piet de Jong worked not only for Evans but also for Alan Wace at Mycenae, where he also executed reconstruction and conservation work. The work in Mycenae was much smaller in scale than at Knossos but the materials and techniques employed were very similar.[180]

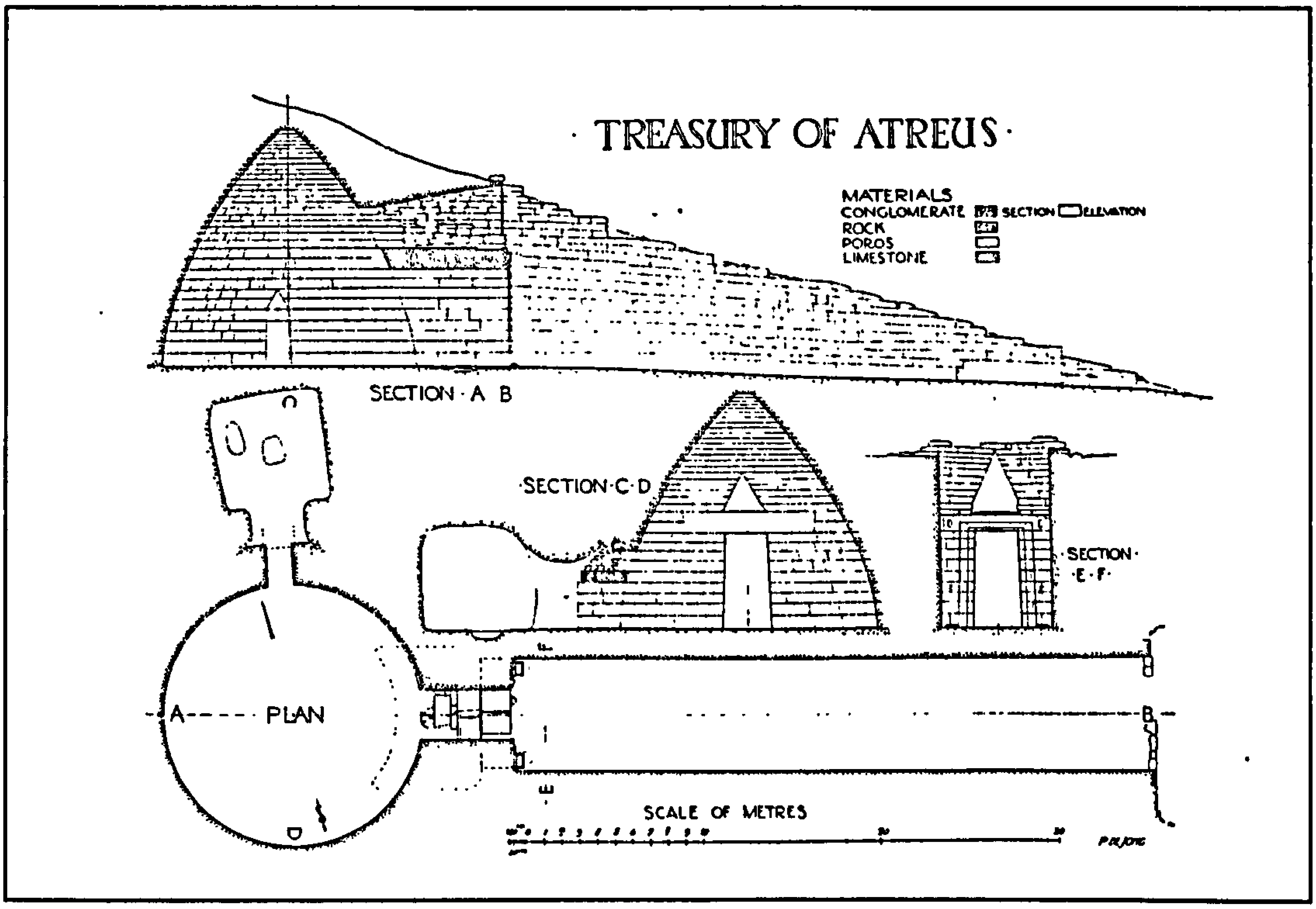


Figure 81 Treasury of Atreus at Mycenae. Plan by Piet de Jong for Alan Wace.

He held the position as school architect until 1932, but due to the lack of funding the position remained vacant.[181] From his departure from the British School until World War II Piet de Jong drew mainly for the American School at their excavations in the Athenian

[179]Annual of BSA, XXVI, 1923-24; 1924-25, p. 317.
[180]See plates 219 and 220.
[181]Waterhouse, 1986, p. 31.

Agora.[182] Throughout the war he produced precision tools in London and lived in his cottage in Snetterton, Norwich.[183] He returned to Athens immediately after the end of the war to resume work with the American School at the Agora. After Richard W. Hutchinson retired in 1947, Piet de Jong became curator at Knossos.[184] His curatorship ended in 1952 when, due to financial pressure, the site of Knossos was handed over to the Greek Government.[185] Piet de Jong stayed for a further few months in Knossos, but as a private architect, not as curator.

He took on small jobs at several sites, mainly to record the excavated structures and to execute reconstruction drawings of both buildings and pottery. He worked with Nikolaos Platon, the Greek archaeologist in charge of Knossos after 1952, and executed further reconstructions at the palace site. The Corridor of the bays was covered with a concrete ceiling, replacing the pitched roof in this area. He also extended the existing concrete ceiling in the West Wing to include the Room of the Niche and the adjoining areas. For nine seasons he worked at Blegen's excavation of the Palace of Nestor in Pylos.[186] In 1964 he executed a reconstruction drawing for the Throne Room at the Palace of Nestor which copied the main features of the reconstruction of the Throne Room at Knossos in 1930. A

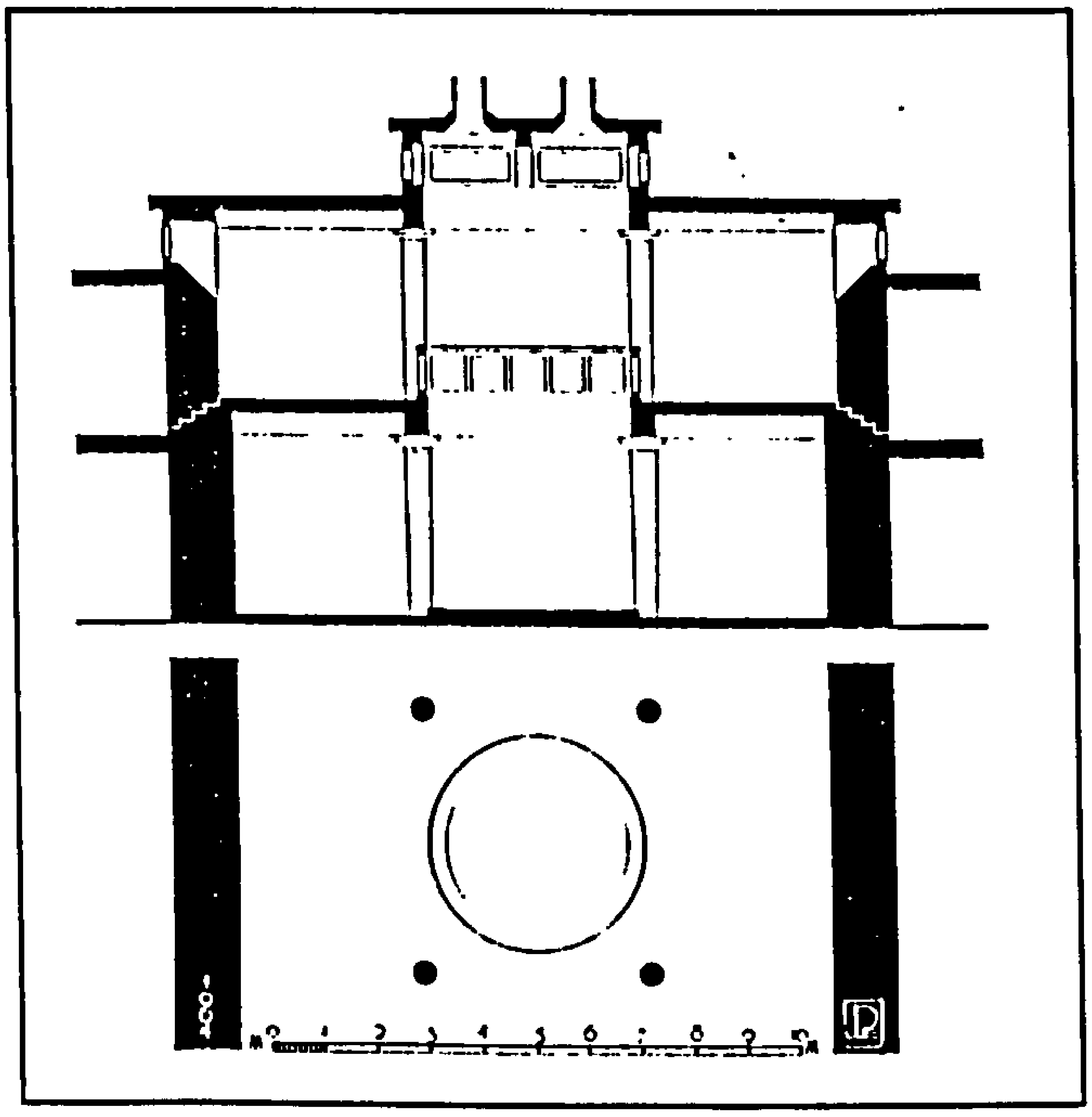


Figure 82 Plan and section of central area, Palace of Nestor, Pylos. Piet de Jong.

[182]*The Times*, 27 April 1967, p. 12. See for example drawing fig. 155 in: The Athenian Agora. A Guide to the Excavation and Museum. By the American School of Classical Studies at Athens.

[183]WYSA Green Book, 1941, p. 13.

[184]Waterhouse, 1986, p. 37.

[185]Waterhouse, 1986, p. 86.

[186]See Blegen and Rawson, 1973, p. x and *The Times*, 27 April 1967, p. 12.

comparison between the section of the suggested reconstruction at Pylos and the executed work at Knossos shows the similarity.[187] In 1965 he worked at the excavation at Keos executing mainly drawings and watercolours of pottery but surprisingly little architectural records.[188] Since 1923 he also produced numerous cartoons, predominantly of archaeologists who worked in Greece and people related to them, depicting them in a humorous way.[189]

In 1965 his wife Effie died and Piet de Jong died soon after on 20 April 1967. Until a year before his death he was still executing drawings for the British School.[190] Since his wife died before him and they had no children or immediate family, hardly any material on Piet de Jong's private life has survived. However, Piet de Jong's extensive work in Crete, and especially his style of drawing lived on as a legacy and affected the archaeological drawings and reconstructions in Crete.[191] It seems that he was a quiet character who was valued by most of the archaeologists in Greece as a valuable and reliable member of the excavation staff. However, at most sites he produced some beautiful reconstruction drawings of buildings but many more of pottery. Thus, he became more a draughtsman than an architect.

5.9 Conclusions

Piet de Jong's work at Knossos is determined by two important elements. First, is the introduction of reinforced concrete as a cheap and durable material. It responded much better to the subsidence problems which occurred at the Stepped Portico in 1922 and proved beneficial in the earthquake of 1926. Employing mass production and reusable shuttering, the concrete reconstructions proved to be much more economical than all the

[187]Compare figure 82 and Section A-A, Drawing 3.
[188]Coleman, 1977, p. viii.
[189]The cartoons are now in ownership of Rachel Hood who is in the process of publishing them.
[190]*The Times*, 27 April 1967, p. 12.
[191]See Roikos, 1986, p 125 - 126.

previous work on site. Second, the aesthetic feelings of Piet de Jong, clearly expressed in his water colours, led him to display the reconstructions in a 'pseudo-ruined' state. This diverges dramatically from the approach taken by Fyfe and Doll, where horizontal top courses were employed for reconstructed walls and ashlar pillars were used to support the beams at the Grand Staircase. The approach of stepping the reconstructed walls down rather than having an abrupt end can be seen in both Piet de Jong's water colours and his physical reconstructions. [192]

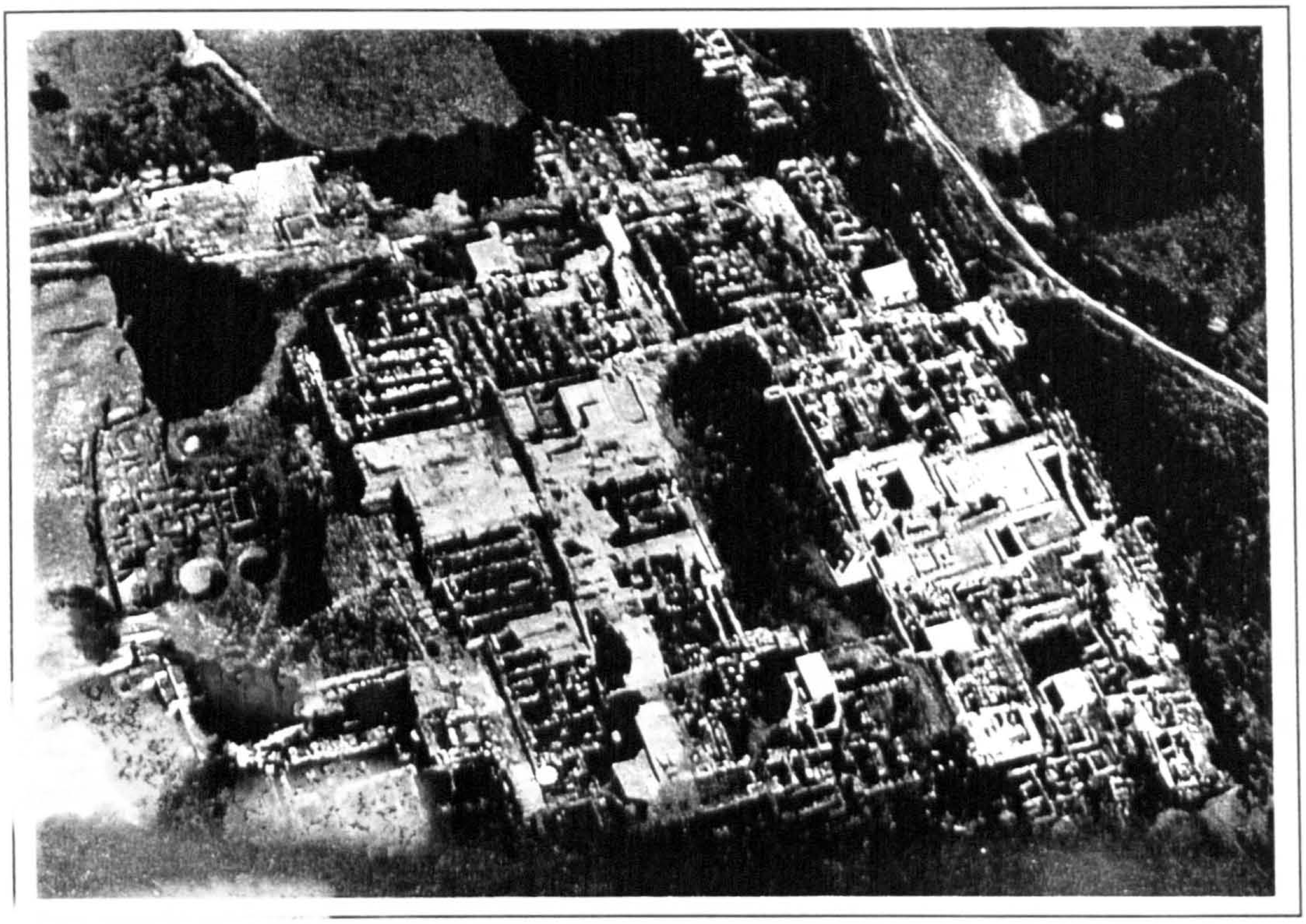
Arthur Evans published the first volume of his monumental book *The Palace of Minos* in 1921 but he had not been to the site since he had left it in 1913. This forced period of absence was a devastating experience for Evans in two respects. First, he saw how much the Palace had deteriorated since he left it. Second, for his forthcoming volumes he started an energetic reinvestigation period after 1922. These new investigations, initially planned to provide him with the necessary information for his book, provided the base for the reconstruction work by Piet de Jong.

The result of Piet de Jong's work was the combination of the following factors: the obvious need for conservation work, the information provided to execute the reconstructions and the availability of a material which was as being regarded appropriate and was also cheap. Finally, Piet de Jong's aesthetic feelings of a picturesque ruin and Evans' constant desire to pass on his knowledge to the visitors added further to the circumstances which led to the work executed on site.

[192]Compare plate H, p. 438, figure 75 plates 82 and 210.

Chapter 6

Evaluation of the Technical Aspects of the Reconstructions



The conservation of archaeological material must begin in the field; planning for conservation needs must therefore start when the excavation is first proposed. This obvious statement needs repeating; although excavation and other archaeological techniques have developed immensely in the past fifty years, the standards of conservation of excavated material have not generally improved to the same extent.

(Nicholas Stanley-Price, 1984, p. 1)

Chapter 6

Evaluation of the Technical Aspects of the Reconstructions

6.0 Introduction

The previous three chapters described the individual works of the architects Theodore Fyfe, Christian Doll and Piet de Jong at the site of Knossos. Each of them employed his own specific techniques and materials for the reconstructions which clearly distinguish them from each other. The chosen reconstruction materials reflect both the financial and geographical limitations and the architectural and engineering knowledge available at this time, but they also reflect the specific conservation attitudes of the architects.

Evans frequently stressed that the main agenda for the reconstructions was to protect the excavated structures. It has already been noted that Evans was involved in conservation debates in Britain before he began excavation work at Knossos and he was certainly not ignorant of the philosophical background and the technical knowledge of conservation.[1] It would be difficult to gainsay the integrity of his publicly proclaimed position that the reconstructions were primarily intended as protection for the excavated structures; it seems certain that this is what he himself believed he was doing.

In this chapter the qualities of the different reconstruction techniques and materials will be discussed. The materials will be analysed and the appropriateness of their use in the reconstructions will be discussed. Furthermore, there will be discussion of where they have been used in Knossos and how they performed there, especially how they harmed

[1]Compare page 68 ff.

or benefited the original palace. In order to do so, each material will be discussed in the following three categories:

- How they have been used at Knossos
- Its adequacy for use in the reconstruction
- Their performance, harm and benefit to the historic fabric

6.1 Stone

Stone is the most obvious material used in the reconstruction at the Palace. The basic material was readily available at the site either in the form of Minoan building material as spoil from the excavation process or as newly quarried material from sources nearby. Local stone dominates traditional Cretan architecture. The walls of both contemporary town houses and farmhouses were built in rubble masonry, and the window and door dressings were executed in dressed masonry.[2] Consequently, skilled local stonemasons were available to execute the reconstruction work at Knossos. Since the original Palace was constructed to a large extent in masonry, to replace like with like seemed to be a good solution.

6.1.1. The Use of Stone in the Reconstruction Process

From the very beginning of the Palace's reconstruction process both, reused historic stones and newly quarried stone was used. The first and, by far, biggest source was the stone which could be found at the excavation site itself. When the Palace was destroyed and finally deserted, the stones of higher parts of masonry walls collapsed into the rooms and courtyards. Some of these stones have been removed in later historic periods but much still remained on site.[3] For most of the stones, which were no longer in their

[2]See Bosineki-Didoni, 1985.

[3]Compare page 152.

architectural context, the former position could not be securely established. In the excavation process these stones were regarded as debris and cleared thereby providing a large amount of stone suitable to reconstruct rubble masonry. The re-use of this material is a very economical solution since hardly any production and transportation costs occur. The reused stones are predominantly póros limestone, sandstone and, occasionally, gypsum.[4]

The second group of stone used in the reconstruction process was newly quarried stones for specific purposes and includes both gypsum and póros limestone. This material was extracted from quarries in the vicinity of the Palace as, most likely, was the case in the construction periods.[5] As in Minoan times, this kept the transportation costs to a minimum. Both the original material and the new material came from, if not the same quarry, at least the same geological strata.[6] Hence, the physical properties of the newly quarried stone are similar but, as we will see later on, not always identical with the original material. This avoids some technical difficulties but creates another problem. If the original gypsum material is weathering too quickly, replacing it with new gypsum from the same source will not solve the problem. Another problem that arises from this procedure is that it blends in too well. While much of the dressed stonework in the reconstructions can be identified as new material, it has become in many parts impossible to distinguish between original Minoan rubble masonry walls and the new walls constructed with reused and new stones a few decades ago.

In the reconstruction of the Throne Room, dressed stone slabs were used to top the brick pillars on which the roof construction rested. Theodore Fyfe also used dressed limestone blocks for the half height pillar at the entrance of the Throne Room and employed stone drums for the construction of the three columns in the same room. The capitals on top of the three columns were made from plaster on a lath under-construction.[7] Fyfe also

[4]Shaw, 1973, p.12 ff.

[5]Ibid., p. 12.

[6]Ibid., p. 38 ff and PM I, p. 532.

[7]See plate 47.

employed dressed limestone slabs for the reconstruction of the Theatral Area in 1903 and for the floor construction at the first floor level in the Domestic Quarter. After the excavation of the North Lustral Basin in 1901 he replaced some of the coping stones of the stepped balustrade with new gypsum slabs to prevent further deterioration.[8] Fyfe also replaced the slabs which covered the cists in the Long Corridor with newly quarried gypsum material after it was excavated in 1903.[9] Furthermore, he used dressed limestone blocks for the quoins at wall ends and for some of the door and window jambs in the Domestic Quarter.[10] In the latter case, the new ashlar masonry receded behind the line of the former door jambs, which were indicated by the original jamb blocks, so that the timber framework could be fitted in front of it in its original position.

Frequently Fyfe used rubble masonry which was fitted into a timber framework. This timber framework provided a rectangular cage structure in which the small rubble stones were build as, for example, at the Hall of the Double Axes, the Queen's Megaron and the Room with the Plaster Couch.[11] Many walls were simple rubble masonry walls with some selected and dressed stones for the corners and wall ends as, for example, the retaining walls, walls in the Domestic Quarter or the small house above the Shrine of the Double Axes. Fyfe's reconstructed masonry walls showed a common horizontal top course. Thus, they were easily distinguishable from the ruinous original walls.

In contrast to Fyfe, Christian Doll used much more dressed stonework and even the rubble masonry seemed to be more regular, employing roughly dressed rubble stone.[12] While Theodore Fyfe, and later, Piet de Jong seem to have used randomly collected stones for their reconstructions, Christian Doll seems to have selected the stones he used very carefully and even reworked some of them. In 1905 he employed neatly dressed ashlar masonry to replace the missing parts of the balustrade wall of the Grand Staircase

[8]See plates 71 and 72. For further reading on gypsum see Ashurst and Dimes, 1990.
[9]Evans 1903, p. 3.
[10]See page 195.
[11]See page 196 and plate 180.
[12]Figure 83.

and in the 1910 reconstruction he used blocks of limestone to construct the pillars and the column.[13] All of these pillars were designed with coping stones to prevent water penetration. When Doll reconstructed the Queen's Megaron in 1908, he used new limestone blocks for the lower courses of the walls enclosing the eastern light-well. The upper part of these light-well walls were executed in rubble masonry as were the balustrade walls in the first floor level above the Queen's Megaron. Both the rubble walls in the light-well and in the upper storey were plastered and covered in the area of the light-well with a pitched roof, or with coping stones in the case of the balustrade.[14]

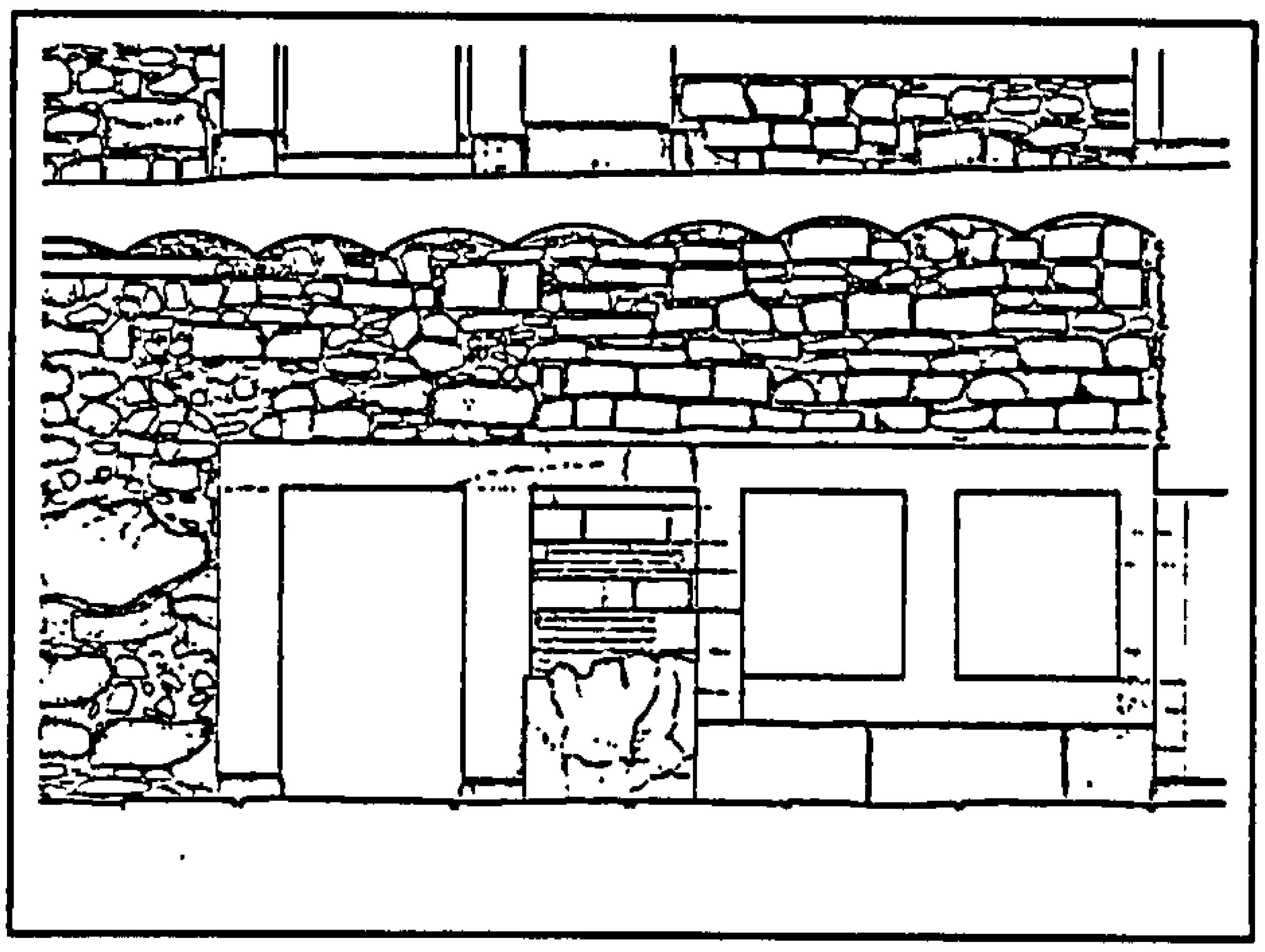


Figure 83 Rubble masonry by Fyfe (above door) and by Doll (above window).

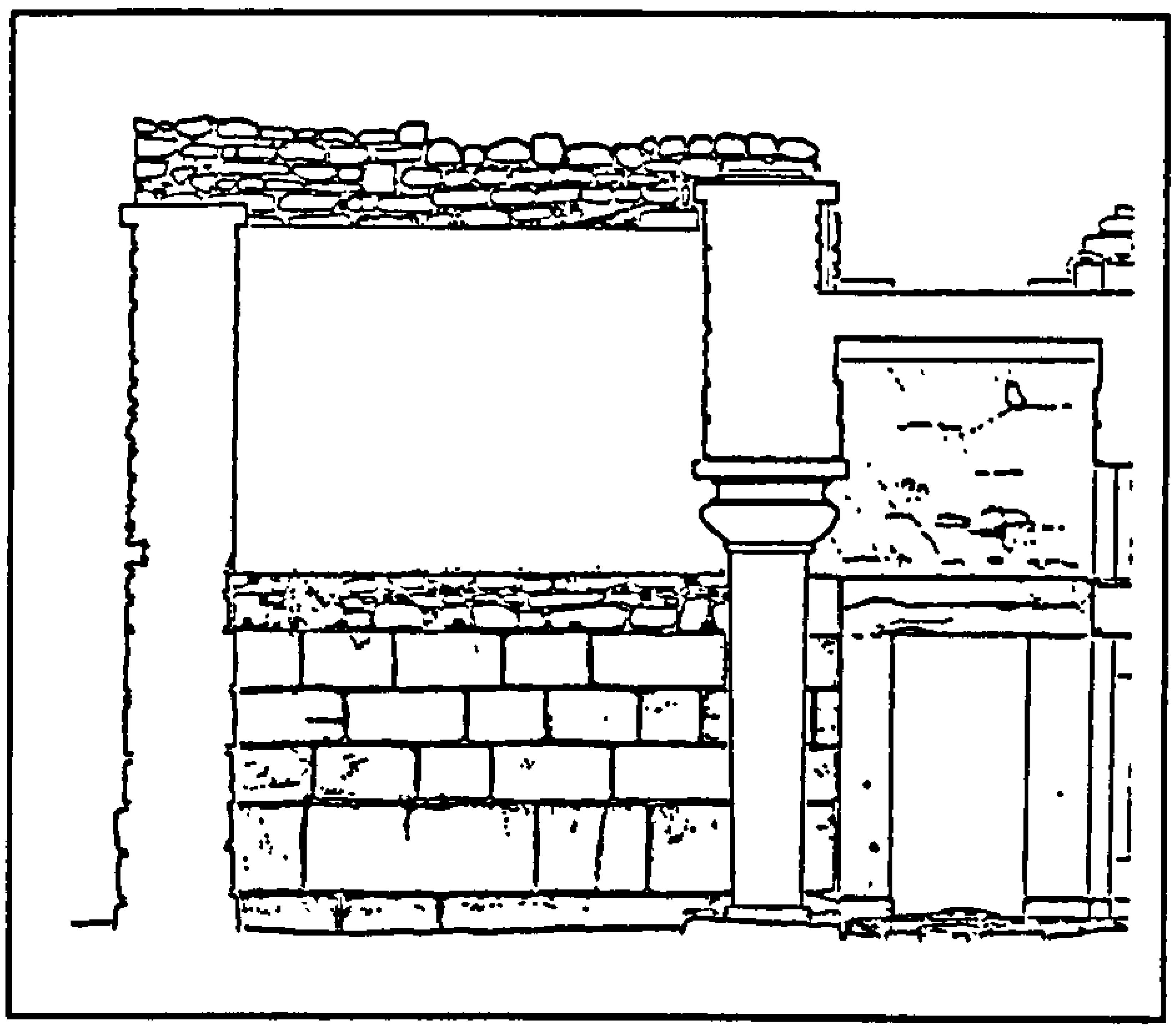


Figure 84 Light well, Queen's Megaron, south wall with ashlar masonry (lower four courses) and plastered rubble masonry above.

In his reconstructions Piet de Jong used rubble masonry to elevate the excavated walls to ceiling height to provide a firm base for the concrete ceilings. As an exception, he had a column carved from limestone in his reconstruction of the Stepped Portico in 1923.[15] Besides this column and some quoin blocks at wall ends, he hardly used dressed masonry in his work. Walls were steadily rising to the required level so that abrupt ends to walls, as in Doll's work hardly occurred. The door and window jambs were executed in rubble

[13]See plate 120.

[14]See plate 120, background.

[15]See page 283.

masonry which was cased with concrete replicas of the original timber framework. The tops of the rubble walls were made waterproof through the use of cementitious mortars. There is no evidence that Piet de Jong used new gypsum material. This must be seen as a logical response to the clearly deteriorating gypsum replacements which were introduced by Fyfe.

Rubble masonry was used from the very beginning of the reconstruction work on site and dressed stone blocks were used for specific purposes. It is prudent to assume that the corner blocks were newly quarried stone, but it is impossible to decide to what extent newly quarried limestone was employed in the construction of the rubble walls. The material came from the same or similar sources and some of the ancient material has been reworked. However the three architects clearly show differences in the way they treated the rubble masonry walls and how these walls were integrated in the ruins. While all architects employed newly carved limestone elements at some place or other, it was clearly Christian Doll who favoured the material and used it most.

6.1.2 Adequacy of Stone as a Material for Reconstruction

From a technical perspective stone is doubtless a material which is compatible with the original structure. The physical properties of the repair material are almost identical with that of the original material and there is no reason to expect structural, physical or chemical difficulties. However, this is only the case with the stones while a wall consists of both, stone and mortar. The mortar used in the historic construction of the Palace was mud which gave the structures a comparative softness.[16] The roof above the walls prevented the mortar from being washed away by the weather. After the excavation process the wall tops were exposed to the weather and the walls rapidly disintegrated due to rain affecting the soluble mortar. These wall tops needed some durable protection.[17]

[16]Durm, 1910, p. 58.

[17]For further reading in the conservation of exposed wall tops at archaeological sites see: Ashurst and Dimes, 1990, Vol. 2, p. 6 ff.

The new masonry, employing the same stone material but different mortars will always feature physical properties different from the original walls, one of which is the wall's structural properties, another its ability to breathe. The exchange of humidity between the structures and the surrounding air is reduced by the new lime mortars affecting the ability of walls to 'breath' as they could earlier. Furthermore, reconstructed rubble walls cannot easily be distinguished from the original masonry if old material is reused. This difficulty is increased by repointing the original walls with a mortar identical to the one used in the reconstruction work.[18]

Another point of interest is the joint between the historic masonry and the new reconstructions. Reconstructed stone walls impose considerable amount of load onto a structure which might no longer be able to carry it. It has been noted that the walls in the palace were constructed with two outer shells between which rubble and clay has been infilled.[19] Once the roof above the wall was removed, a process of disintegration started through water penetration from the top. The bonding between the outer shells and the inner core of the wall is affected which damaged the structural integrity of the wall considerably though this is not always visible from the outside.

The load-bearing abilities of rubble masonry walls vary considerably throughout their length. The internal strength of a rubble masonry wall depends both on a good bonding between the two outer shells and a good integration of the outer shells with the inner core. Furthermore, it depends on a good mixture of rubble stones and mortar in the core: i.e. that stones of various sizes have been compacted well with the mortar. If small stones are missing in the mixture of the inner core, clay mortar has to fulfill this task but this results in a weaker structure.[20] Furthermore, a comparatively smooth inner side of the outer shell of a wall results in a weak bonding between the shell and the core.[21] All these

[18]At Knossos most of the repointing work was executed after World War II by Nikolaos Platon and Piet de Jong. A red coloured mortar was used which allows a clear distinction of this work from earlier work in Evans's time. The work is, somewhat superficially, described in several Volumes of Κρητικα Χρονικα.

[19]Compare page 123 f.

[20]See figure 85 a and b.

[21]See figure 85 c.

criteria are not visible from the outside of a wall, and in Evans' time no non-destructive method for investigating the inner composition of a wall was available.[22] It has been noted that the Minoan builders focussed more on visual appearance than on the quality of the construction.[23] Different masons had originally constructed the palace and the walls origin from different periods. Thus the workmanship of the masonry varies. Furthermore, the destruction process and penetrating humidity affected different parts of the walls to a different extent. Consequently, the ability to carry additional new load varies considerably along the length of a wall even if the wall once carried a similar load.

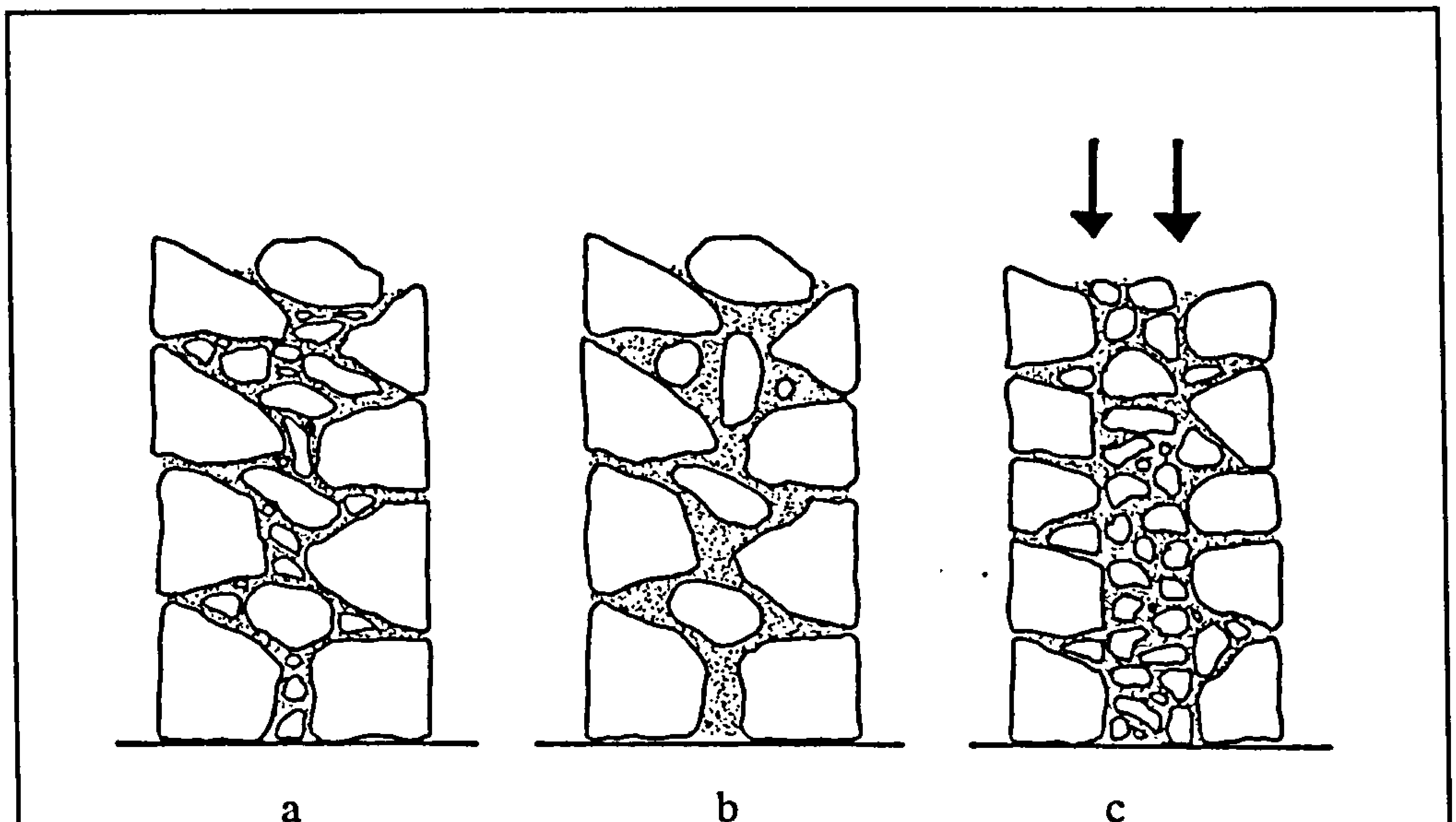


Figure 85 Well constructed masonry with rubble of various sizes (a), weak masonry with small stones missing (b) and masonry with weak internal bond (c).

Most of the walls at the Palace of Minos are rather thick, a fact which has always served as an argument indicating the former existence of upper storeys.[24] While almost all researchers agree on at least one upper storey, others suggested up to three upper storeys above the ground floor.[25] Most walls were, generally speaking, capable of carrying some

[22]In recent years ground penetrating radar, resistivity and magnetometry have been developed to overcome these difficulties. However, to date none of these methods reached a state that would allow predictions with the necessary exactness for construction purposes.

[23]See page 142.

[24]Graham discusses this in his Paper on *The Phaistos "Piano Nobile"*, American Journal of Archaeology, 1956, p. 151 - 157. But see also Graham, 1979.

[25]For example Farnoux, 1996, p. 8.

additional load and in many areas the reconstruction of masonry walls was limited to elevating the excavated structures to ceiling height as in large areas of the West Wing and in the eastern and southern parts of the Domestic Quarter. This hardly exceeded one metre in height and imposed only limited additional load. It was only in the areas of the Grand Staircase and the Throne Room that more storeys were reconstructed. However, it was seen in the reconstruction at the Stepped Portico in 1922 that heavy load imposed on weakened historic masonry can result in the collapse of the underlying historic wall.[26]

Rubble masonry is sensitive to concentrated heavy load at one point. The iron-girders of Doll's and - at the Stepped Portico - de Jong's reconstruction did not rest on a load disseminating wall plate but each of them were laid directly on the masonry of the walls. Thus, the load from the ceiling was not distributed evenly. The collapse of the middle wall under the Stepped Portico might have been avoided if a wall plate had been introduced. However, Piet de Jong's reaction of employing reinforced concrete ceilings for further reconstruction work reflected this problem. The stiff concrete slab distributes the load better than the individual beams and girders. If consideration of this aspect is taken, rubble masonry is an adequate material for the reconstructions.

Reconstructed rubble walls, by selecting the right stones, can be fitted closely to the existing ragged surface of the excavated walls. Only a few loose stones must be removed or reset in mortar; otherwise the historic fabric is not affected by the addition of new rubble masonry.[27] The construction of a good rubble masonry wall needs the same craftsmanship as the construction of a dry stone wall but the Cretan vernacular architecture is made up of rubble masonry houses and skilled craftsmen were readily available. If the right mortars are used, the wall gains some degree of flexibility. Through its many joints, load can be disseminated to some extent if no heavy concentrated load is imposed. The material for the walls was readily available on the site and at local quarries. This was not only very economical but also guaranteed harmonious integration

[26]See page 280 f.

[27]This is very often a major problem in broken load-bearing ashlar masonry. The new blocks cannot be carved to fit closely to the broken surface of the historic blocks and frequently more historic fabric is removed to create a mathematical determined surface onto which the new block is set.

with the existing structures. Thus, as has been stated before, rubble masonry is certainly an adequate medium with which to repair rubble masonry walls, but sometimes it is difficult to distinguish the original masonry from the reconstructions.

6.1.3. Performance, Harm and Benefits

The general assumption will be that a material which has been employed in the original structure cannot harm this structure if used in its reconstruction. This assumption, however, cannot be supported in an unqualified way. Rubble masonry was used in the original construction, but the properties of mortars employed in the reconstruction process vary considerably from the mud mortar employed in Minoan times. The particularity of rubble masonry is its consistence of many small stones rather than a few big members. Load and structural forces can be diverted into many lines and movement of the building members is absorbed by the many joints in the masonry which is, in terms of conservation, a desired effect. However, this property depends to a large extent on the quality of the mortar. If the mortar is too hard and strong, the ability to absorb unwanted forces is reduced.

An analysis of the mortars from Knossos, conducted by the Scottish Lime Centre on the author's behalf, shows that all three architects used lime mortars.[28] While cement was used for the reinforced concrete structures, it was not employed for mortars. All mortars were comparatively soft with little evidence of cementitious binders but were still stronger than the original mud mortar and the mortars used by de Jong were stronger than the ones used by Fyfe and Doll. However, all repair mortars were comparatively soft. As a result of this, no damage could be detected at the Palace which was due to the strength of the mortars used. Thin reconstructed walls responded by bending and sometimes cracks appeared in the mortar joints. For example, the South-North Corridor was reconstructed by Piet de Jong in 1925. In the western part of the Corridor, three

[28]See Appendix 5 for the full report.

walls and a column formed a very firm compound, while at its eastern side only one thin wall supported the ceiling. The movement of the flat concrete ceiling is absorbed by the slim eastern wall which bends while the thick western wall clearly shows the cracks in the joints.[29]

	Sample 1 (Fyfe) Treasury, 1901	Sample 2 (de Jong) Service Wing, 1930	Sample 3 (Fyfe) Service Wing, 1904	Sample 4 (de Jong) Throne Room, 1930	Sample 5 (Fyfe) Inner Sanctuary, 1901	Sample 6 (de Jong) Loggia, 1930	Sample 7 (Doll) Service Wing, 1905?	Sample 8 (Platon) Service Wing, 1950?
Lime & Limestone	7.4	3.2	6.9	20.0	1.6	22.0	4.0	1.1
Gypsum	0.8	0	0	0	0	0	0	0
Clay	0.4	1.5	0.4	1.7	1.0	2.5	0.2	0.1
Sand	1	1	1	1	-	1	1	1

Table 3 Mortar samples from the Palace of Minos.

It seems that no problems occurred at the interface between the historic walls and the new reconstruction. On the one hand the original masonry stands up to a considerable height and rising damp will still evaporate through the original walls rather than being blocked by the reconstruction mortars. On the other hand, these mortars were made of lime and, therefore, they slightly impeded but did not prevent the evaporation process. Many joints of the original walls had been repointed in the 1950s in campaigns by Nikolaos Platon and Piet de Jong but they also used lime mortars.[30] This made it very difficult to distinguish the original and the reconstructed walls in some places but it should have limited affects to humidity exchange of the walls.[31]

Employing a soft mortar, the additional rubble masonry is reversible without too much damage to the historic fabric. The new masonry has not harmed the historic fabric. The

[29] See plate 15.

[30] See table 3.

[31] There are some humidity related problems in the Domestic Quarter which are probably due to drainage problems and general lack of maintenance rather than humidity trapped by mortars.

additional load imposed on the excavated structures by the new walls was less than what had been resting on these in Minoan times. Besides the one case of the reconstruction of the Stepped Portico in 1922, the weight of the new walls did not cause problems for the historic fabric.

It seems that no wall has been exclusively elevated and repointed to prevent further damage to the exposed top. Most of the walls were elevated to carry a roof or at least a door jamb or a similar element from the upper storeys.[32] Some had other structural functions as for example the retaining walls. They were reconstructed to support the Central Court. Some walls were reconstructed for purely presentational reasons as for example the walls at the Theatral Area. Thus, the benefit of the majority of the reconstructed wall was that they carry the roof which protects the floors or fresco remains. The benefit of protecting excavated walls themselves with new masonry on top of it was not utilised. Most wall tops which were not elevated in order to fulfill a specific function were not treated at all.[33]

Dressed stone has been used for the reconstruction of columns which in the original construction had been made of timber. The columns in the Throne Room and in the 1905 reconstruction of the Grand Staircase were made of roughly dressed stone covered with a plaster coat, while the columns of the 1910 reconstruction of the Grand Staircase and the Stepped Portico were made of precisely carved stone drums. Rising damp has caused some salt crystallisation at the lower parts of these columns.[34] The stone columns will thus certainly last longer and require less maintenance than a replacement in timber would have done. However, the stone columns are much heavier than the original timber columns. The ones which were located in a upper storey situation, such as at the Grand Staircase or the Stepped Portico may impose an amount of load which the structures underneath cannot carry. It is debateable whether the reconstruction of fewer storeys with heavier materials imposes more or less weight than the originally existing storeys

[32]See for example elevated walls between magazine doors in Long Corridor. See plates 18 and 54.
[33]See plate 54.
[34]See plate 125.

with lighter materials. In the case of the Stepped Portico the wall underneath actually failed, even though it succeeded at the Grand Staircase. This was due to the fact that at the Grand Staircase the load of the upper column was distributed onto a new iron girder substruction underneath but such a construction was missing at the Stepped Portico.

The specific deterioration problems of the material gypsum had been recognized as early as the first campaign in 1900. In his report for the British School at Athens Evans quotes Theodore Fyfe:

> "The best example of the material [gypsum] is from the long straight wall below the Southern Terrace which has one or two perfectly sharp-angled stones - (except for a slight rounding which was probably intended) - in very good condition. The material is very homogeneous, with no shell or other organic impurities. This wall is quite grey in parts as are also the pillars in the Pillar Room but most of the other stones have weathered white, with a tendency to small furrows, especially on the upper surface exposed more directly to the action of water. The furrowing resembles the water-drip channels on the side of a cave."[35]

After the cists in the Long Corridor were discovered in 1903 and excavated in the same year, the openings had to be covered again in order to prevent rain water collecting in the cists. Theodore Fyfe, in his own way, employed newly cut gypsum slabs for this work since the cists have originally been covered with this material. The decision to replace the removed slabs with new gypsum material must have occurred with the full awareness of the weathering properties of the material. In the original construction of the Palace different types of gypsum were used for various purposes and it seems that some varieties were more resistant to the effects of rain than others.[36] As early as 1900 Fyfe identified different types of gypsum,[37] and Evans confirmed later that some types of gypsum resist the forces of the weather in a better way than others.[38] However, it seems that Fyfe had used either the wrong type of gypsum or had neglected to quarry the material according

[35]Evans, 1900, p. 53.
[36]Shaw 1973, p. 20 and 22. See also PM III, p. 287 f.
[37]Evans, 1900, p. 53.
[38]PM III, p. 288.

to its bedding planes.[39] Gypsum, as limestone, is a sedimentary rock and as all sedimentary rocks performs differently in its various directions. Slabs quarried and used according to the bedding planes last much better than slabs quarried across the planes.[40] The replaced slabs in the corridor today present themselves in a much worse state of preservation than the original slabs.[41]

Theodore Fyfe also replaced the coping stones of the stepped balustrade at the North Lustral Basin with new gypsum slabs.[42] Here again the material weathered quickly and is now almost indistinguishable from the original slabs. Furthermore he replaced floor slabs at the West Entrance area.[43] Fyfe's basic idea of replacing the slabs to prevent further damage to the balustrade and the cists was certainly justified but replacing the floor slabs at the West Entrance cannot be justified from a conservation perspective. Rather it is of a presentational nature and provides a more evenly paved area for the visitors and indicates the original system of causeways in the courtyard pavement. The idea of replacing like with like must be honoured. However, to replace a material which is already known to weather easily with the same material could be teemed as a mistake. There is evidence that Doll removed paving slabs in order to allow for supplementary excavations under the floor level.[44] It seems that he replaced the original slabs at their former position and had no new gypsum quarried for this purpose. There is also no evidence that de Jong had new gypsum quarried. He replaced missing parts with concrete replacements.

Today no damage to the excavated structures can be detected on site which originated in the use of rubble masonry walls which is due to the consistent use of soft mortars. The

[39] Mrs. Stefie Chlouveraki currently undertakes a detailed study on the conservation of Gypsum in the Minoan Palaces of Crete. I owe gratitude to her for these information. However, I investigated the replaced slabs all of which were quarried according to the bedding plans. Thus the deterioration must be due to the wrong type of gypsum.

[40] See Ashurst and Dimes, 1990, Vol. 1, p. 171.

[41] See plate 24.

[42] See plates 71 and 72.

[43] See PM II, fig, 427, p. 673.

[44] See plate 186 and plate E, p. 220.

reconstructed masonry walls had no protective function in themselves but carried roofs which covered exposed floors or supported structures which were in danger of collapsing. Thus, they were an adequate reconstruction method. However, the use of easily deteriorating gypsum is questionable.

6.2 Timber

In Minoan times timber was used extensively in the historic construction of the Palace. Not only ceilings and columns were made of timber, but also walls were reinforced with a timber framework in order to withstand better the forces of earthquakes.[45] It seemed to be a logical choice to use timber beams in the reconstruction process. However, not much of these timber reconstructions survives today; most of it has been replaced by later iron girder or concrete reconstructions.

6.2.1 The Use of Timber in the Reconstruction Process

Charcoaled remains of original timber elements were found at the palace and it has been established that cypress alongside with other species were used by the Minoan builders.[46] Visitors approaching the Palace today will find it enclosed by a grove of tall cypress and pine trees. But these trees had been planted by Evans after Word War I and give an incorrect impression to the visitor. When Evans excavated the site the landscape in the Knossos area was scarcely forested.[47] Most of the trees visible in the early photographs are groves of olive trees. Timber had been used in the vernacular Cretan houses for the roof construction and for furniture but the limited use and the particular construction methods indicate that timber was rare and expensive.[48]

[45] Compare page 132 f.

[46] Compare page 125.

[47] Compare plates 3 and 5.

[48] Bosineki-Didoni, 1985, p. 56.

Cypress wood was not available in the required dimensions on Crete, and so Theodore Fyfe had to look for a substitute. Fir, grown in the mountainous regions of Austria, seemed to be a good choice.[49] Due to the hard environmental conditions in the mountains, the Austrian fir grows slowly and produces a comparatively dense and heavy type of wood which was successfully used in the construction of timber buildings in this region for centuries.[50] Until Austria lost its access to the Adriatic Sea at the end of World War I the timber could be brought to Trieste and transported further by ship to Crete.[51] Evans refers to the timber employed in the reconstruction process as 'pine' and not as 'fir' but the Austrian houses were built in fir which is more common in Austria than pine. Furthermore, a surviving timber beam in the Treasury is fir and not pine wood.[52] The name pine is frequently used as a generalisation of all types of softwood and, most likely, this is what Evans wanted to express.[53] Both cypress and fir are coniferous trees, which produce softwood and have similar weight and strength. Cypress, however, is more durable, resists insects and can be used outdoors[54] while the use of untreated fir cannot be recommended for use in unsheltered areas.[55]

Timber has been used in the reconstruction process in two ways. On the one hand new timber was employed to replace the decomposed wooden elements of the original construction. On the other hand, timber beams were used as additional structural support with no intention to recreate any of the original timber elements. The propping up of the Grand Staircase and the East-West Corridor is a typical example of the second type of reconstruction.[56] In its simplest form, beams were cut precisely to fit under some

[49]PM III, p. 288. Arthur Evans was jailed by the Austrian Authorities in 1882 in Ragusa (Dubrovnik). He was charged with High Treason for supporting the struggle for independence by the Bosnians but was released after six weeks. Obviously, Evans put safeguarding the excavated remains over his own political disagreements with Austria. See: Brown, 1993, p. 26.

[50]See Schäfer, 1984, p. 83 ff.

[51]See plate 213.

[52]See plate 174.

[53]Anon, 1879, p.351.

[54]Anon, 1879, p. 359. The author even mentions the use of cypress for building purposes in Malta and Candia [Crete].

[55]Anon, 1879, p. 351 ff. See also Schwab, 1976, p. 260 ff.

[56]Compare page 185 ff.

structures to keep them up. For instance, when the Hall of the Double Axes was excavated in 1901 timber posts kept the jamb blocks of the upper storey in their position.[57] At this stage, it was not known what to expect at the lower level and since the excavation process was still going on, this was a good and flexible method of keeping the upper level elements in their position. However, this propping up was not a permanent solution and Arthur Evans wrote:

> "The hewing away of the clay concretions and the extraction of the various rubble and earthy materials of the intervening spaces left a void between the upper and lower spaces that threatened the collapse of the whole. The carbonised posts and beams and shafts, although their form and measurement could be often observed, splintered up when exposed and, of course, could afford no support. The recourse to mine props and miscellaneous timbering to hold up the superincumbent mass was at most temporary and at times so insufficient that some dangerous falls occurred."[58]

As soon as the excavation in these rooms was completed, the preliminary posts were replaced with a permanent structure. Some of these permanent structures were not designed to recreate the original structures but were purely functional such as the first support frame at the Hall of the Double Axes.[59] It has been noted that the wooden framework pillars rested at the same places where the original pillars had been resting on the jamb blocks but were not placed on the blocks themselves.[60] Another support structure were two inclined props which kept a piece of upper storey masonry in position. The piece of masonry was cased with timber boards which then were supported by the props. Individual props can only keep up a single stone while endangered masonry walls need timber casing in order not to disintegrate.[61]

Besides at the Hall of the Double Axes, Fyfe constructed the frameworks at the Grand Staircase, at the lower East-West Corridor and at the corridors at the Domestic Quarter, to name most important ones. He also constructed horizontal frameworks which

[57]See plate 133.
[58]PM III, p. 288.
[59]See page 190 and plate 136.
[60]Compare page 190.
[61]See plate 136.

prevented upper elements from collapsing into excavated corridors; for example at the Grand Staircase or at the Dog's Leg Corridor.[62]

Besides these structures Theodore Fyfe also reconstructed timber frames which were intended to recreate completely or partially the original timber elements such as the 1902 reconstruction of the door and pillar wall of the Hall of the Double Axes. This structure was filled, as in the original construction, with rubble masonry and then plastered.[63] Fyfe also built the pillar at the first floor landing of the Grand Staircase and a timber framed cage in the Queen's Megaron which were treated in the same way. Furthermore he had cantilever beams inserted in the wall, partly recreating the original ceiling constructions. They carried projecting roofs to protect sensitive features underneath. In the Treasury and in the neighbouring Corridor of the Painted Pithoi Fyfe inserted new timber posts in the vertical slots of the former reinforcement beams.[64] They were necessary to reinforce the walls which had to carry a piece of reinstalled floor in this area. Here, the reinstalled timber framework not only recreated the original structural function of the missing parts, but also recreated the original structure in material and dimensions.

It has been noted that in the original Minoan construction timber reinforcement beams were only roughly shaped at the front while its back was left unworked. Because of this, and further stresses in the destruction process, the slots left in the walls are very irregular.[65] This fact impeded the reinstallation of new beams in the existing gaps. One possibility was to widen the gap to accommodate a timber beam of the required dimension which would result in the loss of historic fabric. Another possibility was to provide a small timber member to fit into the gap and fill the remaining cavity with mortar. In this case the timbers did not provide the required structural stability. Thus, Fyfe filled only these two vertical slots with new beams but left most of the gaps in the masonry vacant or filled them with smalls stone rubble masonry. Where the walls could

[62]See plates 158 and 159.

[63]Compare page 191.

[64]See plate 174 and Section A-A, Drawing 8.

[65]Compare page 133 f.

not carry the load, he provided new independent timber frames to support the reconstructed upper floor areas.[66]

The structure of the flat roof above the Throne Room was made of timber, as was the later pitched roof above it. Further pitched roofs were constructed in timber by Fyfe above the Shrine of the Double Axes and the Magazine of the Giant Pithoi and by Christian Doll at the Queen's Megaron. This, however, is rather exceptional for Doll. He normally employed timber only for cladding the load-bearing iron girder construction with thin boards, but he rarely used massive beams.

The use of timber is a good indicator of the changing attitudes towards conservation and reconstruction at the Palace of Knossos. In the first reconstructions Theodore Fyfe frequently employed timber. In 1901 after the support work for the East-West Corridor collapsed he replaced the structure with another wooden support frame.[67] Only after the collapse of the support work at the Grand Staircase in the winter 1904/05 did Christian Doll replace the wooden constructions with iron girders which he clad with timber boards. Thus, the function of timber has been reduced from being a structural member to a mere superficial surface. Finally, Piet de Jong used timber only to construct the shuttering for concrete.[68] The concrete beams which were supposed to replicate timber beams were later painted in a colour to resemble wood.[69]

6.2.2 Adequacy of Timber as a Material for Reconstruction

Timber has always been the most important material for support structures of all kind. It can be cut easily, altered and joined on site so that it fits the specific function for which it was selected. This work can be executed by almost any worker without specific

[66]See page 201.
[67]Compare page 185.
[68]See plate 63.
[69]PM II, p. 352.

training and the number of required tools is limited. Timber support work can be altered easily if this is required by the progress of excavation work in this area. For example, the shore which supports a piece of masonry might be extended with the increasing depth of the pit. Furthermore, wooden beams are, in relation to their strength, very light so that they can be transported easily to the site and moved on site. For these reasons timber is widely used for support work at many excavation sites even today.

Timber had been used in the original construction of the palace. The beams provided both the vertical support at pillar, door and window jambs and the required horizontal tensile strength in the masonry walls. To replace like with like, i.e. the use of timber in the reconstruction work seemed to be a good idea. Both iron girders and concrete beams were also able to provide support and tensile strength but were not as flexible as timber.

Timber is an excellent and lasting building material but is not very forgiving if the rules of good design are neglected. These rules include keeping timber away from the ground and avoiding contact with earth. At excavation sites the original roof, which sheltered the buildings from the effects of the weather, vanished long ago. The excavated walls are exposed to the weather in a completely different way than they used to be in the original building. Thus, timber which was replaced where timber originally had been is affected in a different way than the original member. For reconstruction work at archaeological sites where design possibilities are limited, timber might often prove to be the wrong material.

Normally, timber is an affordable material and even in Mediterranean areas it is still competitive with metal. However, timber was expensive in Crete and Fyfe wrote in his letter to Arthur Evans, 19 June 1901:

> "The account for wood will be pretty heavy. Glavosis says wood is dear, and we really need a good deal."[70]

[70]Letter from Theodore Fyfe to Arthur Evans 19 June 1901, Ashmolean Museum, Evans Archive.

Obviously Fyfe relied at the beginning of his reconstruction work on local sources but later had to import timber from Austria. Both the price of local timber and the high transport costs of imported timber were a constraint to its extensive use. Furthermore, imported fir was not the ideal type of wood to be used in the reconstruction process.

6.2.4. The Performance, Harms and Benefits

Theodore Fyfe, and to some extent, Christian Doll used timber for their reconstruction work on site. Only small accounts of it survive to date. Arthur Evans frequently held the Cretan Climate responsible for the fast deterioration of wood. For example:

> "In the first stage of the excavations in the West Quarter of the Palace, where the depth of the excavated area was less and the amount of the upper story remains more limited, wooden props and beams, with at most iron bars to reinforce them over horizontal openings, were made to serve. But the quite unprecedented conditions met with the 'Domestic Quarter' soon demonstrated the inadequacy of such supports. The violent alterations of the Cretan climate and vicissitudes of damp and heat were found to rot woodwork in an incredibly short space of time, and some serious collapses of supports and masonry were the result."[71]

It is a fact that timber that was employed in sheltered areas of the Palace has survived comparatively well. The timber boards installed in the Queen's Megaron in 1908 are still in a perfect condition and so is the window in the Magazine of the Jewel Fresco which was installed in 1922. The greatest danger to timber in Crete are insects and the timber posts installed by Fyfe in the vertical slots in the Treasury and the Corridor of the Painted Pithos have not been attacked by humidity, but by insects.[72]

Obviously it has not been the 'violent alterations of the Cretan climate' but rather the deficient design of the timber reconstructions that caused their collapse. The timber

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[71]Evans, 1927, p. 262. But see also Evans, 1905, p. 23, Evans, 1908, p. 586, Evans, 1928, p. 97, PM III, p. 288.

[72]See plate 174.

framework commonly employed by Fyfe was covered with wooden boards on which earth and original paving slabs rested. Exposed to the weather the rain water penetrated the joints between the slabs and was trapped between them and the boards. With the basin like structure at the northern portico of the Hall of Colonnades this effect was even increased.[73] Here also the timber beams rested directly on the floor and not on the original base stones. Furthermore, the original construction of the stepped colonnade alongside the lowest flight of the Grand Staircase was misunderstood.[74]

The support frames at the Hall of Colonnades and the Grand Staircase were constructed by two workmen who had previous experience in a mine. However, the timber frames in a mine are exposed to a constant level of humidity and temperature. Thus, direct contact with the surrounding earth does little harm. At Knossos the humidity to which the timber was exposed was constantly changing; this is a much worse condition but is a common problem for many buildings. The basic construction rules to keep timber away from the ground and to shelter it from humidity had been neglected.[75] Where these rules had been followed more closely, timber survived in good conditions.[76]

While the first timber support frame at the door and Pillar wall of the Hall of the Double Axes rested directly on the floor, the later one rested on the base blocks. In Minoan times these base blocks were designed to keep the timber frames of the pillars from the ground and were reused in 1902 by Fyfe for exactly the same purpose.[77] The second structure lasted until Piet de Jong reconstructed the Hall in 1928 and the photograph taken shortly before its demolition indicates a clear lack of maintenance but no structural failures.[78] Like any timber framed building, the outer surface was affected by the weather but the

[73]See page 185 f.

[74]Compare page 183 f.

[75]Compare Gerner, 1994, p. 62. He notes that the life expectancy for softwood in dry conditions is approximately 900 years, while softwood in waterlogged conditions survives for 90 years. Timber which is exposed to changing humidity is expected to last only for 45 years.

[76]It seems that this was not a willful neglect by Fyfe but rather a result of the excavation work. While the digging work was going on the support frames were adapted to fit the current needs. When the work was finally completed in this area a proper construction simply was not produced.

[77]See page 191 f.

[78]See plate 145.

structure itself remained sound. The better designed timber structures survived for a long time, but when Evans returned to Knossos after the forced break of Word War I he realized that the timber elements required constant care. He was not able to look after the reconstructions for more than seven years. On return to the site in 1922 he saw the effects of weathering and realized he had to ensure regular maintenance or to replace the timberwork with a material that requires less maintenance.

Where timber was employed to construct roofs, covered with tarpaulin or tiles, it not only survived for a long time in a sound condition but also provided good protection for the sensitive features underneath. The Throne Room was covered by a flat roof in 1901 and by the pitched roof from 1904 but the Anteroom was covered for the first time in 1930 when Piet de Jong executed the concrete restorations in this area. The floor slabs of both Anteroom and Throne Room were in a similar state of preservation at their excavation in 1900. Today, the slabs in the Throne Room are still in a good condition

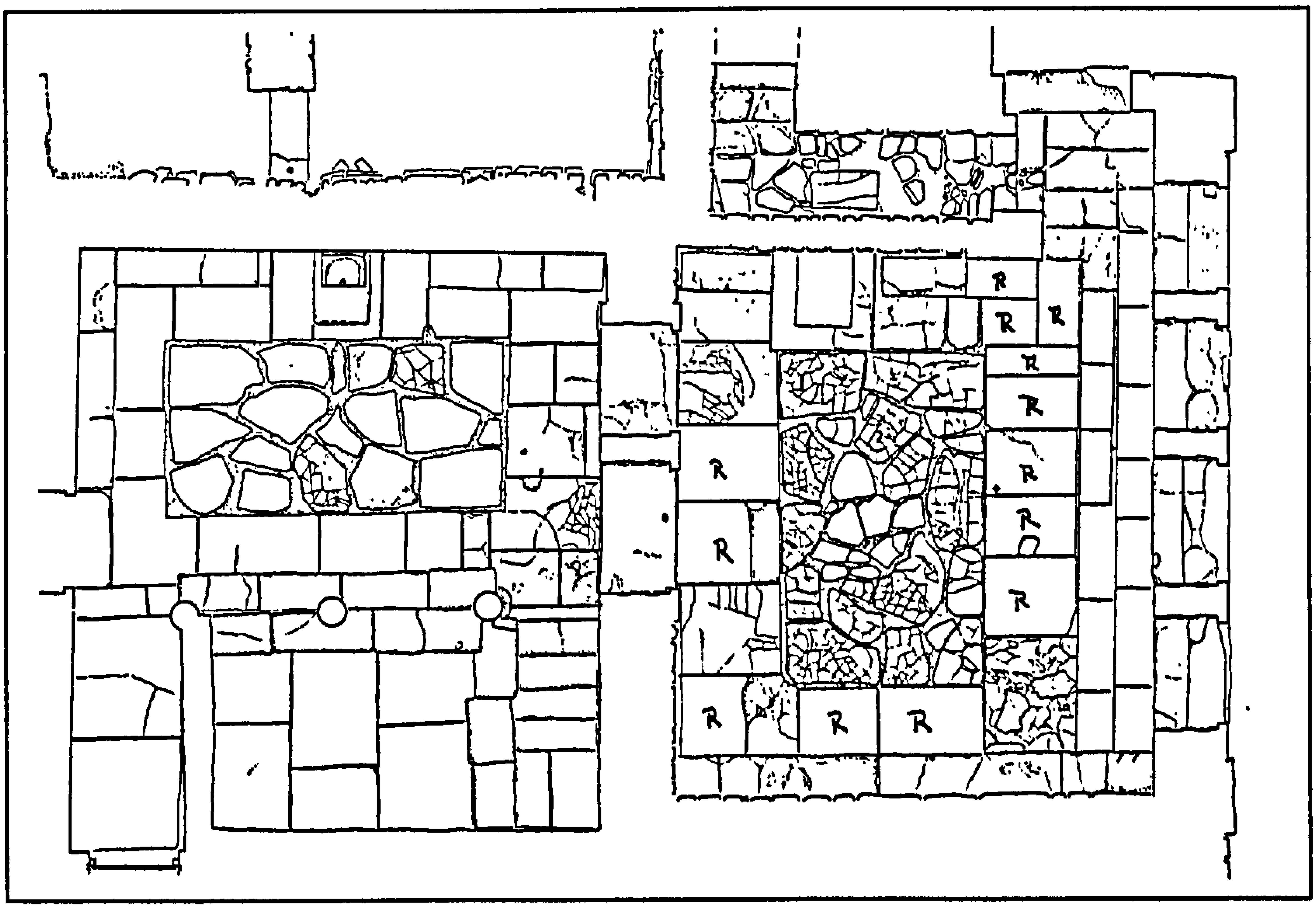

Figure 86 Throne Room and Anteroom, The pavement of the Throne Room was covered one year after excavation the Anteroom was left exposed for thirty years. R marks replaced slabs.

while the ones in the Anteroom are heavily damaged.[79] Here the efficacy of the protective roof becomes evident. Other areas which were covered by timber roofs were Fyfe's small house covering the Shrine of the Double Axes, which lasted well until after World War II when it was removed by Platon in order to install the steel and corrugated plastic shelters. Fyfe also constructed the inclined roof above the Magazine of the Giant Pithoi which was later replaced by de Jong by a flat concrete roof. These properly constructed buildings survived well and fulfilled their protective function.

Timber had been employed in the original construction of the Palace in Minoan times and is not a new material. The new inserted timber frames and support structures were very thin and slender.[80] They were, structurally speaking, soft and timber is a flexible material. Consequently, it did not introduce incompatible new forces to the remaining structures, which these were not able to handle. Due to the fact that excavation sites cannot provide the required level of sheltering for the timber members, they were destructively exposed to the weather. Furthermore, in a number of cases the design of timber frames was provisional and neglected basic construction rules which affected their durability. As a result, only few of the timber support structures, most of which were designed and executed in the ongoing excavation process, survived. Almost all of them were later replaced with iron girder and brick vault structures or concrete reconstructions.

6.3 Bricks

Fired bricks, as they were used in the reconstruction processes at Knossos, had not been used in Minoan times.[81] In the original construction of the palace, and especially in later alterations, sun dried bricks were employed.[82] They had been a very important and widely used building material at the Minoan Palace at Mallia but they never achieved that

[79]See Ground Plan, Drawing 1.

[80]See for example the reconstruction of the door and pier wall at the Hall of Double Axes, plate 142.

[81]See page 135 ff.

[82]Shaw, 1973, P. 189 and see also PM II, p. 519.

importance at Knossos. However, unfired brick or, more generally speaking, earth is one of the oldest, simplest, cheapest and widely used building materials.[83] Earthen structures require a careful planing of all details to avoid damage by water and, furthermore, they need constant maintenance.[84] At the palace no roof protects earthen structures from water and regular maintenance cannot be guaranteed. Thus, to reconstruct parts of the Palace with unfired bricks is impossible, and as the most likely substitute fired bricks were employed on site for various parts of the reconstruction work.

6.3.1. The Use of Bricks in the Reconstruction Process

Fired clay bricks are a material which was used the by all three architects on site but Christian Doll was the one who employed this material the most. Like timber, brick is a good material to study the different conservation attitudes of the architects. Theodore Fyfe used bricks at several areas of the palace, mainly for structural reasons. In the Treasury he supported a leaning wall with a massive inclined brick buttress to prevent its collapse. Other work include the pillars of the Throne Room roof construction,[85] the door jambs in the Room of the Plaster Couch[86] and the brick arch at the South East House. The philosophy of Theodore Fyfe seems to be very clear. Rubble masonry was employed to reconstruct walls where, to the best of his knowledge, walls had existed in Minoan times. He increased the height of the excavated remains of existing walls with rubble masonry. If permanent structural support was necessary but clearly no original masonry had been in this place beforehand, he employed brick work for example at the buttress in the Treasury.

Christian Doll used bricks predominantly for the construction of vaults between iron girders.[87] This was a common construction technique in the second half of the nineteenth

[83]Houben and Guilaud, 1994, p. 3.
[84]See Houben and Guilaud, 1994, p. 245 ff.
[85]Compare page 177.
[86]Compare page 198.
[87]Compare page 231 f.

century in Britain and promised to be more successful on site than the timber reconstructions of Theodore Fyfe. According to Doll's reconstruction proposals, the brick arches were to be hidden by a suspended timber board ceiling. Thus, he employed bricks for a purely functional purpose without any agenda to show a new material in an historic context.

Piet de Jong employed the same iron girder and brick vault technique in the reconstruction of the Stepped Portico. The two magazines below the Stepped Portico were not open to the public but visitors could see the brick vaults at the light-well he created in the first flight of steps. The substructure of the second flight was also exposed to the public. Unlike Doll, Piet de Jong did not try to hide the brick vaults behind wooden boards which in themselves are an imitation of a real timber ceiling. It seems that his attitude is much more in favour of an honest admission of the fact that certain parts have been reconstructed. Most of the bricks used in the reconstruction work in the palace were of uniform size and shape. They are twenty-one centimetres long, eleven centimetres wide and just under five centimetres thick; this seems to have been a common size.

The bricks used by Theodore Fyfe were more irregular in shape and lack the smooth surface, which distinguishes the later material. This is not due to the fact that these bricks have been exposed to the weather for a long time. The sheltered bricks of the underside of the brick arch in the South West House show the same condition as the more heavily exposed bricks. It seems that these irregular and rough bricks were made in wooden moulds.[88] Theodore Fyfe, being closely acquainted with traditional and vernacular building materials, was perfectly satisfied with the appearance of these bricks. Christian Doll, due to his upbringing in London preferred bricks with smooth and regular surfaces. Piet de Jong who used bricks only in his 1922 work at the Stepped Portico employed the

[88]See Brunskill, 1990, p. 24.

same types as Doll. The bricks they employed are of the same dimensions as Fyfe's, but they are obviously made in a metal lined mould and a stock. Thus, the later bricks are all smooth and regular in their appearance and have all the distinctive frogs created by the mould.[89] Three different frog patterns can be identified at the soffit of the lintel of the door between the Throne Room and the magazine south of it. [90] The Arts and Crafts museum at Vori in the South of Crete displays various Cretan handicrafts, including a brick which features an identical frog. This proves that the bricks were a Cretan product and not imported from overseas.[91]

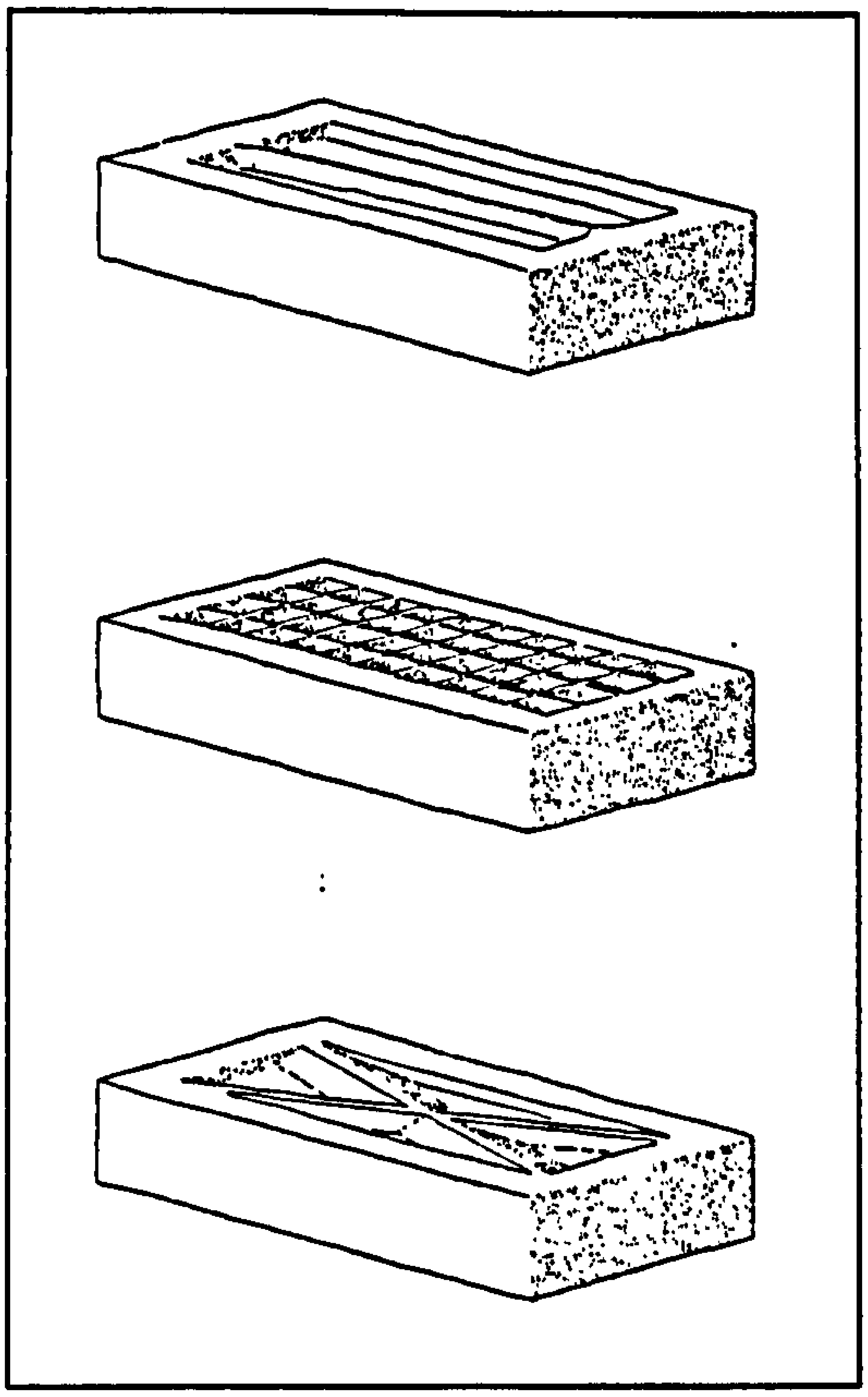

Figure 87 Bricks used by de Jong at the Stepped Portico.

Crete is not a traditional brick area but the traditional local architecture is based on the use of limestone masonry.[92] However, unfired bricks were used in the Minoan period and the Italian excavation at Gortyn exposed fired bricks from the Roman period.[93] In more recent periods, the use of fired clay as a building material has almost exclusively been limited to roof tiles both in the cities as well as in the countryside and for use as pipes. But it seems that from the turn of the century bricks were manufactured in Crete and must have been used to some extent.[94] As a local material, brick had very few transportation costs, but so had stone, which was available on the excavation site for free.

[89]A 'frog' is an indentation in the surface of a brick which reduces its weight, makes it easier to handle and minimises the clay used in its manufacture. Brunskill, 1990, p. 100.

[90]See figure 87.

[91]For further reading in the area of brick making see: Notes on Building construction, Part III, Materials, Rivingtons, London, 1879; Hamilton, 1978 and Brunskill, 1990.

[92]Bosineki-Didoni, 1985, p. 9 ff.

[93]Gorys, 1989, p. 182 ff.

[94]Compare exhibition at the Arts and Crafts Museum Vori.

6.3.2. The Adequacy of Bricks as Material for Reconstruction

Bricks are fired clay blocks of a definite size or form. The raw material is shaped in a mould and the 'green bricks' are dried in the sun. Later they are burned in a brick kiln.[95] The quality of the bricks depends largely on the quality of the clay and the firing process. Large quantities of bricks can be produced in a reasonable time. The great advantage of bricks is their uniform shape which allow brick walls to be thinner and to carry higher loads than rubble masonry walls. The thin vaults between the iron girders could only be executed in brick because of its regular shape and plain surfaces. Rubble masonry is unsuitable for this purpose.

As early as 1823 Giuseppe Valadier (1762 - 1839) supported the dilapidated western side of the Colosseum at Rome with a brick buttress recreating the historic form of arches and cornices. Valadier has commonly been seen as a radical conservationist, and only recent research claims that this approach was much more due to lack of sufficient funds than conservation ethics.[96] Although from the very beginnings of the conservation movement bricks have been used in the repair and reconstruction of historic monuments, it was in the third decade of the twentieth century that brick experienced a huge appreciation as a material for repair and reconstruction. In 1929 A. R. Powys in his book on the 'Repair of Ancient Monuments' suggested the use of bricks and tiles for this purpose.[97] Despite Powys' advice to render the tile and brick repair of historic walls, so that the repaired patches blend in with the surrounding masonry, much brickwork remained visible. For example, in the 1930s Mussolini started major, politically motivated works in historic city centre of Rome. Brick was widely used in the reconstruction of ancient monuments, for example at the Marcellus Theatre and the Forum Romanum.

[95]Brunskill, 1990, p. 21 ff.

[96]Schmidt, 1993, p. 62 ff.

[97]See also: Ashurst and Dimes, 1990, Vol. 2, p. 17.

The distinctive properties of brickwork make it such a good material in the reconstruction process. Brickwork is made up of many small bricks with a high number of joints in between them. If soft lime mortars are used, brickwork is, structurally speaking, flexible. Masonry which is made up of these small bricks with its many joints, is well suited to fit closely to the ragged surface of the ruins. There is no need to alter the historic surface to fit to the reconstruction. Another advantage is the high number of joints and the fired clay material of the bricks which allows water to evaporate easily. This prevents damage related to trapped water in the structure.

One of the common demands of reconstruction work has always been that the new work is clearly distinguishable from the original fabric. As long as the original construction is not a brick building itself, the new brickwork is easily detectible as a new addition. In Knossos, no brickwork was used in the Minoan Palace and the unfired mud bricks have weathered beyond recognition. Thus, the brick masonry by Theodore Fyfe can be easily identified as a modern addition as can the brick vaults by Doll and de Jong.

6.3.3. Performance, Harm and Benefits

As already outlined in the previous paragraph, brickwork is a suitable and adequate material for the reconstruction process. Brickwork is in its structural behaviour quite similar to the original rubble masonry walls. No harm could be detected at any part of the Palace investigated which originated in the used of bricks on site. Neither was there any damage caused by humidity related problems nor was there any harm through structural loads which had not been controlled properly.

All brickwork, which has been installed on site has fulfilled the function for which it was designed. The brick buttresses of Theodore Fyfe permanently helped to keep the historic walls in position in the Treasury and in the South East House. The brick vaults between the iron girders worked well but a specific problem must be discussed here. The floors formed by these brick vaults in the Domestic Quarter and at the Stepped Portico were open to the sky and, thus, exposed to rain. In the first reconstruction of the northern portico of the Hall of Colonnades in 1905, Christian Doll failed to provide a waterproof coating for the floor. Water was seeping in through the joints of the broken floor slabs at the first storey level and harmed the brick vaults and the iron girders underneath.[98] While the rusting and expanding iron I-beams caused indirect harm to the vault construction, soluble salt was carried through the ceiling and crystallised at the lower side of the vaults which caused more direct harm to the brickwork.

Christian Doll must have realised this problem quickly. Even if he might not have understood the full extent of possible long-term damage through rust and salt crystallisation, at least he had seen the water penetrating. As a reaction, square slabs of Maltese Stone with joints filled with fine grout were used at the reconstructions of the Queen's Megaron and the Corridors of the Domestic Quarter providing a watertight floor.[99] He also designed a system of inclined areas to drain the water of the first floor and channel it to gargoyles, which empty the water into the historic water channels.[100] In the area east of the Room of the Plaster Couch, Doll reused the rectangular new limestone slabs of Fyfe's earlier reconstruction. Here, as at the northern portico of the Hall of Colonnades water penetrates and affects the structures underneath. In 1922 Piet de Jong covered the first floor of the Stepped Portico with cement in order to prevent water penetrating the ceiling.

Bricks are a good material for reconstruction work. The comparatively small size of bricks allow brickwork to be fitted well to the ruined surfaces at an excavation site. Brickwork with a high percentage of joints and an adequate mortar is a quite flexible structure and adapts well to the various forces on site. Furthermore, brickwork is durable and resists the weather quite well if the wall tops are planned appropriately, preventing water intrusion into the structure.

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[98] See plate 125, 127 and 177.

[99] See First Floor Plan, Drawing 7. Some of the joints have opened and have not been repointed for a long period. Subsequently, humidity related damage occurred at the brick vaults underneath.

[100] See First Floor Plan, Drawing 7, bottom.

6.4 Iron Beams

In contrast to timber and stone, iron I-beams have no equivalent in the historic construction of the bronze age palace. The basic function of the iron girders is to replace timber beams and, thus, their use must be seen as a reaction to the failure of timber. Unlike timber, iron will not rot and thus seemed to be a much better solution for the problems on site. However, the physical and structural properties of iron are very different from those of timber and while humidity may not induce rot it will cause rust.

6.4.1. The Use of Iron in the Reconstruction Process

Theodore Fyfe used some wrought iron elements and de Jong employed reinforcement rods for the concrete but Christian Doll was the architect to use iron as structural elements in the reconstruction process. Although iron had been known for almost 3000 years when the reconstructions were executed the material was not used on a large scale for structural purposes until the late 18th century. The industrial revolution not only provided improvements to the quality of iron and the creation of steel, it also reduced the production costs. During the course of 19th century the production costs dropped by 80 percent.[101] Steel became available and competitive with traditional building methods. In the latter half of the 19th century steel girders and steel frames became a common building material for industrial buildings and inner city areas. Probably the first building in Britain to use Iron girders and brick vaults, the system employed by Doll, was the Main Mill Ditherington, Shrewsbury, in 1796/97.[102]

[101]Peters, 1996, p. 36. Peters is a very good reading to understand the general background and spirit of the 19th century against which the restoration work at Knossos must be set.

[102]Stratton and Trinder, 1997, p. 65.

Doll used iron-I-beams or, as he used to call them, rolled steel joists (R.S.J.s).[103] In a contemporary source they were described:

> "Rolled Girder Iron, known also as Rolled Joist Iron, Beam Iron, I Iron or H Iron. This is one of the most useful sections of iron for fireproof and other floors, parts of bridges , roofs, etc., and is rolled in depths of from 3 to 14 inches. An endless variety of sections is kept by different makers who generally publish full-size sections of their iron joists, showing the weight per foot run of each joist, and the distributed load that it will support."[104]

Iron girders were not available in Crete at this time and had to be brought to the island from Britain. The transport by ship was not only very costly but also took a long time. Transport and handling of the long girders was difficult and some of the I-beams fell into the harbour basin of Herakleion from whence they could not be retrieved.[105]

Doll employed the iron girders for two purposes: as architrave and as floor joists. Two parallel iron girders formed the architraves on top of the reconstructed columns and pillars in the Grand Staircase area and the Queen's Megaron.[106] These architraves carried masonry of the balustrade above but, much more important, formed the substructure for the joists of the ceiling construction. The floor joists span from wall to wall or were supported by these architraves. The brick vaults which formed the ceiling rested on the lower flange of the I-beams which formed the joists.[107]

In the reconstruction of the Room with the Plaster Couch and the corridors in the Domestic Quarter as well as in de Jong's reconstruction at the Stepped Portico no architraves were employed. Here elevated rubble masonry walls provided lateral support to the ceiling joist on both sides. Since the ironwork of the ceiling construction could not be adapted on site, the supporting walls had to be brought to precisely the necessary

[103]See plates 107, 108, 110.
[104]Anon., 1879, p. 271.
[105]Evans, 1928, p. 97.
[106]See plate 107.
[107]See plate 110.

height. All joists are supported individually, a load disseminating wall plate is missing which is not only absent in the executed work but also in the plans. Hence, there were no economical reasons omitting this plate but Doll regarded them as being unnecessary. The girders of the architraves were cased in a box like construction of wooden boards resembling timber beams and a suspended timber ceiling was placed under the brick vaults which covered the ceiling construction. Thus regular inspection and maintenance could not be executed. However, the suspended ceiling was removed at a later point.[108]

6.4.2. Adequacy

Iron can carry high loads but it is also a very stiff, hard and heavy material. It is comparatively difficult to work iron girders, cut them in length or join two girders. Joints are made with iron plates rivetted or bolted to the girders. All this work must be executed with specialised tools which are hard enough to work steel. Unless these tools are operated by electric power, it takes a long time to execute the work. Certainly it would have been very difficult to prepare this on the building or excavation sites and commonly the iron girders and joining plates were pre-fabricated in the factory and then sent to the site where they were then assembled. This was probably the way Doll executed his reconstructions in the Domestic Quarter, a fact which explains his careful recordings and elaborate reconstruction plans. To order the pre-fabricated girders in Britain, he had to provide exact measurements to the producer. Errors would be costly and time consuming.

At new building sites, iron frames are usually the first structure which is erected and which dictates the shape of all later work. This procedure is well suited for building afresh but is less well adapted to the specific circumstances of excavation sites since the straight and stiff members cannot easily be fitted to the ragged surface of the ruins. Because iron is comparatively difficult to work, frameworks of this material are designed

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[108] It is not clear when the suspended ceiling was removed but it was most likely removed in 1928 when de Jong remodelled the area.

with as few joints as possible and are, structurally speaking, very inflexible. This was a desired effect in contemporary building work but is rather unwanted in conservation at archaeological sites. Furthermore, iron has a considerable coefficient of thermal expansion which, due to the stiffness of the iron framework, can impose considerable forces on the historic fabric. Structurally speaking, the strong iron framework determines the movements of all the historic elements which it supports.

At excavation sites the loads to be supported are comparatively low and there might not be a structural reason for the use of iron girders. Furthermore, iron is only produced at comparatively few places and must be transported from the factories to the building site which creates considerable transportation expenses. However, in the case of Knossos timber, which is the alternative to iron, also had to be transported from a long distance. A clear advantage of iron girders is that they are obviously a new material which can be easily distinguished from the original structures since iron girders were not used in Minoan times. However, the physical properties of iron render it an unsuitable material for reconstruction work at historic sites.

6.4.3 Performance, Harms and Benefits

The major problem of iron constructions is to protect the iron from rusting which can be done by applying a coat of paint. However, this paint has to be checked and replaced regularly. According to Doll's original plans, none of the iron girder's surfaces was accessible to be regularly checked and maintained. They were covered by overlaying masonry, the brick vaults or hidden by timber board casing. In roofed buildings with no water penetration, this might be acceptable because the original coat of paint and the limited humidity protects the iron for a long time. However, at excavation sites this becomes a major problem. Due to different coefficients of thermal expansion, the iron girders and the overlaying masonry move differently and cracks occur in the overlaying structure. This structure is exposed to the weather and water penetrates through the cracks. It collects in the joint between iron beam and masonry, where the coat of paint has been harmed by the building work. Inevitably, the iron beams begin to rust. For example, the floor above the northern portico of the Hall of Colonnades was made of broken paving slabs set in mortar. They were subject to the expansion and contraction movements of the iron girders underneath and, thus, cracks occurred in the joints. Being exposed to the open sky, rainwater seeped in which affected the brick vaults and the iron girders. Another problem occurred at the architraves clad with timber boards. Because they were hidden behind these boards regular maintenance could not be executed.

It has already been discussed above, that Doll regarded as unnecessary a load disseminating wall plate. Structurally speaking, the iron girders fulfilled the same function as the timber beams in the original construction. However, iron girders are heavier than timber beams and, due to their structural abilities, were more widely spaced and carry greater loads. At the point of lateral support this greater load is dispersed to the supporting structure in a much smaller area. Thus, the support for these girders has to be very strong and the rubble masonry is not always able to provide this, as, for example at the Stepped Portico. Most of the girders, however, rest on reconstructed walls which had been designed for this task, and consequently, no problems occurred.

Like timber beams, iron girders have been employed to produce ceilings which protected sensitive features underneath. The floor slabs of the Lower East-West Corridor are clearly much better preserved than the ones in the Hall of the Double Axes. Thus, iron constructions have provided a good service. The building work necessary to facilitate the installation of the stiff and cumbersome iron girders is comprehensive but the use of iron in the reconstructions must be seen as a reaction to the failure of timber structures. However, not enough care was taken to adapt the building techniques, which are successful in roofed buildings, to the environment of excavation sites. Today the rust damage to the reconstructions causes considerable conservation problems.

6.5 Concrete

When Piet de Jong employed reinforced concrete for the reconstructions on a large scale at Knossos it had been known as a building material for approximately thirty years. Thus it was a relatively new material and experience of it was limited. A series of failures of the earlier reconstructions in timber and iron had shown the limitations of these reconstruction methods. Consequently, Piet de Jong and Arthur Evans decided that at the reconstruction of the upper part of the Stepped Portico in 1923 reinforced concrete would be the most suitable material. From this point it was increasingly used for the construction of ceilings, pillars and columns. It was supposed that concrete was the best material to provide support and protection to the excavation site, and furthermore, would provide strength against the effects of earthquakes. [109]

Concrete has been and still remains the focal point of the criticism on the reconstructions of Knossos. While certain factors, such as the aesthetic qualities of concrete or its production costs, have been known and could be assessed at Evans's time other qualities of the material could only be assessed after a longer period. One of the most important questions with such a new material is to analyse the behaviour of concrete as it ages. In the following paragraphs it will be analysed whether the expectations placed upon this new material have been matched.

6.5.1. The use of Concrete in the Reconstruction Process

It was noted that Christian Doll was the first architect to use concrete in 1910 for the reconstruction of the fourth flight of the Grand Staircase where he placed the found gypsum landing blocks in their former position on concrete clad iron girders.[110] In the

[109] Fyfe, 1926, p. 479 and Evans 1928, p. 97.
[110] See page 255 ff.

narrow sense, these concrete clad iron I-beams are not reinforced concrete because the concrete has no structural function but both tension and compression are taken by the iron girder. In contemporary literature, enveloping iron girders in concrete is recommended in order to achieve a fire proof construction,[111] but this was certainly not high on Doll's agenda. Two other facts have been understood and appreciated in this technique. First, the coefficient of thermal expansion of cement and steel is almost identical. Thus, concrete and steel bars can be combined easily. Second, steel members which are enveloped in concrete are protected from the environment which prevents rusting. These two facts suited Doll but he also enjoyed another advantage of this technique: the concrete envelope of the steel beam can be designed to recreate the form of the timber beam of the original Minoan construction. This method was certainly much more adequate for the extremely exposed beams of the 1910 reconstruction than the timber cladding of his earlier work. It is important to note that here for the first time concrete represented lost timber elements. Thus, it was not Piet de Jong's idea to recreate timber by the use of concrete.

When reinforced concrete was used in the reconstruction work at Knossos from 1923 onwards, it had been established as a building material for approximately than thirty years which, in building terms is a rather short period. However some experiences existed and it seemed to solve all problems on site. Evans wrote later in the Journal of Antiquaries:

> "Finally, in order to preserve the results of considerable supplementary researches undertaken in the West Quarter and in the urban area surrounding the whole Palace site, I decided to have recourse to the experience at that time gained by our Cretan masons in the use of ferro-concrete. This material was not only much more manageable than the ponderous girders, but proved to be much better fitted for such purposes as the reconstitution of floors and could be also applied to the reconstruction of great piers and columns."[112]

Employing reinforced concrete required the provision of the basic ingredients, especially cement, trained craftsmen who knew both, the material concrete and how to build good

[111]For example: Adams, 1894, p. 60.
[112]Evans, 1927, p. 263.

shuttering and the skills of the architect in planning and handling the material. When Christian Doll worked at Knossos in 1906 he still imported cement from Britain.[113] In 1905 the first Greek cement production company, TITAN, was established in Athens and the cement was shipped from there to other parts of Greece.[114] However, Crete was an independent territory until 1913 and not a part of Greece. After 1913 cement, produced in Athens, became more widely available and, subsequently, local craftsmen became skilled in the use of the material.

Piet de Jong was probably the first architect to work at Knossos who was trained in the use of reinforced concrete. When he started working in Knossos in 1922, cement and reinforcement rods were regularly shipped to Herakleion and readily available on the island. Crushed limestone which was used as aggregate was available in abundance. Finally, local craftsman had already some ten years of experience in working the material.[115] Thus, the conditions for the use of reinforced concrete were right.

The structural problems at the Stepped Portico and, perhaps, the experience of the earthquake on 20 April 1922, led to the decision to use reinforce concrete for further reconstruction work.[116] This is a purely technical issue while Doll's 1910 reconstruction of the Grand Staircase had already set the example to accept the use of concrete for both practical reasons (weathering) and aesthetically as a surface representing timber in the reconstructions. It is important to note that at Knossos the practical and aesthetical use of concrete predates the structural technical use of reinforced concrete by thirteen years.

Between 1923 and 1930 Piet de Jong reconstructed large parts of the Palace with concrete. He covered large areas of the West Wing and the Hall of the Double Axes with a new concrete ceiling and also roofed several smaller structures for example the North

[113] Letter from Doll to Evans, 3 October 1906. Ashmolean Museum Oxford, Evans's Archive.

[114] This information was given by Mr. Bounakis Konstantinos, Director of TITAN cement in Herakleion. The telephone interview was conducted in Greek language on my behalf by Mrs. Stefie Chlouveraki, whom I owe gratitude.

[115] Telephone interview Bounakis Konstantinos.

[116] Evans, 1922, p. 327.

Lustral Basin, the South-North Corridor and the South Propylaeum. Furthermore, he replaced earlier roofs by Fyfe at the Magazine of the Giant Pithoi and at the Throne Room. Between 1905 and 1910 Doll prepared plans to cover some of these areas, such as the Hall of the Colonnades or the Hall of the Double Axes with his standard iron girder and brick vault system but, probably due to financial limitations, these plans were never executed.[117] Obviously, the reconstructions became possible only because the reinforced concrete structures were much cheaper than Doll's method.[118]

The reconstruction of the concrete ceilings and parts of the upper stories imposed new loads on the historic walls. They could only carry this load if the gaps left by the rotten timber frame work were filled in with some reinforcing load-bearing material.[119] Both the structural abilities and the simplicity of working with it favoured the use of reinforced concrete. The liquid concrete could be filled easily in the irregular and twisted gaps left by the rotted timber reinforcement beams. In the original construction, the timber framework had been installed to reduce the effects of earthquakes on the building. The excavated remains of the palace were even more exposed to these forces than the original structure had been since in its ruined state the missing cross walls and ceilings could not provide the required stiffness to the structure and the rotted timber reinforcement beams could no longer provide tensile strength. In the earthquake of 26 June 1926, the already reconstructed parts of the palace proved to be beneficiary to the historic ruins in providing required strength to withstand the forces of the quake. The timber framework which in the original structure supplied an earthquake resistivity, had been replaced by reinforced concrete which considerably improved the ruin's performance in earthquakes.

Concrete was also used to reproduce columns and pillars. Once again the great advantage of concrete was used by producing moulds for the columns. These moulds were used for the repeated reproduction of columns of the same type. The two columns at the western light well of the Hall of the Double Axes, the six at the eastern and southern verandah

[117]See plate 143.
[118]Compare also Evans, 1928, p. 97.
[119]PM II, p. 352.

of the same room and the one at the North-South Corridor have all been produced from the same mould.[120] All the seven columns in the upper storey of the Throne Room reconstruction also have been cast in one mould. This repeated reproduction in moulds was a clear economic advantage in comparison with the reproduction of individual columns in stone. Piet de Jong also repeatedly used the same moulds for the reproduction of door jambs. In the reconstruction of the upper storey of the Throne Room all walls feature exactly the same width with exactly the same door jambs. The only exception is a wall north of the reconstructed Loggia which could be made thinner since it did not feature any door. However, de Jong not only used concrete for his own new reconstruction work but he also overhauled earlier work. The wooden lintels and door frames of Fyfe's restoration were replaced with reinforced concrete, for example the door south of the Hall of the Colonnades or in the lower East-West Corridor. He also removed most of the timber boards covering the iron girders in Doll's reconstructions and cast them in concrete after adding additional reinforcement rods.[121]

Piet de Jong also reconstructed concrete pillars on top of the excavated blocks south and east of the Hall of the Double Axes. These pillars, necessary to carry the ceiling above, were built individually since they rested on excavated base blocks of individual shape. Similar pillars were produced at the first floor landing of the Grand Staircase, replacing Doll's dressed limestone pillars. Furthermore, he cast concrete blocks which were used in the construction of the western wall of the light well of the Hall of the Double Axes. However, many walls which appear to be cast in monolithic concrete were actually executed in rubble masonry and plastered with a cement mortar, for example east of the Hall of the Double Axes or at the round corner of the Throne Room area.

The surface of the concrete ceilings, the floors and the pillars were left untreated. The texture and colour of the concrete material fitted well into the ruined landscape. However, all concrete reconstructions which replaced original timber members were painted to resemble this material, at least in the areas accessible to tourists. A lighter

[120]Compare Ground Plan, Drawing 6 and plate 150.

[121]See plates 204 and 207. The original timber boards survived only in the Queen's Megaron.

ochre paint was applied as an undercoat, upon which a darker paint then was applied imitating wood grain. Plastered areas were painted in bright colours.[122]

6.5.2. Adequacy of Concrete as Material for Reconstructions

Like the iron girders reinforced concrete has no equivalent in the Minoan building constructions. Unlike the original construction, reinforced concrete ceilings do not consist of a series of individual linear members but instead provide a single stiff disc i.e. they are monolithic. As it has been mentioned earlier, this was seen as a clear advantage, since the quality of the supporting masonry was not consistent over the entire length of the walls and could not be properly assessed. In the light of the failure of the reconstruction of the Stepped Portico in 1922 it seems to be a logical reaction.

It has been described previously that in reinforced concrete structures the pressure is taken by the concrete while the tension forces are carried by the reinforcement rods. For a successful construction in reinforced concrete it is essential to understand in minute detail all forces within the structure. After the shuttering is erected, a network of reinforcement rods is put in position and then the concrete poured in.

At excavated sites regular forms are rather uncommon. The original structure may have been irregular and the destructive forces twisted them even further. Straight elements like timber or iron rarely fit unless parts of the historic structure are removed. The distinctive advantage of concrete is that, in its liquid form, it can be poured in all shapes required on site. At Knossos, the cavities left by rotted timbers were covered with timber boards at the front and concrete cast in the gaps. The simplicity of this method of reconstructing the missing beams bore the disadvantage that the straight timber board of the shuttering determined the width of the reconstructed concrete beam. As a result they appear to be straight and comparatively thick in the reconstructions. This will give a wrong impression

[122]See plates 146 and 149.

to the visitors. In the original Minoan structure thin, twisted and badly shaped beams have been used which have been, generally speaking, covered behind plaster. In the reconstructions thick and straight beams appear to have been used. This dominance creates a generally wrong impression that the palace was a timber framed construction rather than a rubble masonry construction with timber reinforcement beams.

Another distinctive advantage is that moulds can be produced and reused several times for the production of multiple identical members like columns. Thus, concrete is a very economical solution. However, the form of concrete constructions is only as good as the shuttering which was made for it. Rounded moulds are more expensive to produce and, therefore, the shuttering for most concrete constructions is formed of simple straight boards. Simplistic straight and ungainly concrete shelters hardly enhance the visual qualities of an excavation site.[123]

After the liquid concrete hardens, it can withstand the forces of the weather extremely well and requires only little maintenance. Unfortunately, the hardened concrete also withstands the effort to remove it again and thus the reconstructions are irreversible, or at best, they are only reversible with a great loss of historic fabric. Furthermore, reinforced concrete has a comparatively high coefficient of thermal expansion. Thus, large monolithic structures can move considerably due to temperature differences and significant forces result. Severe damage results where the concrete reconstruction is firmly connected with the excavated historic structures which are frequently unable to respond to these forces.

The texture and surface and the monolithic structure of concrete resembles some types of stone but is still clearly distinguishable from any material used in the original construction. Visitors can identify concrete reconstructions. While concrete was in high favour as a good and modern building material earlier in this century, the public image changed in the 1970's.[124] Today it is not commonly regarded as an appealing or pleasant

[123]Compare Schmidt, 1988, p. 55 f.
[124]Sutherland, 1996, p. 255 f.

surface and will be rejected by many visitors for this reason. However, this had not affected the choice of this material in the 1920's.

Concrete provides a considerable number of long term problems which have only been researched recently and could not have been known at the time Piet de Jong executed the excavations. Concrete provides an alkaline environment which protects the iron reinforcement rods from rusting. However, this alkaline environment does not remain stable but the alkaline concrete reacts with the acid environment (air pollution). As a result the ph-level of the concrete is reduced and finally sinks below the required minimum and reinforcement bars start rusting. This is a very common problem for concrete buildings and affects excavation sites even more, since at them the concrete restorations are not sheltered from the weather.[125] Furthermore, if the concrete structures are affected, their removal or repair harms the historic fabric. Another problem, specifically in limestone areas like Crete, is the incompatibility of the coefficient of thermal expansion and contraction between cement based concrete and limestone aggregates. Due to this fact fine cracks (hairline cracks) occur in the concrete surface which allow water penetration and, thus, rusting of the reinforcement bars.[126]

6.5.3. Performance, Harms and Benefits

Piet de Jong made careful considerations when planning the concrete reconstructions. It seems that he understood the forces occurring in the temperature related expansion and contraction of the flat concrete ceilings or, at least, learned about these problems in the process of executing reconstruction work. Only at very few places in the Domestic Quarter do the concrete slabs rest directly on the historic fabric whereas in most of the cases the ceilings rest on reconstructed walls. Thus, the forces of the temperature related expansion is hardly transmitted into the ancient walls. In his later work he even reconstructed the load-bearing walls and the supporting concrete beams in a way to

[125]Sutherland, 1996, p. 256, article 9.
[126]Venečanin, 1990, 602 ff.

prevent these forces from being transmitted. Large areas of the Palace were covered with concrete ceilings which have been constructed in several sections and the joints between these sections are still visible; however they nonetheless form larger monolithic ceilings. The ceiling of the West Wing, for example is approximately fifty metres long from the stairs in the south to the north end of the Throne Room area. The movement of the expansion and contraction of this ceiling will be approximately:

$$11 * 10^{-6} \frac{m}{m * {}^\circ C} * 60^\circ C * 50m = 0{,}033m$$

While the first figure gives the coefficient of thermal expansion for the material concrete, the second figure provides the temperature difference. In a summer day the bare exposed concrete ceiling will heat up to approximately sixty degrees Celsius while it will cool down to approximately zero degree Celsius on a winter night. This, multiplied with the length of the ceiling shows a maximum movement of approximately 0,033 metres or 3.3 centimetres. The concrete ceiling and the supporting masonry has to deal with these movements.

This problem is well illustrated at the reconstruction of the North Lustral Basin. The plastered surface of the walls clearly shows the cracks which occur right under the ceiling at the corners of the building. While walls can bend to some extent, the corners, where two walls join, are stiff structures and the maximum movement of thermal expansion of the concrete ceiling occurs at exactly this point. The corners of the

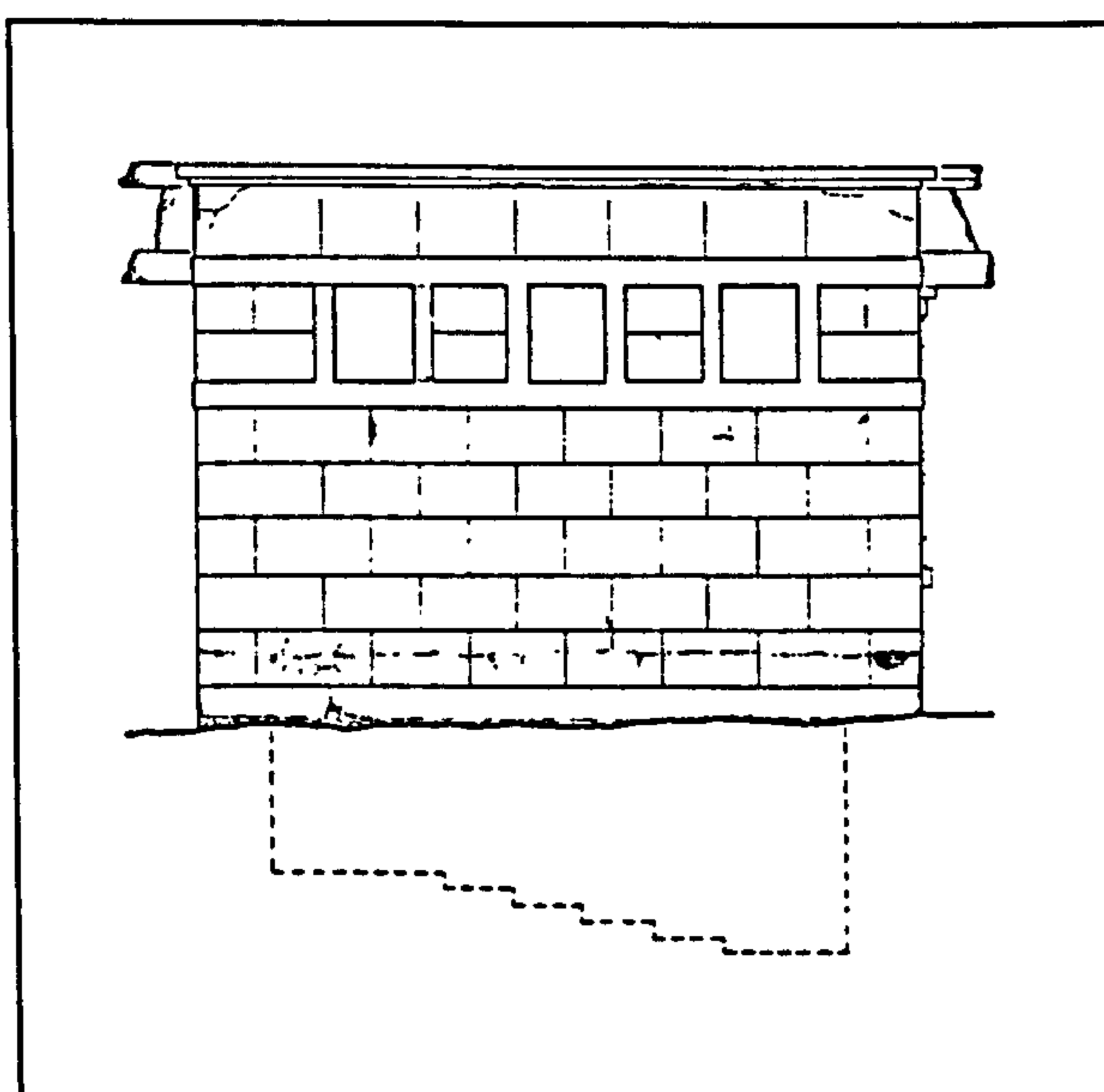

Figure 88 West elevation of the North Lustral Basin.

structure could not follow the movements of the ceiling and, consequently, separated from it. It seems that Piet de Jong disregarded this problem at the small structure above the Lustral Basin but he later became aware of these problems when he designed the reconstructions of the Throne Room. A ring beam was cast on top of the reconstructed rubble masonry walls to tie them together.[127] The top surface of these ring beams was absolutely smooth and no reinforcement bars connected the beams with the overlaying concrete ceiling. Furthermore, the cross beams, which form a structural unit with the ceilings were not connected to the ring-beam but simply rested in mortices.[128] Hence, the horizontal forces of thermal expansion of the concrete ceiling were not transmitted into the masonry.

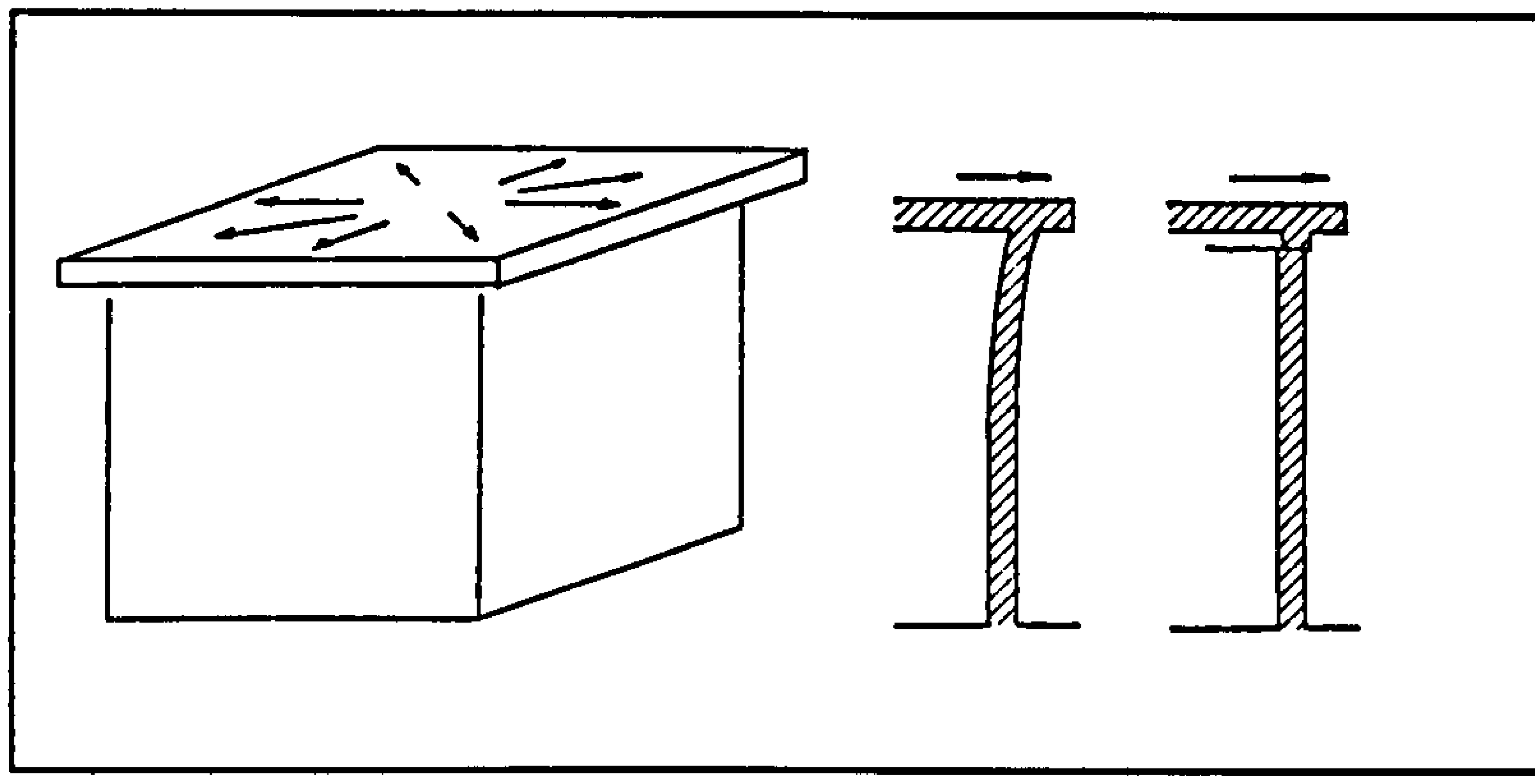

Figure 89 Expansion of flat concrete roof above the North Lustral Basin (a), bending wall in the middle (b) and cracks at the stiff corners of the structure (c).

Provision was made for the rain water to be drained from the concrete ceilings. The inclined ceilings directed the water to the edges and led to down pipes and gargoyles. Walls crossing the flow of the water were designed with small openings in the lowest course of masonry in order not to obstruct the flow.[129] Canals were formed in concrete to transport rainwater to a point where it could be safely discharged.[130] Where original stones were incorporated in the concrete, small dams or canals were built to prevent water flowing into the joint.

[127]See plates 59 and 60.

[128]See plates 59 and 60.

[129]See plate 68 and section through opening in centre of Section C-C, Drawing 4.

[130]See plate 28.

Piet de Jong incorporated excavated gypsum corner blocks and door jambs into his reconstructions and where parts were missing they were completed with concrete. These repairs were not executed flush with the surface as it existed in the year of the reconstruction work but recreated to what was then assumed to be the original level.[131] While the concrete repairs have not weathered very much, the gypsum material has deteriorated quickly. This was predominantly due to the much softer fabric of gypsum, but it might also be accelerated by a chemical incompatibility of the two materials.[132] However, the edges of the concrete supplements clearly show how much the gypsum material suffered from the date of the reconstruction work up-to today. However, the original gypsum elements were replaced at their former position and incorporated in the concrete structures. This should show to the visitors where they came from and that the reconstructions were correct.[133] While the concrete construction protected the gypsum pavement of the ground floor rooms, it exposed similarly sensitive gypsum jamb blocks even more. [134]

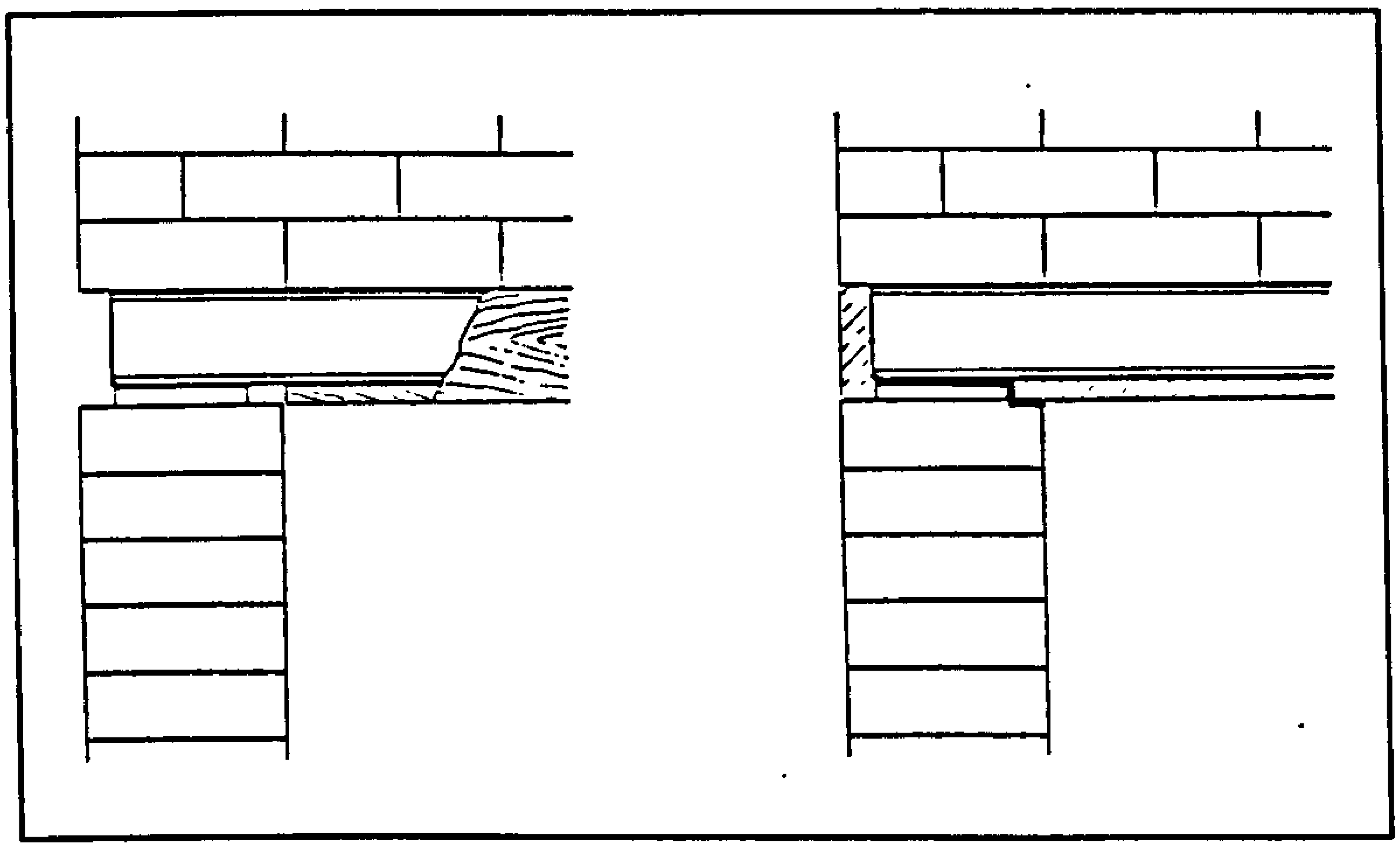

Figure 90 Lintel construction with iron I-beams. Cased with timber boards by Doll (a) and with concrete by de Jong (b). Blue line indicates where iron is not protected by concrete.

The concrete reconstructions have lasted very well. A few cracks have occurred on top of the ceilings, but considering the fact that the ceilings are exposed to the sun without any top coat and limestone aggregates were used

[131]See plate 151.

[132]Zezza, 1994, p. 644 ff. Zezza suggests that gypsum deteriorates because of the action of rain but Stefie Chlouveraki, who is researching on the deterioration of gypsum, communicated in a personal talk on site that there might be a possibility that organic action (bacteria) or chemical incompatibility between cement based concrete and gypsum have furthered the deterioration. This question must be left open until she completes and publishes her research.

[133]PM II, p. 350 f.

[134]Evans stated his intention to preserve the gypsum floor slabs. PM III, p. xii.

in their construction it is rather surprising that there are not more cracks.[135] The concrete reconstructions suffered most where the iron I-beams of Doll's reconstruction have been incorporated in concrete beams. The iron girders of lintels and architraves rested on pillars or columns of masonry, a system which could not be altered. When the concrete was cast around the girders, a fine joint remained between the old pillars and the new concrete beams. Humidity could penetrate through this joint and affect the ends of the iron-I-beams. Furthermore, since the beams were already in position, the thickness of the concrete cover was limited. The iron girders started rusting and exploded their concrete cover.[136]

In the original construction, rubble masonry walls had been the load bearing structures and the timber beams had the reinforcement function of providing horizontal tensile strength in the case of earthquake. In the reconstruction, a new rigid framework of concrete took over from the rubble walls some load-bearing function. The rubble walls, which were constructed originally with mud mortar, are now much softer, structurally speaking, than the surrounding concrete frames. This resulted in a structurally mixed construction in which masonry, to some extent, might work more like panels within a framework. This becomes clear in the reconstruction of the Hall of the Double Axes, where stones were incorporated in both the concrete frame and the panels. Inevitably they cracked due to forces in the different structural systems.[137]

The function of the original timber reinforcement beams has already been discussed. To provide for the heavy load of the reconstructions, Piet de Jong filled the gaps of the decomposed beams with reinforced concrete. It is a rather hypothetical question whether or not this action prevented the structures from collapsing in an earthquake. Minor tremors have occurred in Crete and Evans's account of the 1926 earthquake supports for the assumption that the reconstruction of the beams in concrete was beneficial.[138]

[135]Compare, Venečanin, 1990, 602 ff.

[136]See plates 204, 205, 206 and 207.

[137]See plate 156.

[138]See also earthquake February 1930, PM III, p. xii.

However, research by Lazar Šumanov in Macedonia shows that structures which had their timber ring beams replaced with concrete ones collapsed.[139] However, only the next major earthquake will show if the concrete replacements were beneficial or harmful in this respect.

The reasons why concrete was employed at Knossos have already been discussed and the expectations of this time are what the reconstructions must be set against. In 1928, Evans explained his intentions:

> "But the cutting out of stone shafts and capitals and the raising of stone piers involved a prohibitive amount of labour and expense. The iron girders brought to Candia by sea - some of them now lying at the bottom of the harbour - were both cumbrous and costly, and woodwork was found rapidly to rot owing to the violent alternations of the Cretan climate. It was only the adoption in recent years of the wholesale use of ferro-concrete that has made it possible to continue the work of conservation on a larger scale and in a more durable manner, and to rescue much that had been already done from the imminent danger caused by the rotting of the wooden supports. It has been thus possible to undertake a much more considerable work of reconstitution. The restoration of large areas of upper floors, incorporating at the same time the existing slabs and door jambs, has been much facilitated, and not only the wooden posts and beams but the shafts and capitals of columns have been reproduced in concrete, the exact dimensions being in many cases indicated by the carbonised remains." [140]

The most interesting part in the quotation above is certainly the words " ..on a larger scale and in a more durable manner..". The driving force behind the immense reconstruction work was to cover as much of the Palace as possible. Only reinforced concrete offered this possibility at an affordable price. Furthermore, the concrete reconstructions must be seen as a reaction to the failures of earlier reconstruction work. It is not clear if Evans intentionally used the words "more durable" in this qualifying way or if it was believed that the concrete reconstructions were permanent. Certainly, they were expected to last longer than everything that was tried before, but by no means are they permanent. It has been explained above how concrete ages and needs to be

[139]Šumanov in a personal report on his forthcoming PhD-Thesis. Macedonia refers to the Republic of Macedonia, formerly part of Yugoslavia.

[140]Evans, 1928, p. 97.

maintained, repaired and after some time even replaced. It was the lack of this knowledge that led to the unqualified use of concrete. It has been seen as the advantage of concrete that it could be poured in its liquid state in irregular shapes and then becomes a hard, monolithic material. Today, this is not only known as its advantage but also proves to be a source of problems. It can only be removed with extreme difficulties and with a great loss of original fabric; but this might be exactly what is necessary.

The concrete reconstructions have shaped the view of the site considerably and much of the current criticism is focussed on this. After concrete was left visible in the contemporary architecture of the period between the 1950s and the 1970s it increasingly became a synonym for ugliness. But also in the period of the reconstructions at Knossos, visible concrete was not commonly accepted as good taste. Nonetheless, concrete floors closely resemble historic plaster floors and thus were left untreated. But, when concrete was used to recreate timber beams it was painted to resemble this material. It was not appreciated as a medium in itself but rather as a vehicle to achieve the aims of protection and reconstruction.

6.6 Conclusions

It becomes clear, that the architects Theodore Fyfe, Christian Doll and Piet de Jong had very different approaches towards conservation which were manifested in their choice of materials and the way they used them. They acted and planned according to their beliefs; but, as it seems, not always to the best of their knowledge. Despite careful considerations in many areas, for example how to drain off water, other basic rules were neglected. The biggest fault to which all three architects were prone was the inability to understand how to treat a excavation site differently from a building. A protective roof above all structures is missing. Due to this fact the excavated remains and the reconstructions were exposed to the elements of the weather differently than they would be in a complete building.

Theodore Fyfe had to learn that he could not replace like with like if the circumstances have changed. Timber beams cannot replace timber beams if the roof is gone. Christian Doll had to learn that the iron girder and brick vault construction cannot simply be covered with broken slabs. This is possible inside buildings but at excavation sites he had to cover the structures with slabs and fill the joints with fine grout, as with roof terraces. Piet de Jong had to learn that concrete slabs, especially if large and fully exposed to the heat of the sun, move considerably. He reacted by designing his later reconstructions adequately. Obviously all three architects overestimated the durability of their reconstruction work. Fyfe's work was determined by the principle of minimal intervention and their failure did not harm too much. Even Doll's larger reconstructions were, to a large extent, reversible and did not caused too much damage. However, it seems that de Jong believed his reconstructions would last forever. His massive concrete reconstructions can only be removed with a great sacrifice of original fabric.

It will be difficult to blame de Jong for this. It was discussed how he reacted to the earlier experiences of how to keep the Palace of Knossos standing. Without the support work, the walls would have long collapsed and without the ceilings the pavements would have gone. Without recasting the missing timber beams the walls would not have supported the load of the ceilings and, perhaps, an earthquake could have destroyed everything. The reconstructions must be seen as a manifestation of effort rather than a final product.

Chapter 7

Theoretical and Philosophical Aspects of the Reconstruction Work

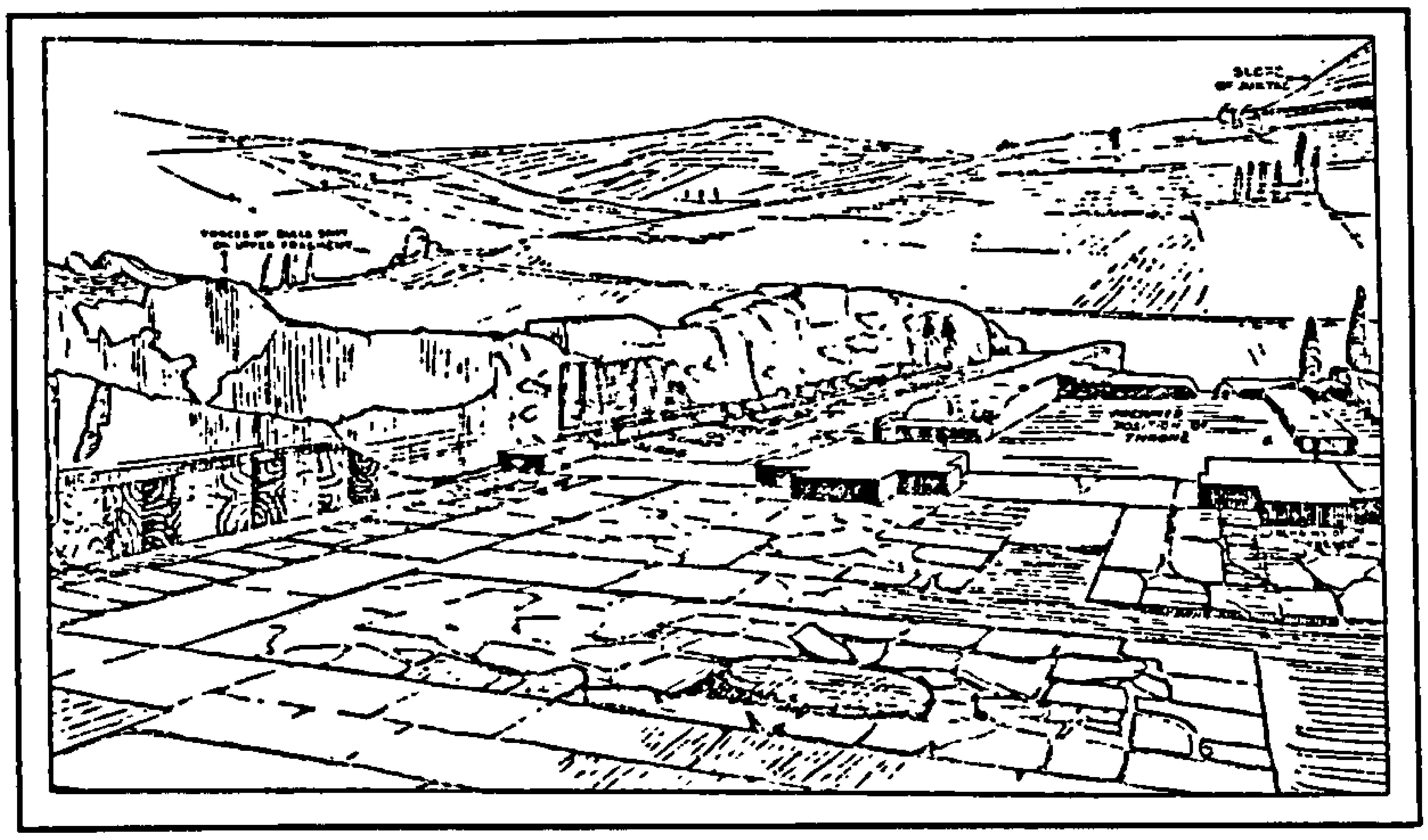

Figure 91 Sketch of the existing remains of the West Porch by Fyfe (?)

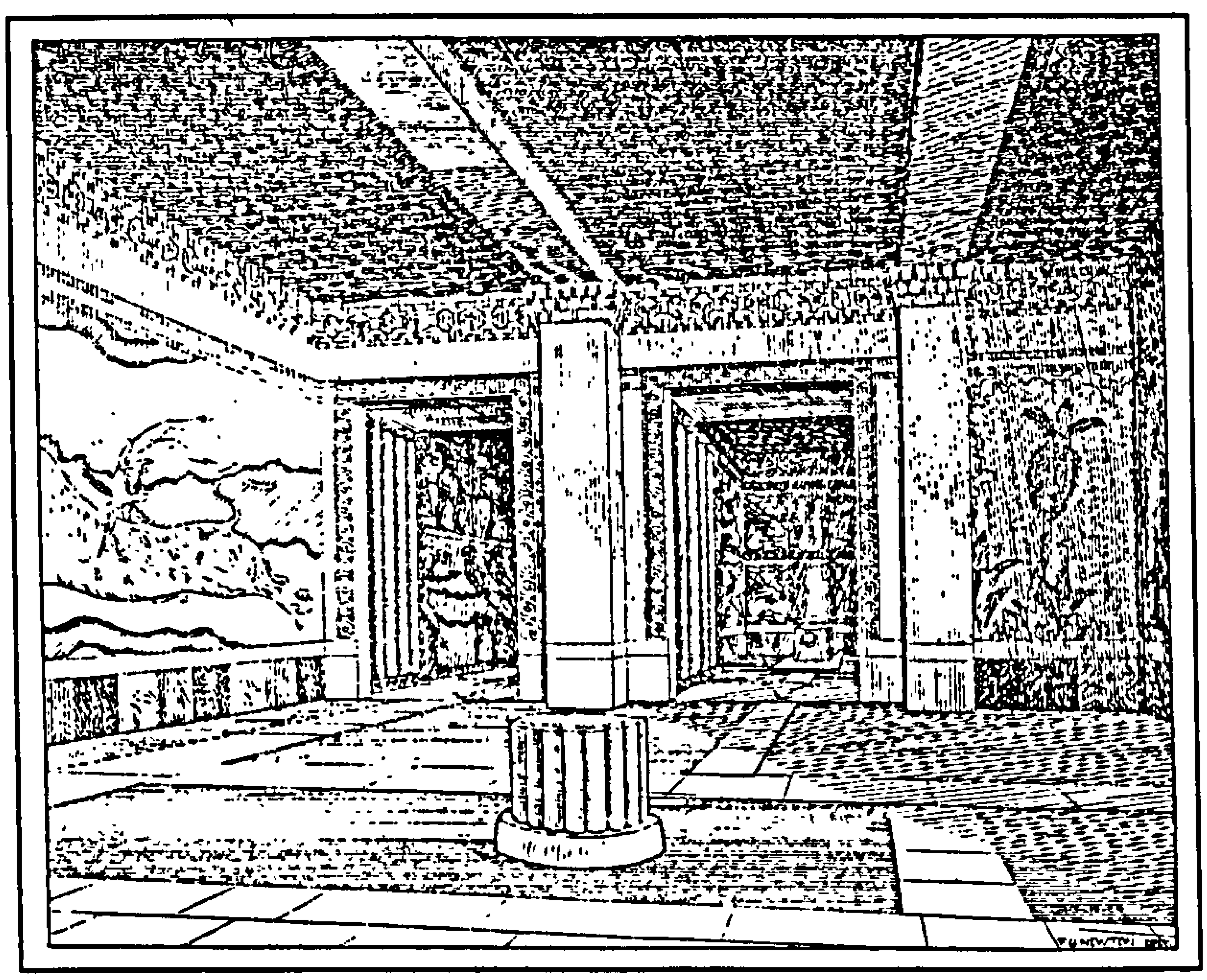

Figure 92 Restored view of the West Porch by F.G. Newton

What is architecture? Will I define it with Vitruvius as the art of building? No. This definition contains a grass error. One must conceive in order to make. Our forefathers only built their hut after they had conceived its image. This production of the mind, this creation is what constitutes architecture, that which we can now define as the art to produce any building and bring it to perfection. The art of building is thus only a secondary art that it seems appropriate to call the scientific part of architecture.

(Etienne -Loise Bullée, 1799, quoted in Johnson, 1994, p. 75)

Chapter 7

Theoretical and Philosophical Aspects of the Reconstruction Work

7.0 Introduction

The evaluation of the technical aspects of the reconstruction work at Knossos is easily executed with the evidence provided by the site itself. The author's records of the site and historic photographs show the performance and their ageing behaviour of materials and construction techniques. However, it is much more difficult to evaluate the theoretical and philosophical aspects of the reconstructions. Besides Arthur Evans, only Theodore Fyfe left some written evidence of his conservation philosophy. Doll and de Jong left no statements which throw light on their attitude to conservation.[1] These written statements form a valuable source but it must be considered that they might be distorted by what their authors desired as outcomes of their work.

Frequently, buildings are perceived as the physical result of an architectural design idea. In reality few elements of the initial design idea are executed in an unaltered way. Laws and regulations, financial and technical limitations, the unavailability of certain materials or skills at a specific place or time are all constraints which determine the difference between the intention and the result. This process is easily understood when it is closely followed from the first design brief to the final result. The influence of the various limitations on the original design can be identified and it is possible to understand the

[1]While Piet de Jong had left no written sources himself he was quoted in books such as Cottrell, 1953, p. 100 ff.

physical building as a result of this process. However, at historic structures only the result, the physical building, is known. In order to discover the original design idea the limitations which influence the process must be identified. In the case of Knossos the reconstructions literally are before us in a concrete way. In the previous chapters every effort has been expended to identify the technical constraints that have affected the design. This chapter will examine the theoretical and philosophical aspects that influenced the reconstructions.

The first, and by far, most important factor influencing the design of the reconstructions, is the philosophy of Evans, Theodore Fyfe, Christian Doll and Piet de Jong. However, the only sources we have, are their own statements in writing which are few, as far as the architects are concerned, and the work they have left us. Thus, the next four sections will extract the conservation philosophy of Evans, Fyfe, Doll and de Jong from these sources. The further sections will discuss the purpose and the aim of the reconstructions and it will be considered how accurately the reconstructions represent the original Minoan architecture.

7.1 The Conservation Philosophies of Arthur Evans, Theodore Fyfe, Christian Doll and Piet de Jong

The reconstruction and conservation work of the individual architects was described in the relevant chapters. Their different conservation philosophies can be reconstructed through an analysis of the work executed on site and - as far as Fyfe is concerned - the written sources. By contrast, establishing Evans' conservation attitude relies to a large extend on written sources. While changes in design and execution of the reconstruction work indicate the arrival of a new architect with different conservation ideas or a learning process, the continuum of the design objectives must be attributed to Evans.

It goes far beyond the scope of this study to produce an individual psychological profile of all the people who worked on site, for example Emile and Edouard Gilliéron, Duncan

Mackenzie or the Greek foremen, masons and carpenters. All of them had some influence on the reconstructions. The work of Gilliéron fils and père focussed on conservation and copy of artefacts and frescoes.[2] Some structures such as the South Propylon, the South-North Corridor or the North Entrance Passage were reconstructed to facilitate the replicas of frescoes executed by these two artists. This has not influenced the technical execution of the reconstructions but their ability to provide Evans with the replicas had an influence on the design brief. Without this option, there was no need to execute these structures at all.

Duncan Mackenzie was the loyal and trusted archaeologist who was not only in charge of keeping the excavation diary, he also supervised the daily work on site. His share in the excavations has not yet been fully recognised outside a small expert group.[3] However, in his diary he referred only once to reconstruction work and, thus, it is not known how he influenced the architect's and Evans' conservation and reconstruction ideas. Furthermore, the Greek foreman and workers, with their skills and knowledge have certainly influenced the reconstruction work but it can be assumed that most of their influence was on a detail level and had little impact on the overall design. Thus, the main actors who influenced the shape of the reconstruction work were Evans, Fyfe, Doll and de Jong.

7.1.1 The Conservation Philosophy of Arthur Evans

The life of Arthur Evans and his early ideas of conservation were described in the first chapter. He wrote an enormous amount of material on various aspects of antiquity and on Knossos including many passages on conservation and restoration work. He

[2]Little research was done on Gilliéron, père and fils. However, Kenneth Lapatin, Boston University has done some research. They were Swiss artists who worked at various excavation sites and produced replicas of pottery, frescoes and metal objects for museums but were also linked to criminal forgery. Lapatin, e-mail on Aegeanet Discussion List, 27 September 1997.

[3]Dr. Nicoletta Momigliano is currently in the process of writing a biography of Duncan Mackenzie which will put his achievements in the proper perspective.

frequently explained the necessity for protection of many of the sensitive features, something which already has been examined in chapters three, four and five. It has been established that in many cases he was definitely right and that protection measures were necessary. However, Evans also frequently stated that he wanted to show the visitor how the structures once looked. He always openly admitted the presentation aspect of the reconstructions.

The criticism on the reconstructions has not focussed on the protective shelters *per se*, they were undoubtedly necessary, but on the decision to design the shelters in a 'Minoan fashion'. The colourful and enthusiastic descriptions in Evans's publication give reason to doubt whether the reconstructions were conscientious and accurate reproductions of the original structures. It is important to not that Evans never stated that the reconstructions were accurate reproductions but used phrases such as: "...it has been possible to a great extent to restore..."[4], "....gives the best normal idea of..."[5], ".. to restore its general effect..."[6] or "...reproducing the probable method...".[7] He also frequently supplied numerous evidence to illustrate why the suggested reconstruction is the most likely version.[8] Furthermore, all published plans distinguish clearly between original remains and probable reconstructions.[9] Obviously, he was aware that the reconstruction work could not be accurate reproduction of the past but give only some general impressions and that it must be clearly labelled.

It has been made clear in the previous chapters that both the presentation aspect and the conservation aspect of the reconstructions were present from the very beginning. It seems that in modern conservation philosophy one of the most crucial questions is hardly ever asked: for whom do we conserve. If we conserve historic structures not just for their own sake, we will conserve them for people to enjoy or to learn from them. The

[4]PM II, p. 350.
[5]Ibid., p. 389.
[6]Ibid., p. 9.
[7]PM IV, p. 922.
[8]PM I, p. 328 f; PM I, p. 336; PM I, p. 343.
[9]See PM II, p. 397 f; figure 62 and figure 73.

structures are conserved for the generations to come after us. If conservation of historic structures means the conservation of information, we need to have a recipient for this information. It has already been pointed out that Arthur Evans became director of the Ashmolean Museum in 1884 and that he supervised the construction and the move to the new premises at Beaumont Street. Obviously, the public and the presentation of archaeology to the public were of major importance to Evans.[10]

It is clear that both the presentation and the conservation aspects of the reconstructions at Knossos focus on the same object: the visitor. In Evans' vision, people are supposed to come to the site and see the palace. While he was in Knossos, Evans guided them over the site himself; but he also ensured that the palace could be enjoyed by the visitors of the future. The visitor envisaged by Arthur Evans in the early twentieth century is certainly not the same visiting the site today. Then, the means of travel were limited to upper class and generally well-educated people and these were the visitors Evans catered for. Today, Crete is a popular destination for package tourism. The visitors today will generally have a different perception of the site.[11]

In a modern understanding of management of archaeological sites the issues of conservation and interpretation are both important but they are usually addressed independently. The interpretation of a site is usually presented on boards, guide books or in interpretation centres while the conservation of the ruins aims to alter the found structures as little as possible and is generally unexplained. It is known today that the interpretation of a site will change continuously. New knowledge of the past will alter our perception of it and require a different interpretation. Concrete reconstructions cannot adapt to this change. Evans addressed the same two issues, interpretation and conservation, but he unified both in one structure. Thus, they can be called 'protective reconstructions'. The combination of the two aspects resulted in an aesthetic landscape of ruined structures, an effect which was certainly desired.

[10]See page 72 ff. and compare Lapourtas, 1997.

[11]Until a comprehensive study of the social background of the visitors then and today has been made this statement must remain in a very general form.

Arthur Evans's basic attitude to conservation and reconstruction changed little over the period he worked at Knossos. Both aspects, conservation and interpretation, were present at the first roof above the Throne Room in 1901 and lasted until the final work was completed in 1930. However, the physical form of the conservation work on site underwent many changes. This was due to contact with many visitors, fellow archaeologists and, certainly, to the exchange of views with the architects employed by him, but it was also due to the problems of the site, the failure of earlier work, the long forced absence from the site during World War I and aesthetic shortcomings of support work. As more work became necessary he realised that structural, but not recreative support work was not only an aesthetic obstacle but also a hindrance towards understanding the site. Plate 4 shows that the roofs above the Throne Room, the Magazine of the Giant Pithoi and the eastern light well of the Queen's Megaron form a distinctive but alien element in the landscape of the site. Covering the large area of the Hall of the Double Axes with a flat roof or a pitched roof similar to the one of the Throne Room would have impeded the understanding of the site considerably. This negative effect of non-reconstructive protection shelters became more obvious as more conservation work was needed and, consequently, the element of reconstruction gained more importance.

In the literature, the reconstructions at Knossos have been labelled almost exclusively as Evans's work.[12] It has been discussed in previous chapters that the individual architects executed the reconstructions in their own particular ways. However, it is important to understand the relationship between Arthur Evans and the architects. Evans employed them on site and for several months every year they worked exclusively for Evans. Thus he was their boss. Nonetheless, they lived at the same accommodation and shared the same food and they were part of the British excavation team as opposed to the Greek workers. Their relationship was different from a standard architect-client relationship. However, in a typical architect-client relationship there is hardly ever an architect who can execute buildings according to his own design ideas. As it is common in these

[12]Compare literature review in the introduction, page 53 ff.

relationships, the client approached the architect with a clear concept of what he wanted to build. The architect employs his aesthetic skills and knowledge of construction to turn the client's ideas into a proper plan and, finally, to realise them. In a good relationship, this produces a constant dialogue over a long period of time. Fyfe, Doll and de Jong worked a long time for Evans and it must be assumed that their relationship was quite good and they had a distinctive influence on the reconstruction work.[13]

Evans's design brief has changed remarkably little over the thirty years of reconstruction work at Knossos. Although the elements of protection and presentation were present from the beginning, every new architect provided new aesthetic skills and knowledge of construction. Thus, the building programme changed little while the way it was executed changed greatly. The different philosophies of the three architects created different results.

7.1.2 The Conservation Philosophy of Theodore Fyfe

Like Evans, but not to a similar extent, Theodore Fyfe has left some written material about his philosophy. The most interesting work in this context is certainly his paper 'The Atelier *versus* The Builder's Yard' which he gave in 1911 to the Architectural Association.[14] It could be considered close enough to the date of his reconstruction work at Knossos (1900 - 1904) to be regarded as relevant. In this paper he strongly argues for an architectural training which includes both the builder's yard, where young architects learn how to deal with the structures and materials, and the atelier, where architects are trained in draughtsmanship and theory. In his opinion, only the combination of both skills can result in good architecture. Thus, he puts himself in the tradition of the 'Arts and Craft' movement and the Society for the Protection of Ancient Buildings (S.P.A.B.) which is further supported by quoting William Morris, the founder of this organisation.

[13] See Lapourtas, 1997 who suggests a different view of this relationship between Evans and the architects at Knossos.

[14] Fyfe, 1911, 49 - 55.

Later he worked with the S.P.A.B. architects A R Powys and W R Lethaby when he became architect to the Dean and Chapter of Chester Cathedral in 1920.

In his reconstructions Theodore Fyfe used materials, which had been used in Minoan times and it was his prime concern to replace like with like. However, as has been analysed in the chapter three, much of it did not last very well and had subsequently been replaced by Doll's and de Jong's later reconstructions. This was not, as Evans wrote, due to the Cretan climate but due to constructional mistakes and to a lack of understanding of the different decay rates of materials on archaeological sites as opposed to those in roofed buildings. However, a clear distinction must be made. Only the support work, inserted to keep parts of the crumbling ruins in position, was affected by deterioration but this support work was never intended to last.[15] Wherever he was able to design the completely new reconstructions, they responded very well.[16] Theodore Fyfe's reconstructions, though using traditional materials, were nonetheless distinguishable from the original fabric in a somewhat subtle way. Walls were executed in straight lines and new walls always featured a straight horizontal top. This contrasted with the original walls which were left in their fringed and ragged way.

When Theodore Fyfe revisited Knossos again in 1926 he was able to look upon his own reconstructions retrospectively. He described the earlier reconstructions, his own and Doll's work, in the *Journal of the Royal Institute of British Architects* in 1926:

> "...the palace, as a whole, would gradually become a shapeless and almost unintelligible ruin unless some practical methods were adopted to ensure protection from the elements for its more essential features. These methods have been adopted by Sir Arthur Evans with constant and unwearying forethought in all available time since the first years of excavation. Much of the earlier work of preservation was necessarily tentative and experimental. This is now being replaced to a great extent by more permanent methods, and a lot of additional work has been done."[17]

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[15]Fyfe, 1926a, p. 479. For example the Grand Staircase, the northern portico of the Hall of Colonnades, the East-West Corridor, etc.

[16]See page 343 ff. For example pillar wall Hall of the Double Axes, Throne Room, Shrine of the Double Axes, Magazine of the Giant Pithoi, etc.

[17]Fyfe, 1926a, p. 479.

He not only approved of the later work but also accepted that the repairs he had executed himself had not fully satisfied his and Evans's expectations. It is relevant moreover that in 1926 Theodore Fyfe supervised the concrete reconstruction of the Royal Villa[18] which shows that he was prepared to adopt to new materials and techniques and learn from earlier mistakes. This learning process focused on materials and techniques but his conservation attitude changed very little, if at all. In 1922, when he had to defend work he was responsible for as Cathedral Architect at Chester he wrote in the *Diocesan Gazette*:

> "We are here face to face with a standpoint based on historic values which is of the very essence of the spirit in which the repair of historic structures may best be approached not to show them as they *were* - an impossible task - but most worthily as they *are*."[19]

It seems that this statement contradicts his earlier agreement on the concrete reconstructions at Knossos in 1926.[20] In contrast to the spirit of his earlier work of conservation the concrete reconstructions seem to show how the palace was in Minoan times and not what it was in the early twentieth century. A closer look reveals that Fyfe is much more critical of his earlier work than of the concrete restorations. His earlier work used the original materials in their original dimensions at the places where they might have been. They are more likely to be confused with the original remains than the concrete work of the 1920s.

Fyfe was, like Evans, concerned about the outside visitor who has to interpret the site. In both, the quotation in the *Diocesan Gazette* above and in a paper in 1926 he talks about showing or suggesting to the competent visitor how the places looked in the past.[21]

[18]The Royal Villa was reconstructed in 1926 with concrete similar to the palace following plans by Piet de Jong. It seems that de Jong was busy elsewhere in the palace and the supervision of the work was left to Theodore Fyfe.

[19]Theodore Fyfe, in Diocesan Gazette Chester 20th February 1922, in S.P.A.B. Archive London. Obviously, Fyfe's attitude to conservation has matured between 1904 and 1922 and the conservation problems at Chester Cathedral differ from the ones at Knossos. Nonetheless, the quotation gives a good idea of Fyfe's thoughts.

[20]Compare Fyfe, 1926, p. 479.

[21]Compare quotation page 386.

From 1921 Fyfe gave lectures at Oxford and from 1922 he was teaching at Cambridge; but already in 1911 he discussed the education of architects in a paper in the *Architectural Association Journal*.[22] Thus the didactic element was of considerable importance in his later work, a viewpoint which he might have adopted from Evans while he was working for him at Knossos. Fyfe believed, as far as can be judged from the sources available, that the concrete reconstructions could clearly be distinguished from the old material and would not harm the historic fabric. They have not replaced the historic fabric but are an additional element to support in both the physical and the didactic way.

In his earlier work on site, Theodore Fyfe used materials and techniques in his reconstruction which were identical with the original Minoan ones. They could only be distinguished through their specific shape. The reconstructed parts featured straight lines while the original parts were rugged and fractured. These subtle differences were frequently not recognized by non-trained visitors. To them the texture of the reconstructed parts was indistinguishable from the historic fabric. This problem occurred only gradually with a larger number of visitors on site who were no longer guided by Evans himself but visited the site on their own.

7.1.3 The Conservation Philosophy of Christian Doll

It is more difficult to discuss Christian Doll's attitude towards conservation than that of Evans and Fyfe. He has not left any writing on his work and he did not practise for long either before or after his work at Knossos. As I described earlier, Doll focussed on politics in his later life rather than on architecture. It almost seems as if he never really had an interest in architecture and was drawn into the profession by his father rather than by his own desire. It seems that Doll's father had a considerable influence on the

[22]Fyfe, 1911, p. 49 - 55.

architecture of the Villa Ariadne and probably other works of Doll.[23] This indicates that Doll was not a very confident and creative person and Josef Durm, who met Christian Doll at Knossos in 1906, refers to him in a similar way.[24]

However, his work at Knossos allows us to judge Christian Doll's attitude towards conservation. He understood the conservation needs and provided technical solutions. To Doll the work at Knossos was not an aesthetic or ethical challenge but an technical challenge. Iron girders and brick vaults were employed to cover the rooms and to replace historic fabric to its former position. Unlike Fyfe he removed much of the overlaying fabric and replaced it after iron girders were inserted. The structurally necessary work was clad with timber boards to conceal the load-bearing structure and a suspended ceiling covered the brick vaults. Obviously, a shift has happened from the use of real materials to a twofold system where the structurally necessary steel constructions were hidden behind timber boards. This construction method was not kept secret but was described by Evans in 1905.[25] This honest and straightforward information policy will contradict any speculation of a decisive intention of deception but the synthesis of Fyfe's system was lost.

Another detail distinguishes his work from Fyfe's reconstructions. Doll's masonry was more accurate and stones were cut roughly into rectangular blocks while Fyfe used random rubble.[26] In many areas Doll even built ashlar pillars, clearly distinguishable from the old fabric, to support reconstructed beams. He adopted Theodore Fyfe's idea to show new work with straight edges but went much further than his predecessor. The recording of the site, the reconstruction proposals and the final work on site, all witness the same accuracy of Doll. Everything is executed in precise straight lines, technically correct but somehow unimaginative.

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[23]See page 241.When not in Knossos, Doll worked in his father's office and while he was at Knossos he frequently asked his father for advice. The correspondence between Doll and his father has not survived but Doll regularly reported to Evans and in these letters he referred to his father's advice. Some of these letters survived (Ashmolean Museum, Oxford).

[24]Durm, 1910, p. 60 footnote 1.

[25]Evans, 1905, p. 25.

[26]Section B-B, Drawing 8. Wall above door (Fyfe) and window (Doll) in lower East-West Corridor.

A statement of Doll that the Grand Staircase could be reconstructed on a mathematical line with the treads three times the height of the risers illustrates his attitude.[27] Exact sciences such as mathematics and engineering were important to him rather than form and design. These were elements which could be later attached to the structure. When he developed the plans for the Grand Staircase in 1905 and the archaeological evidence did not coincide with his technical understanding, he favoured the latter. It has been discussed in chapter four how his technical thinking had influenced the various reconstruction proposals for the Grand Staircase. This highlights how technical problem-solving dominated his thoughts.

It has already been mentioned that Doll did not pursue his architectural career. This seems to be a logical personal development. An essential quality in practising architecture is creativity. Christian Doll's attitude to conservation and reconstruction on site was formal and might have been a textbook example but was lacking in the necessary imagination.

7.1.4 The Conservation Philosophy of Piet de Jong

Despite being the most recent architect employed at Knossos, little material on Piet de Jong survives and he did not write any papers that give information on his attitude to conservation. Consequently his philosophy has to be established based on an analysis of the building work he executed, in spite of the dangers connected to such an undertaking. However, Piet de Jong not only worked at Knossos but also at Mycenae - a fact which allows us to compare the two sites. The excavations at Mycenae were directed by Alan Wace, while Knossos was excavated by Evans. The similarities of the reconstruction and conservation work must be de Jong's responsibility, while the differences probably originate in the excavators' attitude. Much less reconstruction work was executed in Mycenae, something predominantly due to the following facts:

[27]Doll in: Evans, 1927, p. 267.

- Mycenae was first excavated by Heinrich Schliemann in 1876. Much of the historic fabric had been dug away in the excavation process and Schliemann had not initiated an immediate conservation programme like Evans at Knossos. Thus, much of the historic fabric had vanished long before de Jong started his work.

- Unlike Knossos, which was left up to three storeys high in the Domestic Quarter, at Mycenae, located on a hill top, remains of upper storeys were not found *in situ*. The specific conservation problems of Knossos were not present here.

- Many of the impressive fortification walls were executed in large blocks of Cyclopean masonry. They survived quite well even without protection while the rubble masonry walls of the houses inside the walls suffered considerably.

- Unlike Knossos, gypsum was not widely used in Mycenae. In the few areas where it was used, such as in the Megaron of the Palace on the summit, restoration work was executed by de Jong.[28] Since the gypsum was not sheltered by a roof it weathered badly and was largely destroyed.

- While Evans was the owner of Knossos and had considerable financial abilities to execute his reconstruction work, Mycenae was an excavation of the British School which always had very limited resources and frequent financial difficulties.[29]

Despite these differences, work executed by de Jong in Mycenae shows some similarity with his work at Knossos. The choice of material and the specific techniques used to employ it seem to be his contribution, while the amount and the place of the reconstruction seem to be the input of the excavators - Alan Wace at Mycenae with rather limited resources and Evans at Knossos with better facilities. For example, reinforced concrete was used in a similar way at both sites. Concrete floors replaced missing original ones and fragments of the original material were incorporated in the new

[28]An exception is the portico of the megaron.

[29]See Waterhouse, 1986, p. 92.

concrete column bases.[30] Thus, we have to anticipate that de Jong genuinely believed in the material concrete and its abilities to solve the conservation problems on site. This fact is supported further by de Jong stripping the timber roof of Penrose's British School building in Athens in order to replace it with a flat concrete construction.[31]

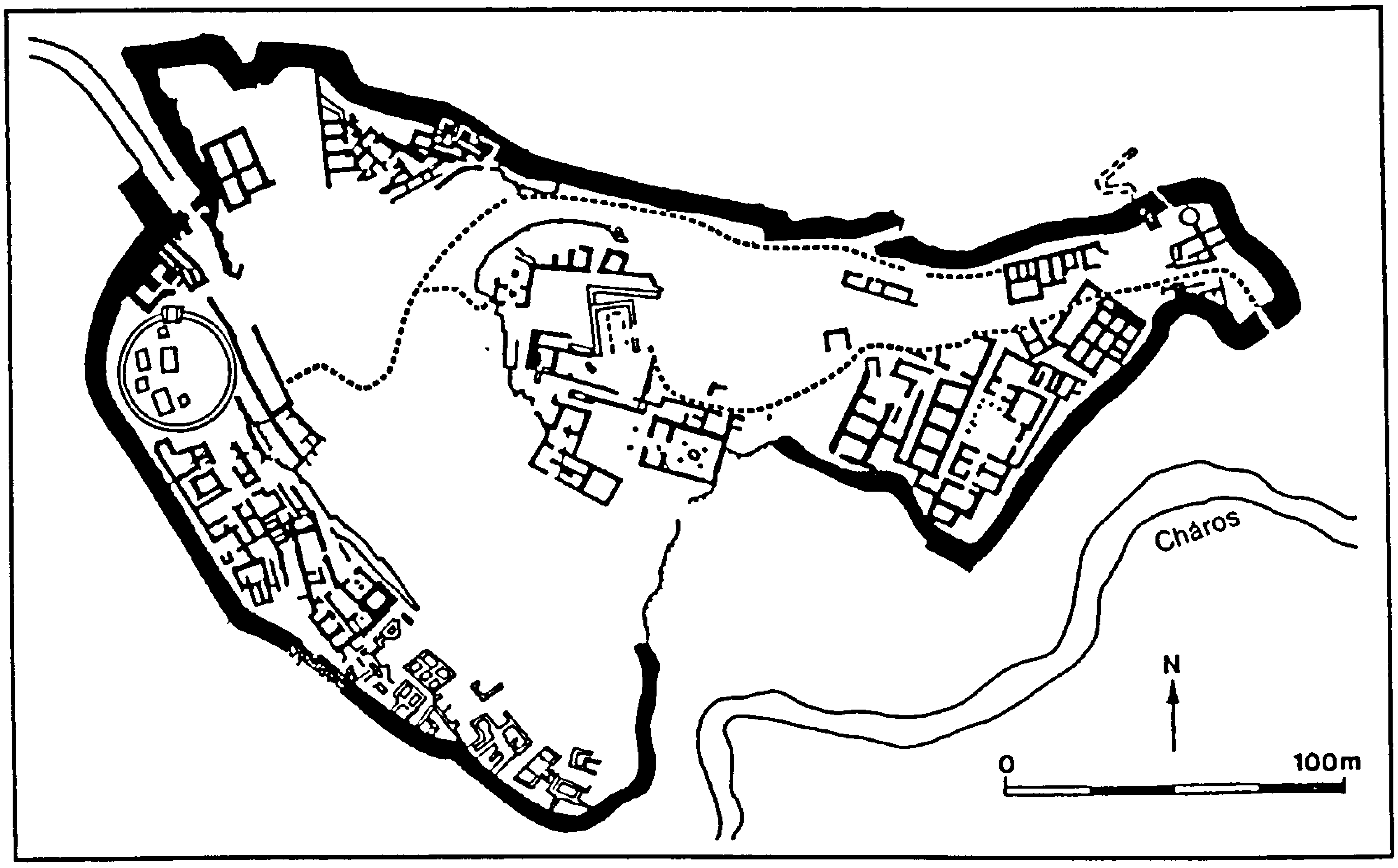

Figure 93 Plan of the Acropolis of Mycenae.

At Knossos, Piet de Jong used reinforced concrete for the construction of the ceilings and for the reproduction of the timber reinforcement beams both in the excavated ruins and in the reconstructions. The material concrete was expected to last well in the Cretan climate. In the areas accessible to visitors, concrete that recreated timber was painted in a two-colour technique resembling wooden grain. The colour used in this technique is ochre-orange rather than brown and while it clearly indicates timber it hardly can be mistaken for it. Thus, Piet de Jong not only stated clearly that this was a reconstruction but also which material had been used originally .

[30]See plate 223.

[31]See page 320 f.

Piet de Jong introduced the idea of the picturesque ruin to Knossos. Fyfe's and Doll's reconstructions were comparatively small in scale. Their impact on the ruined landscape of the site was limited, but when Piet de Jong started to cover large areas of the site with concrete reconstructions the impact of the modern work could no longer be neglected. In fact, he hesitated to reconstruct facades. For example, the Stepped Portico was reconstructed in 1922 and 1923 and large parts of the West Wing were roofed in 1925, but the Pillared Portico was constructed later and the West Facade as late as 1929.[32] In order to blend in with the existing ruins, he started to slope the reconstructed walls like ruins from a low level to the required height.[33] Thus, his reconstructions might more easily been mistaken for original ruins than the work of Fyfe or Doll. He compensated for this problem by using reinforced concrete, a material which allowed for better recognition than the materials used by his predecessors. Generally, there was a shift from the visitor recognizing the reconstructions by their shape to a recognition by materials.

It has been noted that original elements which had been found in their original position, had been incorporated in the concrete reconstructions. While the concrete ceiling protected the gypsum floor underneath it exposed these incorporated elements of the same material to the weather. One cannot fail but see the conflict between these two parts of one and the same construction. However, this must be seen in its historic context. The original elements were found in their position in the excavation process and all subsequent struts, timber support frames and reconstructions aimed to keep them there. They form an important role in understanding the architecture of the upper storeys of the palace.[34] Alternative solutions for de Jong for not placing these elements in their former position included accommodating them on site in one of the sheltered areas or off site in a museum. In both cases the door jambs would be removed from their architectural context and no longer provide valuable information to the visitor. In respect to Evans' philosophy, this was certainly not desired.

[32]See page 272 ff.

[33]See plates 82 and 161.

[34]For example, the door jambs of the upper Hall of Double Axes indicate that this hall had a floor plan almost identical to the one at the ground floor. Compare figure 31 and figure 62.

Piet de Jong's reconstructions are aesthetically pleasing and photographs taken before the construction of the modern shelters show the design qualities of his work.[35] The large reconstructions were designed with a minimum of sharp contrasts. The restored parts rise gently above the ruins and the walls slope down or step down from the higher levels to the original remains. This gentle transition led to confusion and it became difficult to distinguish the original from the reconstruction. However, employing this method it was possible for Piet de Jong to fit an enormous area of reconstructed upper floor level into the ruined landscape of the site. For example, the reconstructed upper floor of the West Wing covers approximately 1300 square metres and approximately the same area is covered with a protection shelter at the Palace of Nestor at Pylos.[36] In contrast to the massive shelter at Pylos, the solution at Knossos is unobtrusive and aesthetically pleasing. Piet de Jong's skills and his aesthetic feeling have determined his approach to the necessary work on site.

7. 2 The Aim, Function and Purpose of the Restoration Work

It has been discussed in the previous chapters that specific factors such as the material and construction method of the Original Palace and their survival up to three storeys high demanded attention. The starting point for all work on site was this demand. Any criticism which focused on the conservation and support work would not be justified since this work was certainly necessary and, in fact, hardly any critique on this work can be found. Most disapproval on the reconstructions at Knossos imply that they have been, at least in some parts, executed for purely representative reasons. It is commonly assumed that the intention of the reconstructions was to show how the ruins looked in the past but their conservation aspect is frequently underestimated or completely neglected. For example, Sinclair Hood wrote:

[35]See plates 29, 82 and 161.

[36]See plate 221.

> "The aim of Evans in making these reconstructions was to try and give some impressions of how parts of the palace might have looked in their original state. His reconstructions aroused much controversy at the time, and have continued to do so."[37]

The reconstruction work at Knossos has frequently been grouped into two sections: the works of Theodore Fyfe and Christian Doll, commonly regarded as good and necessary, and the work of Piet de Jong, which is more often labelled unnecessary and wrong. The separation into two phases is based on Arthur Evans's statement that a 'new era of reconstruction' started in the 1920s.[38] Commonly, this phrase was interpreted as a new understanding of conservation and reconstruction philosophy starting after World War I.[39] However, Evans was only talking about a way that 'made it possible much more efficaciously and cheaply to replace upper floors'.[40] Thus, there was no dramatic change in Evans's attitude towards conservation but the new material allowed him to execute what he had intended to do for a long time.

The characteristic element of the work at Knossos is the combination of two ideas in one structure: *conservation* and *reconstruction*. Thus, the reconstitutions at Knossos are *protective reconstructions* by nature.[41] While their conservation aspect cannot be criticised, their reconstruction aspect can be and has been criticised. Restoration work or the reconstruction of a past was condemned by William Morris in his *S.P.A.B. Manifesto* in 1877. It was mentioned that Evans was involved in the conservation debate in Britain in the late nineteenth century. There is no proof that Evans read or knew the Manifesto but he was certainly familiar with the arguments for conservation of his time. Evans's aim was not to reconstruct the palace in order to reproduce something that had never been there or for the sake of a pure style or the completeness of a structure. The fragmented reconstruction of only parts of the palace contradict this theory. His aim was to preserve the excavated remains for their information value. If this is so, the question

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[37]Hood and Taylor, 1981, p. 5.

[38]PM III, p. 288. For interpretation see Lapourtas, 1997, p. 77 f. and Horwitz, 1981, p 197 ff.

[39]See for example Lapourtas, 1997, p. 77 f and Horwitz, 1981, p. 197 ff.

[40]PM III, p. 289.

[41]This term has been coined by the author first in a seminar at the University of York in 1996. Compare: Kienzle, 1997, p. 122.

remains why he did not cover the site with a protective shelter but reconstructed it in parts?

It has been discussed in chapter one that protective buildings were built above archaeological features in Germany, Switzerland and Britain at the end of the nineteenth century. The idea of protective shelter was known at the time; however, the first structure at Knossos, the flat roof above the Throne Room, differs in a minor but very important detail from these buildings. To support the beams of the flat roof, structural support was necessary in the middle of the Throne Room. This support was designed in a Minoan fashion. Evans, who claims responsibility for this decision, argued that the reproduction of the original columns would avoid the introduction of "any incongruous elements in such surroundings".[42] When the timber support structures of the Grand Staircase failed in the Winter 1904/1905 they were replaced with Christian Doll's iron girder and brick vault construction. Again, reconstructed columns were chosen to provide the required support. Evans explains in the Annuals of the British School:

> "It being in any case necessary to obtain strong and durable supports for the upper structures, the *minimum* of incongruity seemed to be secured by restoring the columns themselves in their original form - but in stone with a plaster facing in place of wood."[43]

From the very beginning of conservation work at Knossos an element of reconstruction of historic features was present. Evans argued that this was necessary because other structures of support would be 'incongruent'. There are two aspects to this argument one being aesthetic and the other educational. Generally speaking, perspective reconstruction drawings and, in recent times, animated computer reconstructions have been employed to help the understanding of vanished architectural spaces. They compensate for the missing parts of the buildings on site, so that visitors can obtain some impressions of the spatial arrangements. At Knossos, props, poles and girders of support structures which

[42]Evans, 1901, p. 2.

[43]Evans, 1905, p. 25. Emphasis by Evans.

were employed to keep ancient fabric in its position criss-crossed the space.[44] They were not only an aesthetic obstacle but made it difficult to experience the ancient spaces. Few people will be able to penetrate intellectually the structural system of an ancient building if the original load-bearing columns are missing and the roof is carried by additional new poles in different positions. If support of upper elements was necessary, and this was certainly the case in the Throne Room and the Grand Staircase, Evans felt, it was desirable to reconstruct the original columns. This was regarded not only as more pleasing aesthetically but also more accurate if shown to the visitor.

In his inauguration speech as the Keeper of the Ashmolean Museum Arthur Evans discussed the use of facsimiles in a Museum context and supported the idea that they might be used if the original cannot be displayed.[45] Evans used reproductions of frescoes in the palace but he was always very frank about the fact that they were not originals. Furthermore, he always documented the reconstruction work in his annual reports which clearly show that he had not intended to fool anyone but intended to give as much information as possible to visitors so that they could understand the Minoan past. Flinders Petrie, who excavated in Egypt and whom Evans frequently quotes for showing relationships between Egypt and Knossos discussed archaeological ethics in his book *Methods and Aims in Archaeology* of 1904:

> "In archaeology there is perhaps a greater range of ethical questions, of the individual *versus* the community, than in any other science. And the results of action are the more serious as the material is limited, and perhaps no other chance of observation may ever occur. In most sciences the opportunity of experiment and observation is unlimited. If an alloy is spoiled it can be remade at once, if a star is not examined to-night it may be next night, if a plant is not grown this year it may be next year. But Theodoric's gold armour once melted, we shall never know what it was like; the heads of the Parthenon statues once burnt to lime, are gone for ever; or the Turin papyrus once broken up, we can hardly hope ever to recover all the history it contained."[46]

[44]For example see plates 129, 136 and 158.

[45]Evans, 1884. See also Lapourtas, 1997, p. 72.

[46]Petrie 1904 p. 169 f.

Once again, there is no proof that Evans knew this piece of writing but we can assume that he was familiar with Petrie's attitude. Arthur Evans understood, in the modern sense of archaeology, the site of the Palace at Knossos as a collection of information. He frequently had visitors at Knossos and took pride in showing them round the palace.[47] Arthur Evans was passionate to show the public the information he had excavated and, doubtless he preferred to show the original information rather than a replica. However, he understood that if he wanted to continue giving information to the public, he had to secure the survival of the medium of this information. He had to bring the sensitive fresco fragments to the Museum in Candia. To allow his visitors a complete understanding of the site he had replicas of the restored frescos fixed in the palace.

In 1928 Edouard Gilliéron restored the Dolphin Fresco at the north wall of the Queen's Megaron.[48] The megaron was reconstructed by Doll in 1908 and for twenty years it had a different paint scheme.[49] The fresco fragments were found in 1902 either side of the west wall of the light well and Evans assumed that it originally decorated its back wall.[50] Furthermore, figure 94 shows that the few remains enabled Gilliéron to reconstruct a general scheme but not an exact reproduction of the original fresco. Thus, a decorative scheme was recreated which is neither a correct reproduction nor is it at its correct position. However, in *The Palace of Minos*, Arthur Evans stated:

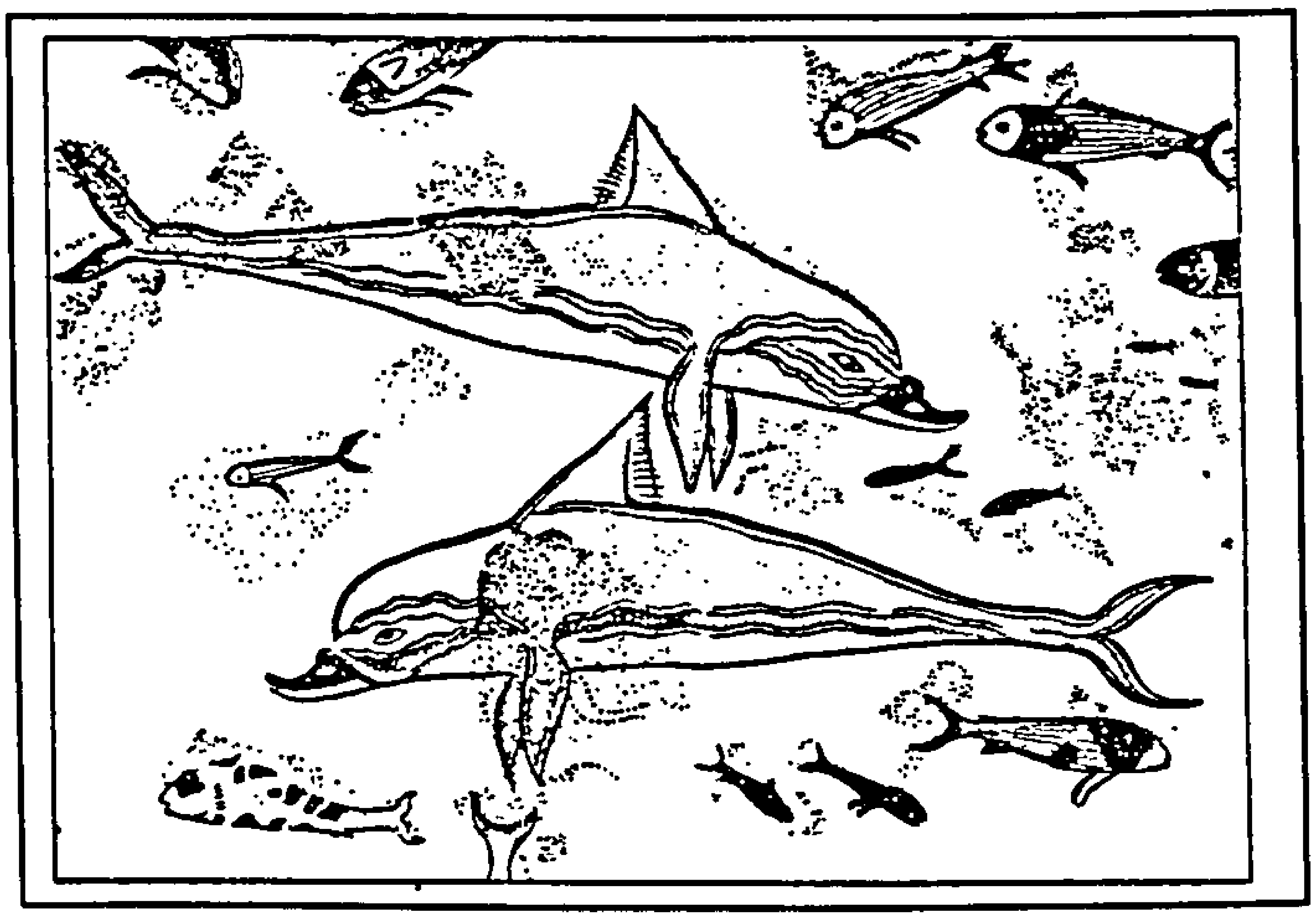

Figure 94 The Dolphin Fresco. Original remains shaded.

[47]See Brown, 1994, p. 30.

[48]Evans, 1928, p. 97.

[49]See plates 188 and 189.

[50]Evans, 1902, p. 46 and 56. Compare also Palmer, 1969, p. 87.

> "To restore in part the original effect, a spirited amplification of the existing remains of the Dolphin Fresco has been executed for me by Monsieur Gilliéron, fils, along the upper part of the north wall of the inner Section of the 'Megaron'."[51]

A clearer picture can be drawn of Evans's intentions. First of all he understood and accepted his responsibility as an excavator to conserve the exposed remains. However, conservation work cannot be an aim in itself. Effort and resources spent for conservation work always include the question: for whom is it conserved? Conservation work has in it a public dimension: historic sites and artefacts are supposed to be seen by the public. Evans, with his experience in museum display, always had a strong intention to present the excavated site to visitors. It was not important to him to recreate scientifically correct reconstructions but to catch the spirit of the past and to present it to a wider audience.

Theodore Fyfe became a member of the S.P.A.B. in 1921 and Director of the Cambridge School of Architecture one year later. Thus, he had not only a reputable position himself but also was a committee member of the one organisation which was opposed to restoration work in the strongest possible way. Consequently he had a mature and distinctive perspective looking at the reconstruction work when he revisited Knossos in 1926. He was no longer the young architect depending on his employer Arthur Evans as he was almost twenty years earlier. Thus, his judgement of the recent reconstruction work is of high interest:

> "Mention has been made of the word "re-constitution." It is one expressly used and desired to be used by Sir Arthur himself, and it meets the case very well. Such work as this is not, and ought not to be, "restoration." Its objects are (1) to preserve those key positions of the Palace plan and structure already existing that are essential for its proper understanding, and (2) to suggest to the competent observer further methods of construction and finish that years of study of evidences in fresco, etc., have elucidated. About the general soundness of outlook in these re-constitutions there can be no doubt whatever: nothing that has been done is either wild or improbable. So far as actual structure is concerned, there is hardly a single bit of new work that is not based on facts as certain as any such facts can be."[52]

[51]PM III, p. 378.
[52]Fyfe, 1926a, p. 479.

When Fyfe visited Knossos in 1926 some of the most controversial reconstructions had not yet been executed, such as the final work in the Throne Room, the North Lustral Basin and the North Entrance Passage. However, if the reconstitutions at Knossos had to serve not only for the preservation of the remains but also for visitors to understand the site, then we have to ask if the reconstructions are a truthful replica of the original Minoan structures.

7.3 The Truthfulness of the Reconstructions

The question which inevitably arises when discussing the reconstitutions at Knossos is whether or not they are correct. Evans has frequently been criticised that his reconstruction work at Knossos followed a hidden agenda. The reconstructions have been seen as a narrative, as his interpretation of the Minoan past cast eternally in concrete.[53] Castleden calls it a 'persuasion in concrete'.[54] In order to evaluate these accusations it has to be established whether the reconstitutions were accurate or just the imagination of Evans and the architects. However, first of all, it must be defined what 'accurate' means in this context. Chapter Two described how ancient buildings in general and the palace at Knossos in particular deteriorated and became ruins and finally archaeological remains. Archaeological reconstruction aims to reproduce fully or partially the former structure. This aim can be achieved by reassembling existing original remains or by constructing new parts.

The process of reassembling existing elements in their former position is called *anastylosis* and was accepted in the Venice Charter as the only permissible form of reconstruction at archaeological sites.[55] However, *anastylosis*, in the absolute meaning of the word has not yet been executed and, probably, never will. The original cause of destruction to the site and subsequent looting for material by later generations have

[53]Hitchcock, 1994.

[54]Castleden, 1990, p. 32.

[55]Venice Charter, Article 15.

hardly ever left the complete and structurally sound material for *anastylosis*. Chipped off corners or missing material needs to be replaced in order to provide a structurally sound entity on site. Frequently, material for reconstitution is only available for some parts of the building but not for the entire structure. Thus, it became common practice at many Mediterranean sites to reconstitute only a few columns or a corner of a building. Hartwig Schmidt called this system *Architekturprobe*, architectural sample.[56] This allows the visitor to see the original height at one point which enables him to reconstruct in combination with the excavated, visible ground plan, the original volume of the structure in his imagination. The problem with this method is that it does not recreate the complete former structural system. Individual corners or columns which are not connected to the surrounding structure as in ancient times, are easily affected by storm and earthquake.[57] All reconstruction work in the Mediterranean has to be done with this fact in mind.[58] Thus, alteration to the existing material and incorporation of new material is necessary to guarantee the survival of these architectural samples.

It is virtually impossible to reassemble ancient parts without the integration of any new materials. It has become common habit to call reconstitutions which need only a small part of new material anastylosis and to accept them as good practice while other reconstitutions which rely on a larger amount of new material are called by their name and condemned as bad practice. The border-line between the two groups remains to be defined. It seems that the main problem is not the actual amount of the new material but whether it can be determined how the missing parts looked.

This problem might be best illustrated by two drawings of the *pronaos* of the Parthenon at the Acropolis, Athens, by Manolis Korres.[59] The first drawing shows the current state

[56]Schmidt, 1993, 199.

[57]See for example Kamiros, Rhodes where six re-erected columns were knocked down in a storm in 1962. Schmidt, 1993, p. 207.

[58]For a detailed discussion of structural design in connection with reconstruction at archaeological sites see Wenzel, SFB 315, University of Karlsruhe, Germany. Wenzel was responsible for the structural engineering of the reconstitution of a pert of the *Trajaneum*, a temple dedicated to Trajan at the Acropolis of Pergamon.

[59]See: Korres, 1994c, p. 110 ff.

of what has been left on site.[60] The second drawing shows the same facade with all surviving parts which formerly belonged to the facade. The white gaps in the columns and the architrave are missing parts. Irregularities of the fluting and the *entasis* of the columns allows every remaining drum to be positioned in their exact former position. All missing parts can be exactly determined. Replacing the missing drums and parts enables the original parts to be put back in their original place. After long and careful deliberations in the Acropolis Committee it was decided that Korres should execute this work.[61]

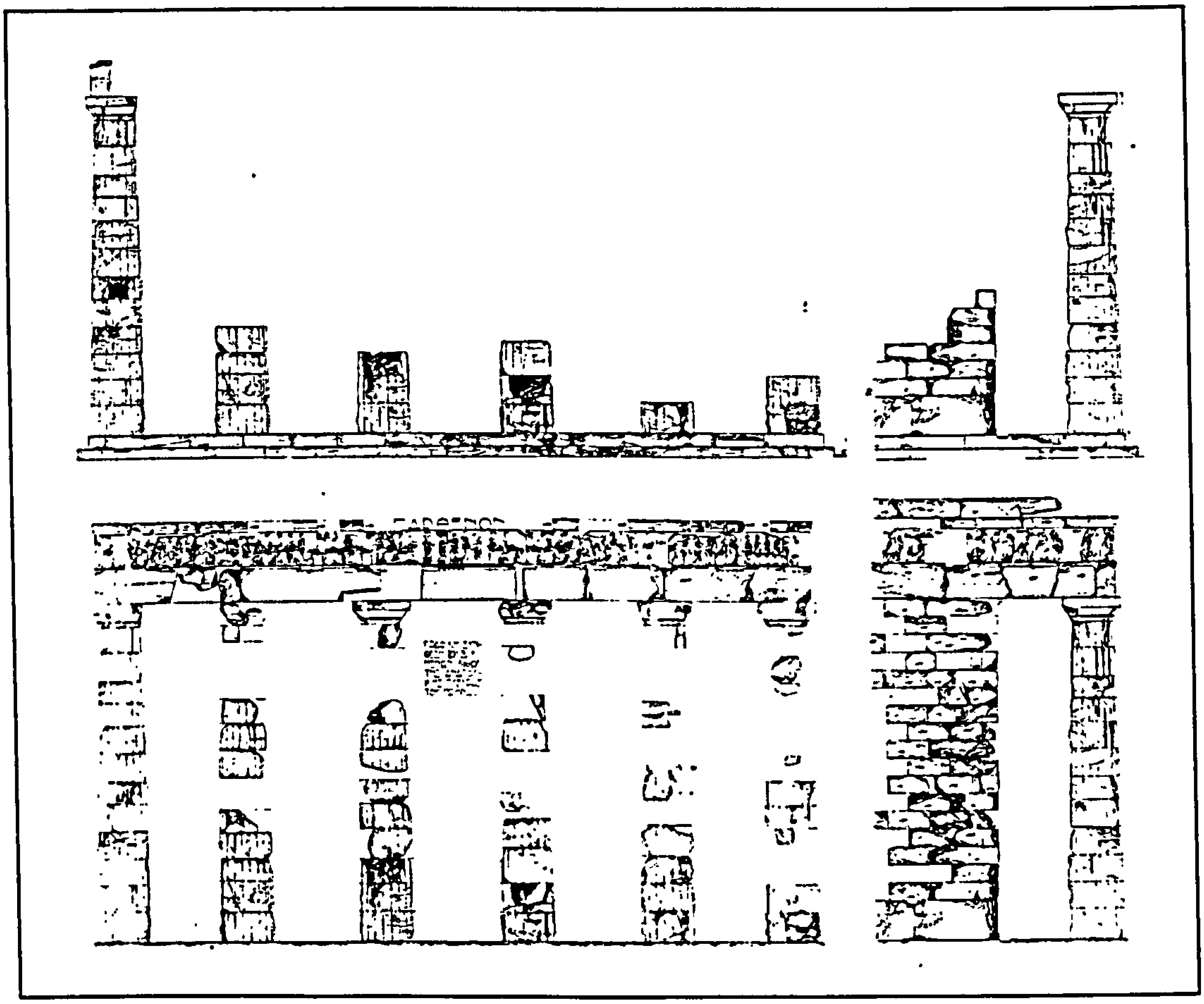

Figure 95 Pronaos of the Parthenon, Athens. The upper drawing shows the current situation. The lower drawing shows all surviving elements in their former position. Drawing by M. Korres.

[60] Images taken from Korres, 1994c, p. 132.

[61] Korres, 1994c, p. 131.

The above-described interventions at the Acropolis are generally accepted because the data available to design the missing parts is comparatively good and the possible error will be small. The classic period of Greece is well researched and paintings survive depicting the Parthenon before its destruction in the Turkish - Venetian war in 1687 and in the two sieges in the Greek war of independence 1822 - 27 and 1827 - 33.[62] However, placing the original parts in their former position and designing the missing parts in between is based on logic and experience. A number of elementary design rules were employed to reconstruct the former facade. For example, in classic Greek temples the architrave is not interrupted and is always at the same level. Round arches or architraves at different levels are a later Roman invention. Furthermore, the entasis of the columns will change gradually but consistently. Observing these pre-set rules allows found elements to be placed in their original position even if the adjoining or supporting element is missing. Still, it cannot be guaranteed how the original facade looked like because it anticipates two axioms. First it makes the assumption that the original building has followed these rules but, since parts are missing, we have no guarantee for that. Second, it anticipates that our current level of understanding of the architecture of this period is correct and sufficient.

The Charter of Venice simply states that restoration must stop where conjecture begins. Only anastylosis, the reassembling of existing but dismembered parts, can be permitted.[63] However, it will be impossible to execute any work without any new material and, consequently, some conjecture. The statement cannot be accepted as an imperative demand but must be seen as the aim to reduce the amount of conjecture to a minimum. Thus, the correctness of a reconstruction is based on the degree of conjecture. However, the system in which the correctness can be evaluated depends on our knowledge of the past. Dietwulf Baatz correctly pointed out that every reconstruction is a documentation of the contemporary level of research.[64] Archaeology progresses and will gain more detailed information on specific issues. Something that was accepted as correct at a

[62]Mallouchou - Tufano, 1994, p. 68 ff. Compare page 102 ff.

[63]Charter of Venice, Article 9.

[64]Baatz, 1985, p. 119.

specific point of time might be proved wrong later. Obviously, as more conjecture is employed in the reconstitutions the more likely it is that it will be proved wrong some time in the future.

The main difficulty in assessing the correctness of the reconstitutions at Knossos is that the information on the Minoan Bronze Age is limited. Unlike the classical and later periods no written sources are available that could help in reconstructing the past; the excavated ruins and pottery and other artefacts are the only sources left.[65] When Evans started his excavation work in 1900 the Minoan culture was unknown. It was he himself who created the terminology and, in 1905, the chronology which are, with amendments, still in use today. The amount of information that was available at the time when the reconstitutions were executed was very limited. Besides his own work in Knossos, Evans obtained information on Minoan culture from the excavations at Phaistos, begun by Luigi Pernier and Frederico Halbherr in 1900,[66] and the excavations in Gournia by Hawes who started excavating in 1901.[67] From 1915 he could also obtain information from the new excavations at Mallia by J Hazzidakis.[68] Nonetheless, the amount of comparative data which would allow a clear picture of Minoan architecture was very small at this time. Thus, the sources from outside Knossos that could be employed for the reconstitutions were limited.

Generally speaking, the danger in reconstruction lies in the preoccupation of the mind of the executing archaeologist or architect.[69] When the work at Knossos was executed the knowledge of architecture stretched back to the classical period of Greece and Rome and to ancient Egypt and Mesopotamia. Everyone involved in the reconstructions had travelled widely in the Mediterranean before they began working at Knossos.[70] Therefore, it was likely that their understanding of architecture was influenced by observation of

[65]The Minoan writing systems Linear A and Linear B are lists of goods but no descriptive texts.
[66]La Rosa, 1992, p. 232 ff.
[67]Myers, Myers and Cadogan, 1992, p. 104 ff.
[68]Myers, Myers and Cadogan, 1992, p. 175 ff.
[69]Compare Bintliff, 1984.
[70]See individual CV's of Evans, Fyfe, Doll and de Jong in Appendix 1, p. 489 ff.

these structures and their adaptation in later periods. The principle of this architecture is largely defined by symmetry but it is questionable to take this principle of symmetry as the right measure to reconstruct the palace at Knossos. Surprise was an integral part of Minoan architecture: corridors bend many times and visitors were led from dark areas to bright light, from the enclosed to the open. This constant surprise is alien to the classical idea of how to approach a building. Lawrence described it in the following way:

> "It appears that the Minoans did not object to disorderly planning as such; they obviously saw no advantage in symmetry and may have been lovers of the picturesque at all costs; in fact their architecture resembles their other art in showing no sense of form."[71]

The dilemmas of reconstruction work at Knossos were that the knowledge of Minoan architecture was very limited and its principles not fully understood, and that the architectural principles were not in line with the common system derived from the classical period. Consequently, Evans's claim that he reconstructed in accordance with usual Minoan practice seems to be questionable.[72] For example, the disputed reconstitution of a broad flight of stairs at the South Propylon seems to be more 'classical' in its concept than seems to fit the Minoan palace. The reconstituted staircase is frequently criticised because no evidence could be found on site; in the early plans the site of the stairs is labelled Central Clay Area.[73] A year later the same area was labelled in the plan as Court of the Altar[74] and a conjectural stair to the upper level was suggested north of the court.[75] However, in 1907 Arthur Evans wrote in *The Times*:

> "Another discovery, done[?] in the same exploratory methods, in the neighbouring "clay area" must be regarded as of first-rate architectural importance. It had been supposed theoretically that a broad flight of steps led up from the Propylaeum to the south of this area to a series of upper halls, of which the traces are still visible above the basement rooms of the west wing: but the earlier explorations had here come to a full stop owing to the mistaken impression that the underlying stratum of Neolithic

[71]Lawrence, 1957, p 34.
[72]PM I, p. 353.
[73]Evans, 1900, p. 17.
[74]Evans, 1901, facing p. 1.
[75]Based on a suggestion by Dörpfeld. Evans, 1901, p. 21 ff.

> clay, in places some 25 feet thick, had here been reached. So far as concerns[?] the slight ramp, representing the original ascent of the steps, this conclusion proved to be correct. But on the east flank of this the clay layer turned out to be only a shallow artificial platform due to later occupants of the site who had here built out of the stair foundations a hall apparently of the mainland type. On removing this intrusive clay stratum massive substructures forming a solid rectangular block became visible which evidently belonged to a great supporting bastion of the original stepway the exact dimensions of which can now be ascertained."[76]

In 1925 the broad stairs were reconstituted in concrete at this place.[77] This reconstruction is frequently criticised in later literature. For example Castleden suggestion of two ground floor sanctuaries in this area is based on the fact that Fyfe's first plan did not show stairs.[78] This interpretation was only possible by completely ignoring the finds of 1907. It might be possible that Evans misinterpreted the foundations he found in 1907 in order to fit his earlier theory, but it might also be possible that it actually proved his earlier ideas. It is of uttermost importance to get an exact understanding of which sources Evans employed for his reconstitutions and how reliable these sources are in order to assess the reconstitutions for their correctness. Therefore, the next section will analyse the sources employed for the reconstruction work.

7.4 The Site as Source for the Reconstructions

It has been mentioned above that archaeological evidence and logical thought are not on their own sufficient to provide enough data to reconstruct a site absolutely correctly. However, a careful consideration of all available data will lead to an approximation of the 'perfect' reconstruction. In this section it will be discussed which sources have been employed to reconstruct parts of the palace. Of course, the main source has always been the physical remains of the palace. However, two distinctive problems were connected with these remains. First, Duncan Mackenzie, who wrote the daily reports has noted

[76] *The Times*, 15 July 1907, p. 8.

[77] *The Times*, 9 October 1925, p. 15.

[78] Castleden, 1990a, p. 83 f.

pottery and small finds but referred to architectural elements only if they were of particular quality such as carved stones. Besides this, Mackenzie sketched the walls of rooms in order to provide information on the find context of pottery and small finds but not as a record in its own right.[79] Recording the structural remains of the palace was left to Fyfe, but both Fyfe and Mackenzie sketched only entire walls and similar big features but disregarded individual stones.[80] Thus, the precise origin of individual stones which were found in the excavation process and which were employed later in the reconstructions is frequently not known. Second, the architectural remains give little evidence on the shape of upper structures. While some gypsum blocks indicate the layout of upper storeys, information on the elevations was scarce. This information was taken from secondary sources such as frescoes, the faience tablets of the town mosaic and the house models.

In principle, reconstructions must be additive. The original structure might have been higher, wider or longer than the remains but could not have been lower, smaller or shorter than the existing fabric on site. However, this statement presupposes that all material is in its original place and has not been moved by natural or human forces prior to the excavation. Furthermore, this statement is only true for the last period of use of a structure. Knossos had several successive periods of occupation and building phases. In order to excavate earlier periods, later structures have been removed.[81] Here the reconstruction presented less material than the originally excavated remains.

7.4.1 Archaeological Evidence

At Knossos, stones from the upper stories settled at a lower level after the load bearing timber beams rotted.[82] Architectural and archaeological knowledge and interpretation

[79]See Mackenzie's diaries, Ashmolean Museum.

[80]In fact, there was no detailed record of the site until Hood and Taylor's plans in 1978.

[81]For example PM III, p. 488.

[82]Compare for example Grand Staircase.

must be employed to re-establish their former positions. Have they only settled vertically or have they also moved in their positions? Already in these minor details interpretation is used to establish the original shape of a building feature. The difficulty faced with this interpretation can be highlighted by three examples: The second flight of the Stepped Portico, the Grand Staircase and the reconstruction of the great halls at the upper floor of the West Wing. [83]

The evidence for the first flight of steps of the Stepped Portico was clearly given by the first four steps which were still in situ when excavated in 1900.[84] In his report in the *Annual of the British School at Athens*, Evans stated that no material of an upper platform could be found.[85] However, as can be seen in the plan of 1900 the area around the Stepped Portico was not completely excavated in this year. Brown wrote on the Stepped Portico:

> "The steps led to the upper floor or Piano Nobile and a second flight gave access either to a second floor or the roof. Mackenzie thought, probably wrongly, that two slabs forming a 'seat' in the Room of the Chariot Tablets were steps from here."[86]

Mackenzie did not explain how these steps had got from the Stepped Portico to the Room of the Chariot Tablets twenty metres to the south nor does he specify whether the steps belong to the upper or the lower flight. Furthermore, Brown did not give a judgement on the correct reconstruction of the stairs and whether Mackenzie's interpretation has actually caused a wrong reconstruction. However, Papadopoulos employs precisely this passage of Brown to support his argument that at least some of the reconstructions are wrong.[87] Brown's statement that Mackenzie mistook seats for steps were used by Papadopoulos to show that the stairs were reconstructed wrongly. Disregarding the two steps or seats in question, the main argument for the existence of

[83] There are much more areas in the palace where these problems occur but these three examples are the most significant ones.

[84] See plan 1900, plate 7 and Evans, 1900, p. 34 ff.

[85] Evans, 1900, p. 35.

[86] Brown, 1994, p. 42.

[87] Papadopoulos, 1997, p. 115 and see footnote 24.

an upper flight of stairs is a gypsum block with traces of the steps on its side which was reset in the middle wall. This block was mentioned neither by Brown nor by Papadopoulos.[88] Plate 54 shows that this block was not kept in its original position so it cannot prove the exact position of the second flight. Replacing this block at a slightly higher level pushes the first step of the second flight further west while placing it at a lower level pushes the first step east. Thus, the exact length and position of the second flight is questionable but not its general existence.

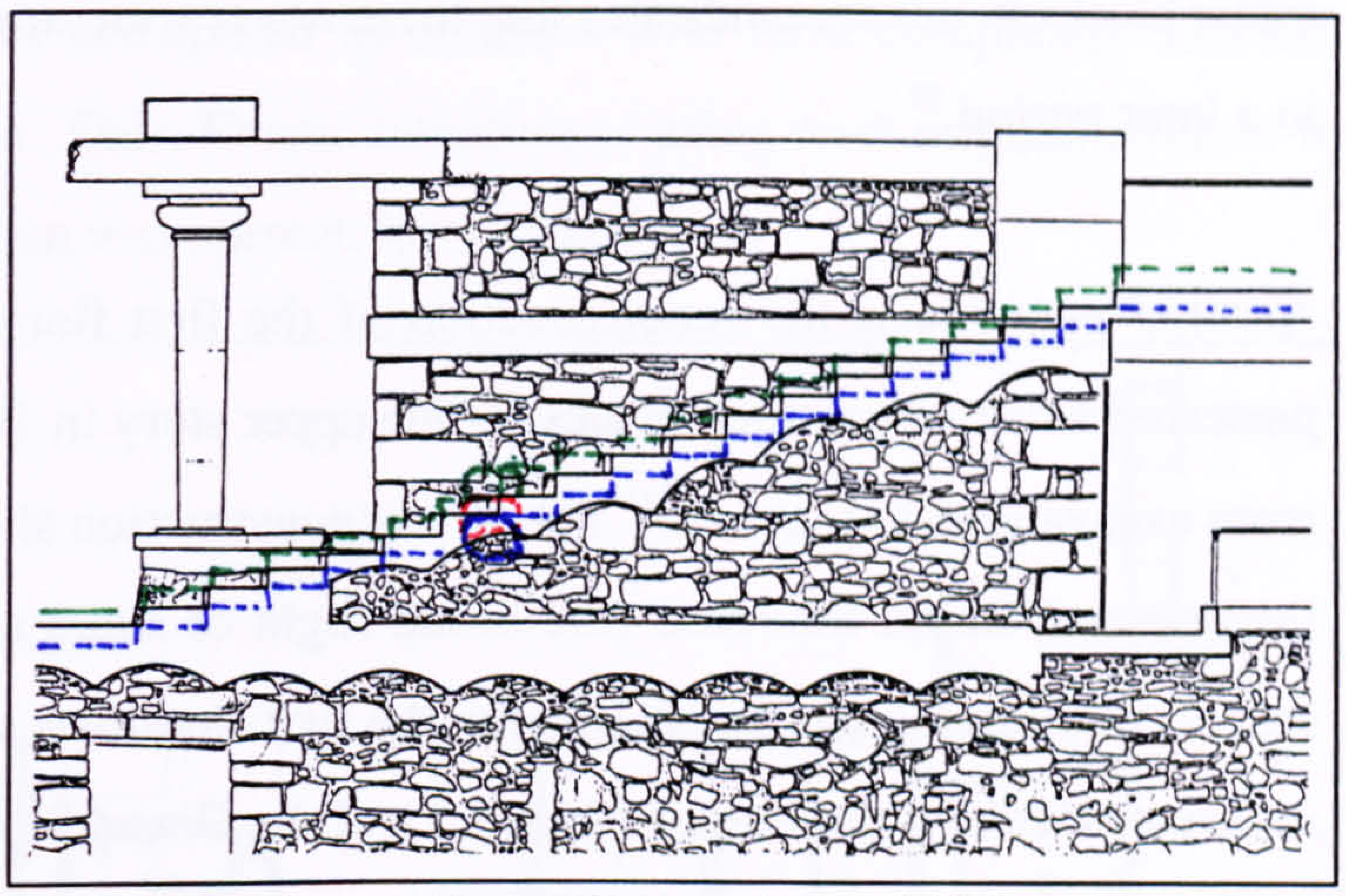

Figure 96 Stepped Portico. Position of second flight as reconstructed and according to a higher or lower position of the found gypsum block.

It has been explained in the section on the Grand Staircase that the first reconstruction drawings of the east elevation featured the head ends of cross beams. This was based on the fact that gaps were left in the ashlar masonry and Doll supposed that these gaps were the places of timber cross beams.[89] In later reconstruction drawings and in the final execution of the reconstructions in 1905, ashlar masonry was used instead. It seems illogical that the upper blocks of ashlar masonry and the gypsum parapet slabs were found in position while lower stones were missing. They had not tumbled in the light well and stone robbing can be excluded. While Evans suggest stone robbing for the North Entrance Passage, it is very unlikely that masons would take blocks of a lower course if good quality blocks were easily accessible in the course above.[90] Obviously, the lack of

[88]See figure 70 and compare Brown, 1994 and Papadopoulos, 1997.

[89]Compare page 226 ff. and figure 51.

[90]The reuse of building material from earlier structures was a common practice and follows a few practical rules. Generally, old structures are dismantled from top down to prevent the structure collapsing onto the workers.

ashlar blocks in this area indicates that there never were any and thus did not go missing in a later period.[91]

Another example is the reconstruction of the first floor in the West Wing.[92] Evans presented a first reconstruction idea for the upper story in 1901[93] but revised it later after more excavations in the area.[94] The first reconstruction shows less steps at the Stepped Portico and Grand Staircase (the broad flight of stairs at the south end) indicating a second floor on a lower level. Finally, the first floor was restored at a higher level with more steps at both the Stepped Portico and the Grand Staircase. The reconstruction of the two column hall in the middle of the west facade can be argued for by the two buttresses in the magazines and the half column base found nearby.[95] The reconstruction of the hall, north of the middle hall is uncertain since neither doorjambs nor supporting buttresses were found. The thicker walls between Magazine XII and XIII and between XIV and XV may support the idea that they carried columns or pillars.[96] However, this argument is not conclusive. The walls may have carried the load of upper walls or may have been accidentally thicker than the other walls. Thus, various reconstructions are possible.

Castleden, who offers a completely different interpretation of Knossos as a sanctuary instead of a palace, reconstructs the upper West Wing in a different way, which is more suitable to his interpretation.[97] However, the parts which have been physically reconstructed are almost identical in both interpretations.[98] Only at the not reconstructed southern and northern ends Castleden's suggestions differs from Evans' version. Obviously, the elements found in this area provide enough material for a relatively secure

[91]The absence of evidence is not an evidence of absence. However, in the given situation it seems to be the most logical explanation.

[92]See figure 97.

[93]Evans, 1901, p. 23. See figure 66.

[94]See Pendlebury, 1933, p. 38.

[95]See figure 97 and compare with figure 4.

[96]Compare figure 4.

[97]Castleden, 1990a, p. 162.

[98]Compare plans in figure 97 with plate G, p. 326.

reconstruction of it which is undisputed by scholars who have completely different interpretations of its function. Thus, Evans' intention of using reset original remains to illustrate that his interpretation was correct, has worked well.

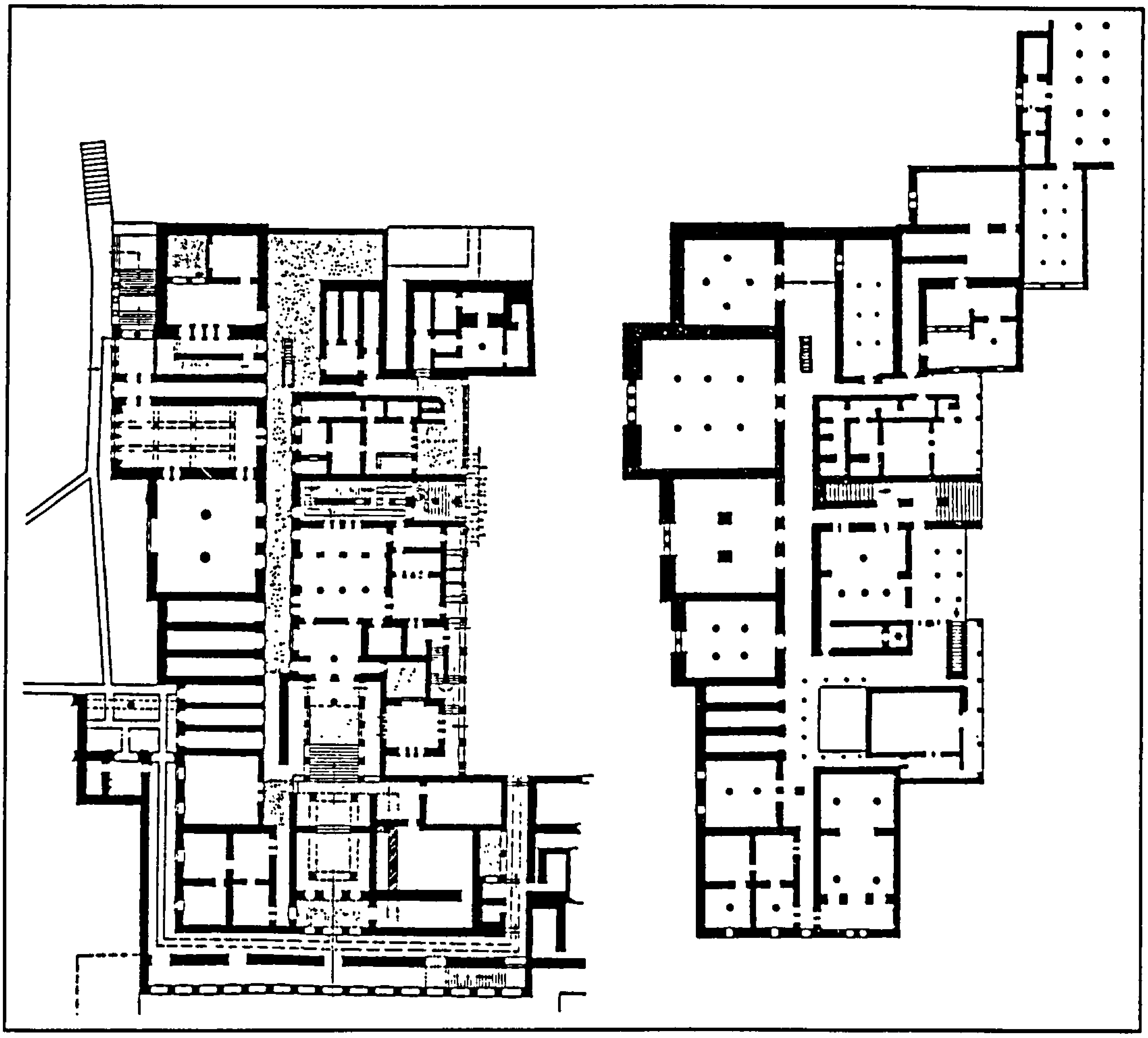

Figure 97 Plan of the reconstructed upper floor. Evans' reconstruction (left) and Castleden's reconstruction (right).

From the start of the excavation in 1900 Evans employed architects on site to record the excavated structures. The main excavation work took place in the first five campaigns between 1900 and 1904. The basic plans of the palace were executed by Theodore Fyfe in this period and were revised in successive years by Doll and de Jong. Evans explained:

> "It may be said that the real work of exploration begins where wholesale excavation ends. Supplementary researches have been continued throughout the Palace area, and in carrying out this work of revision we were fortunate in again securing the services of Mr. Theodore Fyfe, the architect to whom the earlier plans of the Palace were due. The analysis of the sherds contained in the

> undisturbed parts of the walls and foundations has been found specially useful in determining the relative chronology of various parts of the building, and its architectural stratification may now be regarded as fairly determined. A great part of the Palace plan has also been thoroughly remodelled, and it has been possible to add or complete many important features especially at its southern borders and in the Northern Portico."[99]

Obviously, a more detailed investigation of areas excavated earlier led to alterations in the interpretation of the structures and their function. Fyfe, Doll and de Jong produced numerous reconstruction proposals, discussing how parts of the Palace might have looked. For example, Theodore Fyfe produced a plan of the Domestic Quarter, ground floor and upper floor in 1902.[100] Christian Doll produced a new set of drawings of the same area in 1910.[101] These drawings are very much alike and the only major difference is the missing wall between the northern and eastern portico of the upper Hall of the Colonnades in Doll's plan.[102] Both sets of plans distinguish clearly between existing materials and probable reconstructions. Other plans, for example of the Theatral Area,[103] the North Entrance Passage,[104] or the South Propylaeum[105] show similar distinctions.

Supplementary research was executed after World War I in order to provide data for both the forthcoming volumes and the reconstructions.[106] Evans did not hesitate to correct earlier reconstruction proposals when further research proved them wrong.[107] However, the main problem of reconstruction is not the ground plan but the elevation. Unlike many other sites, Knossos provided its excavators with a substantial amount of material from the palace's upper stories. Nonetheless, much of the information is still missing and must be derived from other sources, such as frescoes, the town mosaic or the house models.

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[99] *The Times*, 27 August 1908, p. 6.
[100] Evans 1902, p, 56 f.
[101] Evans, 1921, fig. 239 and 240.
[102] Compare page 233. See figure 62.
[103] See figure 45.
[104] See figure 78.
[105] See figure 73.
[106] Evans, 1927 p. 264 f.
[107] Compare South Propylon, Hall of Double Axes, Quadruple Staircase (all Evans, 1901).

7.4.2 The Frescoes

The frescoes found in the excavation process at Knossos played a crucial role in the reconstruction of the elevations of the palace and, therefore in its physical reconstitutions. Fyfe dedicated a section of his paper to the Royal Institute of British Architects to the frescoes as a source for the restorations.[108] He also discussed how wall decoration determined the room height in some parts of the palace.

The Miniature Fresco was found in the northern part of the Palace in 1900.[109] The depiction of the columns in this fresco provided the evidence for the construction of the columns in the Throne Room in 1901.[110] The specific shape of the capitals in this fresco was recreated only in the Throne Room while the capitals of later columns, featuring a simplified form, were modelled after another fresco found later.[111] Both frescoes depict the shaft of the columns in a downwards tapered form but only in the later fresco is this really obvious. The Miniature Fresco of 1900 was in a very fragmented condition and the entire column is only a few centimetres high. The only guideline for the Minoan artist was a middle line incised in the plaster. Thus, the minimal downward tapering could have its origins in either the artist's shaky hand or in his deliberate intention. It was probably Evans's incredible eyesight for details and his intuition that decided him to recreate tapered columns in the Throne Room. This intention was ultimately confirmed by the later finds.

The downward tapered columns attracted much criticism which was based on the classical understanding that columns have to be smaller in diameter on top than at the

[108]Fyfe, 1902, p. 114 ff.

[109]Evans, 1900, p. 44 and 46 ff. See plate 214.

[110]The first reconstruction proposals for the Grand Staircase and the Hall of the Colonnades by Fyfe in 1901 (Evans, 1901, p. 106 and 111) depict the same type of capital.

[111]Compare PM I, p. 342 and 443 and Fyfe, 1902, p. 114.

bottom.[112] No column survived at Knossos and the examples from the Treasury of Atreus and Lion Gate at Mycenae could not provide conclusive evidence.[113] The reconstruction of tapered columns in the Throne Room in 1901 was based on very little evidence but later evidence supported the reconstruction. It has been suggested that the downward tapering of the column had its origin in the practice of employing tree stems upside down so that the sap could drain more easily and the trunks would last longer.[114] This explanation is not justified by physical evidence. However, the columns were, structurally, a very good solution which reduced the span of the architrave and provide a good resistance against horizontal forces.

Later research confirmed that the columns were reconstructed correctly but in other details such as the West Facade, the reconstructions were proven wrong by later research. Obviously, the evidence for reconstruction was not always sufficient and it was chiefly Evans's imaginative skill that led frequently to a reconstruction later proven to be correct. Piet de Jong described Evans's skill :

> "You know, one of Sir Arthur's greatest gifts was his capacity for visualizing. He could tell, just by looking at a few broken stones, a fallen column, and a few bits of fresco, exactly how the whole room or building originally looked. And he'd get most impatient if his architect couldn't see it just as quickly. Yet when the architect had surveyed and measured the site, and studied all the architectural evidence, the fact is that Sir Arthur was nearly always right."[115]

The exact height of the first floor ceiling in the Domestic Quarter had been determined by the remains of the Grand Staircase. In the West Wing no such feature survived and the ceiling height was reconstructed with the aid of the wall decorations in the Throne Room and the Magazines. The plaster fragments determined a room height with a minimum of 2.25 metres but determined no upper margin.[116] The only other argument

[112]Compare Durm, 1910, p. 60 ff. As late as 1931 Pernier doubted the correct interpretation of Minoan columns (Pernier, 1933, p. 271).

[113]PM I, p. 342.

[114]Baker in: Evans, 1928, p. 102.

[115]Piet de Jong as quoted in Cottrell, 1953, p. 176.

[116]Fyfe, 1902, p. 111, fig. 6.

which supported the reconstruction of a ceiling at this level was the ratio of a column's diameter to its height. The diameters of the column bases in the Throne Room were given and the ratio between base diameter and height was determined from the fresco. This led to the reconstruction of the columns and, consequently, the height of the Throne Room. The first reconstruction of a flat roof above the Throne Room finally determined the ceiling height of the entire West Wing. However, it seems inconsistent to reconstruct room heights of about 2.50 metres in the West Wing while room heights of approximately 4.00 metres were archaeologically determined in the Domestic Quarter.

7.4.3 The Town Mosaic

Another source for the reconstruction of the elevations was the so called town mosaic. A series of more than 40 porcelain tablets were found in the north-eastern quarter of the palace in 1902.[117] They depict the facades of houses and were interpreted by Evans as representations of the town houses of Knossos or of another contemporary Minoan town.[118] Evans argued that they should be used as an example for the reconstruction of the palace.[119] The representation of walls at the tablets can be divided into three groups: regular ashlar masonry, horizontal beams with intervals and horizontal beams with circular discs. The first group was straightforwardly interpreted as buildings constructed in ashlar masonry while the second group was interpreted as a timber construction with the intervals filled with plastered rubble masonry. The third group was interpreted similarly with the circular discs representing short tie beams crossing the thickness of the walls.[120]

[117]Evans, 1902, p. 14 ff.
[118]Ibid., p. 16; PM II, p 372.
[119]PM I, p. 306.
[120]Evans 1902, p. 16. See also Spiers, 1903b, p. 97.

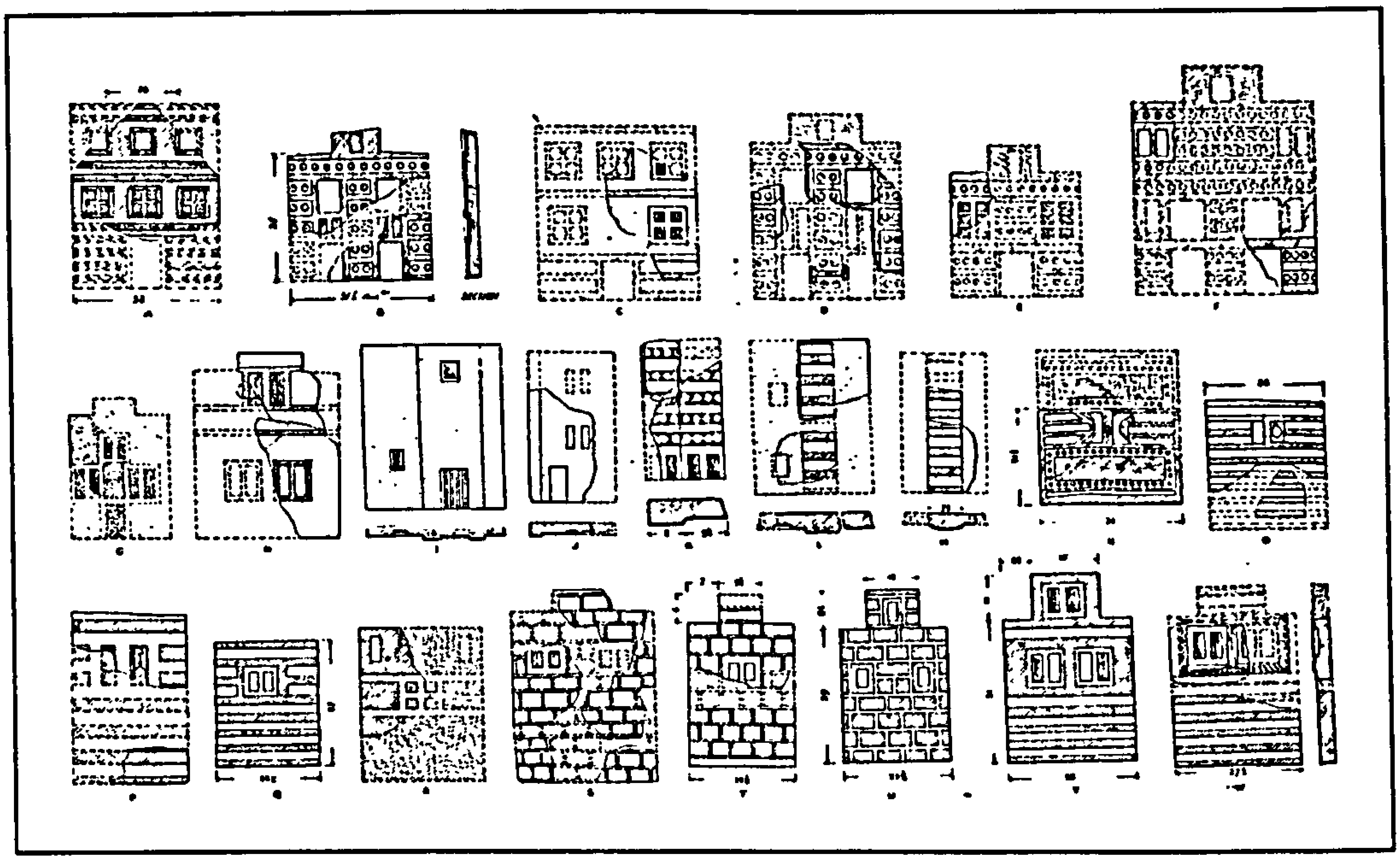

Figure 98 Faience tablets of the Town Mosaic. Drawing by Theodore Fyfe.

The interpretation of the discs as beam ends is clearly a reaction to the criticism Evans received for his suggested reconstruction of a gallery in the Hall of the Double Axes in 1901.[121] He admitted that the horizontal gap in the Light Well's masonry must be interpreted as the place for a reinforcement timber beam and the holes crossing the wall must be interpreted as the place of short tie beams. Thus, the circular features at the House tablets must represent the ends of the tie beams.[122] Another detail of the House Mosaic tablets influenced the reconstructions. Above the doors of some of the houses windows were depicted. In fact, no archaeological evidence suggested the reconstruction of windows above the doors in the Hall of the Double Axes. This feature was exclusively derived from the tablets.

Another detail in the reconstruction of the palace might be attributed to the discovery of the tablets. In 1900 the west facade of the palace was excavated and Evans assumed that above the course of large gypsum orthostats rose a wall of more perishable material.[123] This was predominantly based on the complete absence of any identifiable ashlar material

[121]Compare page 193.
[122]Evans 1902, pl. 40 f.
[123]Evans, 1900, p. 10.

from upper structures. In 1902, Fyfe followed Evans's assumptions and reconstructed a wall with timber frames and panels.[124] However, in 1929 the wall was rebuilt in rubble masonry with a cement facing recreating ashlar masonry above a representation of a timber reinforcement beam. Evans argues that the limestone ashlar blocks had been robbed by later (Greek, Roman and Venetian) builders for re-use.[125] However, there is no evidence for any limestone ashlar masonry above a course of gypsum orthostats and there were absolutely no traces of original ashlar blocks.[126] Furthermore, it is quiet unlikely that the Minoan builders who could distinguish different types of limestone and used it appropriately would have placed the harder limestone on comparatively soft gypsum orthostats. Obviously, the reconstruction of the west facade in ashlar masonry was influenced by other ideas, one of which was probably the depiction of ashlar masonry on some of the house tablets.

However, the town mosaic clearly depicts individual houses within a townscape and it is questionable to what extent the construction of the palace can be compared with the construction of town houses. The builders of the much more important palace probably had access to better resources in materials and skills than the builders of the average town houses.

7.4.4 The House Models

Another source for the reconstructions were the so-called house models.[127] These clay models of architectural features were found at several Minoan sites, however only the ones at Knossos might have had any influence on the reconstructions. They were found

[124]Fyfe, 1902, p. 115.

[125]PM II, p. 349. Evans, 1928, p. 349.

[126]Shaw, 1973, p. 90.

[127]For a full discussion see Schoep, 1994. Besides frescoes and the house models Schoep also identifies representations on seals and sealings and on reliefs (for example the steatite rhyton from Zakro) as possible sources for the reconstruction of architecture. However, there is no evidence that any of these sources influenced the reconstructions at Knossos and, therefore, they are not discussed here.

in the Loomweight Basement in 1902.[128] The clay models show a chequered pattern similar to the one depicted in the miniature fresco, cornices with circular red discs and 'horns of consecration' crenellating the structures. Schoep argues that the models form some type of stage for (ritual) actions performed with figurines.[129] The models lack specific domestic features (doors, windows) and might rather represent a sacred structure (altar?) than a house. However, the models doubtless depict architectural features and have influenced the reconstructions.

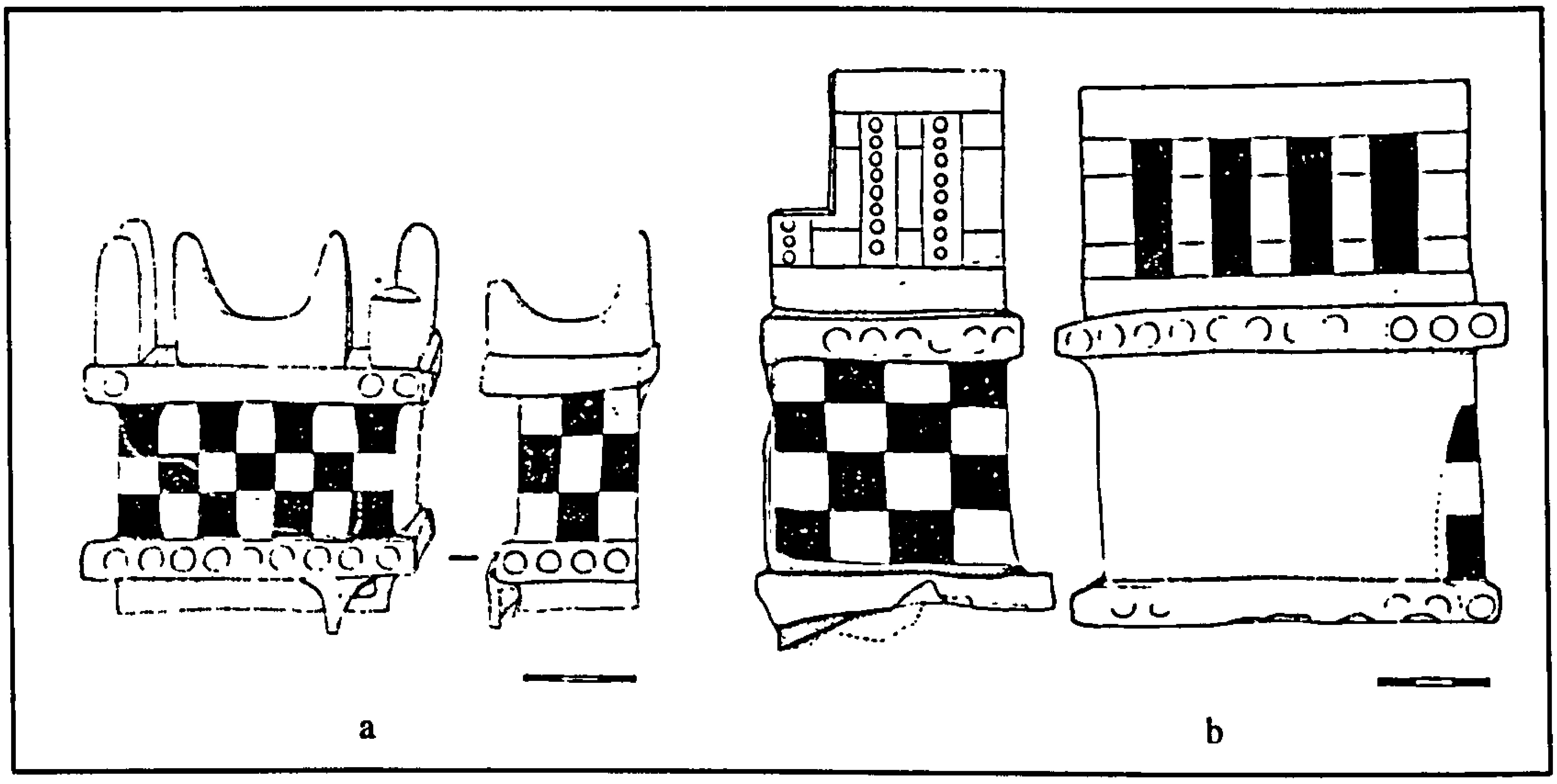

Figure 99 House Models from the Loomweight Basement, Knossos. Drawing by Schoep.

The Horns of Consecration mounted on the edge of a flat roof were not depicted in the Miniature Fresco. There the horns were placed at floor level between columns. Another fragment, wrongly interpreted for some time as part of the Miniature Fresco, allows for an interpretation of horns at roof level but the fragment is too small and its place in this context uncertain.[130] It cannot provide conclusive evidence. The reconstruction of the horns of consecration on the top of a wall and later on the edge of the South Propylon roof had its origin in the house models.[131] Another detail taken from the models was the

[128]Evans, 1902, p. 30.
[129]Schoep, 1994, p. 208.
[130]PM III, p. 84.
[131]Plate 25.

cornice with the circular discs. The discs were supposed to represent the ends of beams in the ceiling construction. Fyfe suggested that already in the Minoan architecture the discs were used in a decorative or symbolic way and did not reflect real beam ends.[132] The motif has been depicted in frescoes as well as in the models. However, only in the models do the discs align in long bands as they have been recreated in both the reconstruction of the Pillared Portico and the North Entrance Portico. While it was executed as relief in the North Entrance Portico, it was only painted in the Pillared Portico.

7.5 Influences from Outside

The reconstructions were not exclusively determined by the intellectual input of the individual architects and Arthur Evans and the data provided by the finds on site. The work was also influenced by financial constraints and the criticism of other experts and the work on site reflects how Arthur Evans reacted to these influences.

7.5.1 Financial Aspects of the Reconstructions

The fact that Arthur Evans paid for the majority of the work himself is another aspect which influenced the reconstruction and conservation work on site and should not be underestimated. In 1899 David Hogarth, then Director of the British School at Athens, and Arthur Evans established the Cretan Exploration Fund to finance their work in Crete.[133] The treasurer of the Cretan Exploration Fund, George MacMillan, wrote many articles in the Times to convince the public to donate to the fund, but his request met with little success.[134] Horwitz suggests that the ongoing Boer War in South Africa may have diverted public attention but Lapourtas also suggests that subscribers may have

[132]Fyfe, 1902, p. 110.
[133]Brown, 1993, p. 84.
[134]See: *The Times*, 12 April 1905, p. 4 but see also 5 November 1900, p. 9.

disapproved of Evans's expensive restorations.[135] In a letter Hogarth wrote to Evans, he suggested that subscribers were not willing to support a rich man's interest and rather appreciated the work of a person like Flinders Petrie who had to work with limited resources.[136] Whether this reflects the public opinion or Hogarth's feelings is not clear.

Besides the money from the Cretan Exploration Fund he was also supported by the Cretan State.[137] On 15 March 1901, the Cretan Government agreed in a letter to Iosif Hazzidakis, who was the Ephor in Herakleion, that he could use governmental funds to support the construction of a protective roof above the Throne Room.[138] However, Arthur Evans was quite well off and could afford to pay for large parts of the excavation work himself. For example, in 1905 Evans paid between £ 700 and £ 800 out of his own pocket.[139] He received further support from his father. Nonetheless, already in 1902 he realized that the size of the palace and the necessary conservation work would cost much more than originally estimated.[140] The expenses of the excavation and the reconstruction work drained his resources and he was at times forced to sell parts of his collection in order to continue working at Knossos.

In 1905 the Grand Staircase was at the brink of collapse due to heavy winter rain. It required immediate attention and was subsequently reconstructed. The Villa Ariadne was build in 1906/07 but no reconstruction work was done on site. Chronologically the next reconstruction work was the roof above the Queen's Megaron, the plans for which were executed by Doll in June 1908 shortly after John Evans's death. John Evans, Arthur's father, died on 31 May 1908 and left his son a considerable amount of money.[141] which allowed him to proceed with a task he had envisaged for a long time but had not been able to execute so far. The sensitive features of the Queen's Megaron were protected by

[135]Horwitz, 1981, p. 142 f; see also Lapourtas, 1997, p. 74.

[136]Letter Hogarth to Evans, Ashmolean Museum. See page 89 ff. for description of Petrie.

[137]Until 1913 Crete was independent from Greece.

[138]Document stored in the Herakleion Museum Archive. See forthcoming BSA Supplement by Fotou, Evely and Hood. I owe to Vasso Fotou who told me about the document.

[139]Cretan Exploration Fund, 1905, p. 3.

[140]Horwitz, 1981, p. 142 ff.

[141]Evans, 1943, p. 356.

Fyfe's timber constructions which needed improving but were not threatened by immediate collapse. Thus, roofing the Queen's Megaron seemed desirable but was not urgent and only after inheriting his father's wealth could he execute the work.

With the death of Thomas Gordon Dickinson, the last male descendant of his maternal grandfather John Dickinson, on 28 October 1908 Evans inherited the Dickinson estate.[142] Now, he was even wealthier than his father had ever been. This inheritance enabled Evans to carry out the covering over of the corridors in the Domestic Quarter and the reconstruction of the fourth flight of the Grand Staircase. Once again, the work in these two areas was desirable and, due to rotting timber props, necessary in the long term but they did not require immediate attention. With his inherited money, Evans was able to execute them in 1910. The Hall of the Double Axes was another area which needed urgent attention because of its floor of gypsum paving slabs. Doll executed a plan to roof the area with his standard system of iron girders and brick vaults.[143] However, Evans stated that Doll's method was too expensive and the work was not executed despite the inheritance.[144]

Another example where money influenced the design of the reconstructions, is the treatment of the doors. A reconstruction drawing by Christian Doll showed the timber frame work for the door jambs and, in fact, he executed them according to his plan. It consisted of vertical members and two horizontal braces at the lower end and immediately below the lintel beams.[145] The horizontal braces are structurally necessary to distribute the load from the four lintel beams.

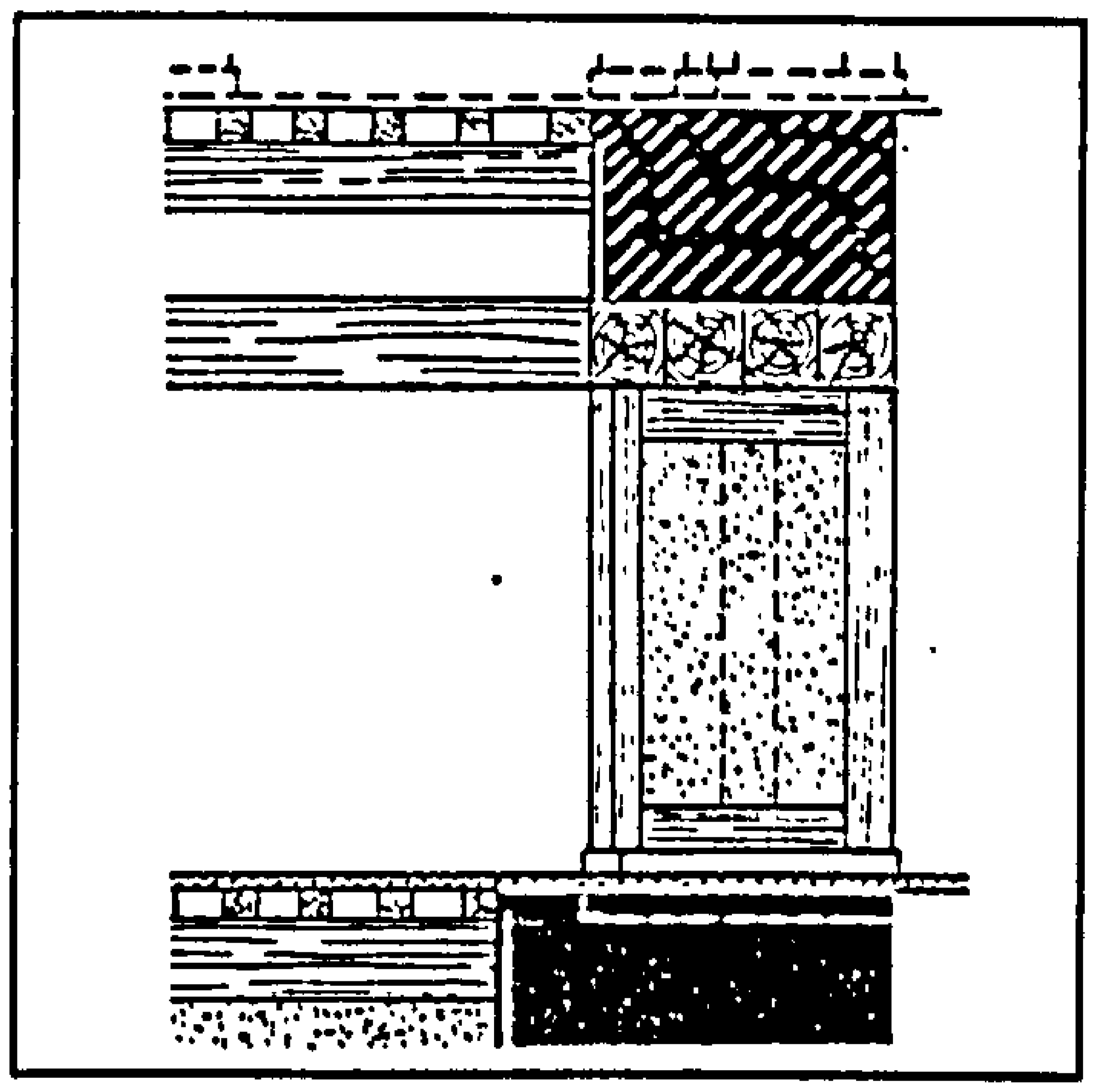
Figure 100 Section through a door frame. Drawing by Doll.

[142]Evans, 1943, p. 356.

[143]See plate 143.

[144]PM III, p. 289.

[145]See figure 100 and compare plate 189.

However, the reconstruction of the concrete door jambs by Piet de Jong did not show this detail. In order to reuse the same shuttering at several doors of different height, the representation of horizontal braces was ignored. In the Hall of the Double Axes the bottom brace was painted on the concrete, but the upper rail was missing.[146] Reconstructed doors in other areas such as the Throne Room or the North Lustral Basin lack the depiction of both upper and lower braces. Of course, the reproduction would not serve any structural function, but it would have improved the visitor's understanding of the historic construction.[147]

The availability of funds for the reconstruction of parts of the Palace at Knossos varied over time. Besides the above-mentioned simplifications the availability of funds had little influence on the quality of the reconstructions. The design and the shape of the reconstructions were determined by the quest for the best possible solution to protect the excavated remains. Evans was not willing to compromise in the quality of work but only in the quantity.

7.5.2. Other Archaeologists and Experts

It has already been mentioned in the first chapter that Arthur Evans was not a trained archaeologist. His reputation at the beginning of the work at Knossos was that of a researcher, collector and as the director of the Ashmolean Museum but not that of a practising archaeologist. However, he organized a good team by employing Duncan Mackenzie as an experienced archaeologist, Fyfe, Doll, de Jong as architects, the artists Gilliéron father and son, Halvor Bagge and other experts.

Evans has frequently been described as a self-confident, sometimes even overconfident, person.[148] Nonetheless, he was in constant contact with other archaeologists to discuss

[146]Compare plate 146.

[147]Compare Section A-A, Drawing 3.

[148]See Lapourtas, 1997, Harden, 1983, Castleden, 1990a. But see also Cottrell, 1953, p. 108.

his ideas. Like any other researcher he needed approval and confirmation from other scholars, and he referred to recognised authorities like Dörpfeld and Karo, thereby adding additional strength to his arguments. He invited these scholars to come to Knossos and see the site.

Dörpfeld was a frequent visitor who came to Knossos every year as part of his *Inselrundreise*, an organised study tour of the Greek islands. On 7 May 1901 he was shown the Throne Room Areal which had been excavated in the previous year. A horizontal rounded gap in the masonry of the wall behind the sunken basin was interpreted by both Mackenzie and Evans as a water supply pipe. This interpretation was perfectly in line with the idea that the sunken basin held water in Minoan times.[149] However, it has been mentioned that horizontal timber reinforcement beams had been employed at many places including Troy (Hissarlik) which was excavated by Dörpfeld and Schliemann. In fact, it was Dörpfeld who suggested to Evans that the horizontal gap was the place of a former reinforcement beam and was not used for water supply. Evans happily accepted this new view and later research in the area proved that Dörpfeld was right.[150]

The Theatral Area was excavated between 8 April and 23 April 1903.[151] It had been restored immediately afterwards and when Dörpfeld visited Knossos with the *Inselrundreise* in 1903 a dance was performed in the Theatral Area by the Cretan craftsmen.[152] Obviously, the restoration was initiated in order to present the newly excavated areas in the best possible light to a scholar whose opinion Evans valued. In fact, Dörpfeld reported favourably on Evans's work in *Athener Mitteilungen*, the newsletter of the German Archaeological Institute in Athens.[153] It has already been mentioned that in 1902 Dörpfeld constructed an excavation house in Pergamon which

[149]See page 178 f.

[150]ENB, 1901, 7 May.

[151]See DM 1903.

[152]PM II, p. 585.

[153]Dörpfeld, 1905 and 1907. He has not reported on the dance. Perhaps, he commented on the event in his diary but these diaries are unfortunately kept in Pergamon and were inaccessible.

reused the excavated walls of a Hellenistic *peristyle* house.[154] It certainly encouraged Evans to build new structures on top of excavated walls after this example was set by a reputed scholar such as Dörpfeld.

The restoration of the Miniature Fresco is another example of how other scholars influenced the work at Knossos. The fresco was found in 1900, and in 1901 Evans published a restoration drawing by Emile Gilliéron with the upper part of the central cell completed in a manner similar to the two wings.[155] Some years later an additional part was found and the reconstruction was corrected.[156] Furthermore, in 1907 an area was identified east of the Temple Repositories which might have accommodated a shrine similar to the one depicted in the fresco.[157] Based on this new discovery and the corrected version of the Miniature Fresco, Theodore Fyfe executed an elevation of how the original shrine might have looked which was never published in 1911.[158] Later Rodenwaldt showed that the latter part was not the roof of the central cell.[159] The first reconstruction version was re-adopted, and a perspective drawing of the entire east facade of the Central Court was executed by Newton.[160] A final coloured reconstruction drawing was executed by Edouard Gilliéron and published in Volume III of *The Palace of Minos* in 1930.[161] Obviously, Evans was convinced by Rodenwaldt's argument and, subsequently, altered his own interpretation a second time.

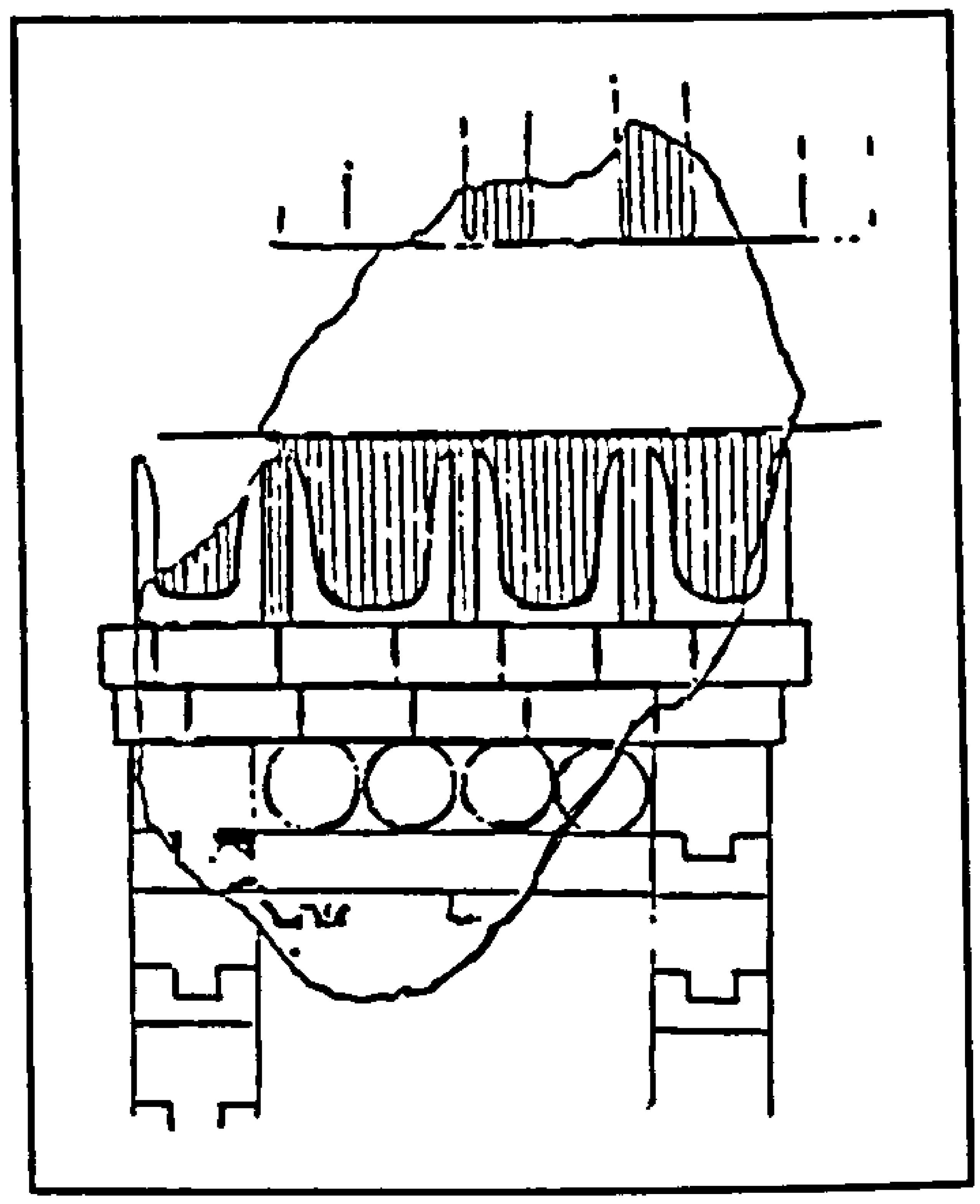

Figure 101 Architectural fresco fragment. Drawing by Gilliéron..

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[154]See page 88 and plate 218.

[155]Evans, 1901b. For original fresco remains see plate 215.

[156]Evans, 1911, facing p. 290. See figure 101 and 102.

[157]*The Times*, 15 July 1907, p. 8.

[158]Evans, 1911, facing p. 294. See plate 214.

[159]PM III, p. 83.

[160]See figure 65.

[161]See plate 216.

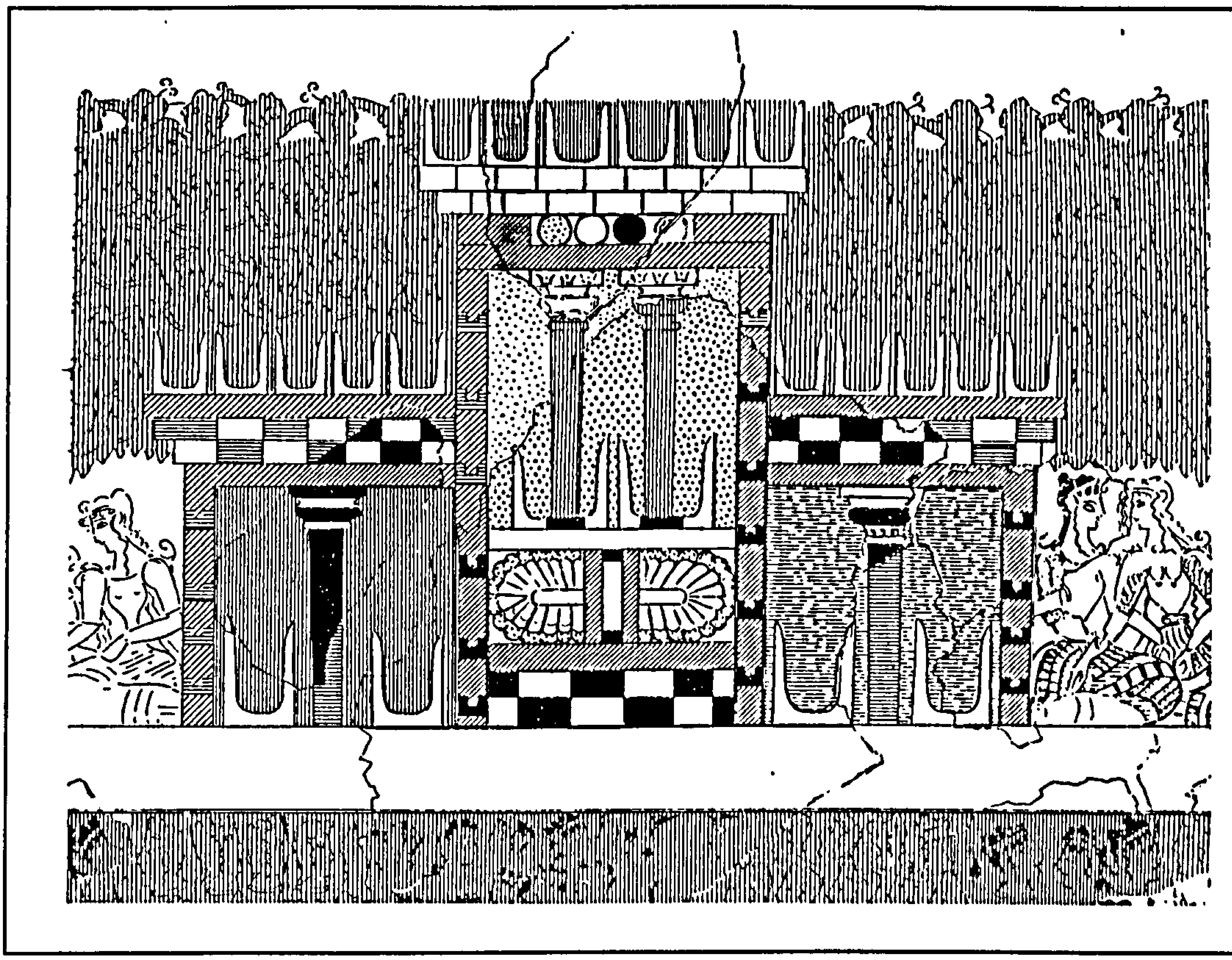

Figure 102 Reconstruction of miniature fresco incorporating the new fragment.

Another example is Josef Durm's criticism. He was one of the earliest, and certainly one of the fiercest, critics of the reconstructions. He visited Knossos in 1906 when only a few reconstructions had been executed and the most frequently criticised concrete reconstructions by Piet de Jong had yet not even been considered. Durm's main criticism was the shape of the columns which he regarded as gigantic table legs.[162] He explained that the large tapered piece of charcoaled timber, which had been found in the domestic quarter, could not serve as proof for the tapered columns because it was not found *in situ*. This piece of timber could have been a column tapered upwards or an architrave. Evans accepted this criticism and withdrew his statement that physical proof was found for his reconstruction of the tapered columns. However, he held up other evidence and maintained that the Minoan columns had the distinctive tapered form.[163]

[162]Durm, 1910, p. 59 f.

[163]PM I, p. 343.

It is clear that Evans always listened carefully to the criticisms and suggestions of other archaeologists and architects. Some of them he accepted, and subsequently he altered his interpretation or reconstruction of certain parts of the Palace. However, he rejected others after discussing carefully in the 'Palace of Minos' or other papers why they were not justified. It cannot be said that he arrogantly ignored any of the comments on the work of conservation and reconstruction at Knossos.

7.6 The Significance of the Reconstructions

While both construction shelters and reconstructions had been previously executed at excavation sites elsewhere, the significance of the reconstructions at Knossos is that both reconstruction and conservation were unified in one structure. The uniqueness of the work at Knossos is the vast scale of it in both duration and area covered. Furthermore, Evans was one of the first excavators employing a specialist team of architects, archaeologists, and artists from the start of the excavations.[164]

These protective reconstructions changed in style and material but their ultimate aim remained the same: the preservation and presentation to the visitor of the excavated remains of Minoan culture. The site and Evans's comprehensive publications became well known to an interested public. Consequently, the reconstructions at Knossos influenced architects and archaeologists in many ways. Three examples have been chosen to identify influences of the reconstructions at Knossos: a villa in Athens built in the Minoan Style, the conservation work of the excavation site at Akrotiri (Thera) and the Charter of Athens.

[164]Karo, 1959, p. 18.

7.6.1 A Villa in Athens

It has been suggested that the reconstructions were influenced by contemporary fashion in architecture.[165] A few buildings feature a design language similar to the reconstructions at Knossos, such as Le Baron Jenny's Second Leiter building in Chicago (1889 - 1891), Peter Behrens' Mannesmann Headquarters in Düsseldorf (1911-1912) or Tony Garnier's Abottoirs la Mouche in Lyon (1909). However, all these buildings were constructed for industrial purposes and it seems unlikely that they influenced the reconstruction of the Palace of Minos. Modern domestic architecture with a design similar to the reconstructions such as Perret's Maison Cassandre in Versailles (1926) or Bruno Taut's Onkel-Toms-Hütte in Berlin, 1925 - 1931) were constructed long after Newton supplied his perspective drawing of the West Wing in 1922 which determined the work at Knossos.[166] There is no strong evidence that current architectural design had a major influence on the reconstructions.

However, the excavations and reconstructions at Knossos influenced other buildings in the first half of the twentieth century. In 1936 the Greek architect Nikos Ch. Somrolides (1888 - 1969) built a villa for a relative of his in Philotei, a northern suburb of Athens.[167] The building at 1 Kapodistrio was constructed in rubble masonry and concrete, and employed several features from Knossos. The columns follow these reconstructed at Knossos, tapering downwards and featuring a cushion capital. Pillars similar to the ones of the Queen's Megaron were recreated. The paint scheme follows the reconstructions at Knossos and the floor tiles at the porch were obviously inspired by the spiral relief ceiling described by Fyfe in 1902 and depicted in Piet de Jong's watercolour of the Queen's Megaron.

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[165]Farnoux, 1993, p. 95 ff.

[166]All information on the above named buildings in Tafuri and Dal Co, 1988. This paragraph provides only a short overview of contemporary architecture. A more detailed study of contemporary (English) architecture is necessary to assess whether or not it had influenced the design of the reconstructions.

[167]See plates 225 and 226. This information was given by the current owner of the building who bought it from the first owner some decades ago. I owe gratitude to Dr. H. Kiehnast from the German Archaeological Institute who first told me about the building and Mr. Dimitris Krokidis, MA, who helped me find the building and conducted the interview with the owner.

Nearby is another villa which recreates the stepped balustrade of the Grand Staircase. Furthermore, in 1931 Luigi Pernier mentioned in his paper at the Athens Conference that modern houses have been build in the Minoan style in Athens.[168] Obviously, the Minoan style must have had an influence on the Greek architecture current at this time. A likely explanation is that the villas reflect an affection for the recently discovered early roots of Greek culture. The interesting fact is that the villas copy exactly the style of the reconstructions as they were executed by de Jong. Thus, they copied Evans's and de Jong's reconstruction architecture rather than the excavation architecture.

7.6.2 Excavations at Akrotiri (Santorini)

Many excavation sites relied on the reconstruction experience which was gathered at Knossos.[169] The excavations of Akrotiri on the island of Santorini have been chosen because they feature similar structures and, thus, similar conservation problems. The town of Akrotiri was destroyed in a volcanic eruption at Santorini and was covered by several metres of pumice.[170] The archaeologist Spyridon Marinatos discovered the site on the south side of the island in a ravine when parts of the town were exposed after winter rain. The work began with a survey in 1967 and continued with full scale excavations from 1968 onwards.

Similar to the palace at Knossos, the excavated houses at Akrotiri were constructed in rubble masonry and timber reinforcement beams. Window and door openings were also constructed in timber. The houses survived up to two stories high and were supported by the pumice infill after the timber had rotted.[171] Early in the second season, the excavation site was covered with a provisional shelter constructed with Dexion profiles.[172] This allowed the shelter to be fitted easily to the rugged terrain of the site,

[168] Pernier, 1933, p. 270.

[169] For example see: Evans, 1927, p. 258.

[170] See Doumas, 1998, p. 16 ff.

[171] See plates 227 and 228.

[172] Marinatos, 1969.

and, with the progress of the excavation in successive years, extensions were built for the shelter covering the newly designed excavation areas.[173] The annual construction of a shelter extension for the newly designated excavation areas left no area exposed to the weather. It avoided one of the big threats Evans experienced at Knossos as rain water could not affect plaster, frescoes and mud mortar. The shelter was understood to be provisional but remains there to this day. However, plans are currently underway to replace the shelter with a permanent protection roof.[174]

Visiting the shelter made clear what Evans and the architects tried to avoid at Knossos. The Dexion lattice beams support a roof only slightly higher than the original top soil level. Consequently, the lower side of these lattice beams is immediately above the excavated ruins and the lattice pillars rest in the ruined landscape. These structures protect the site but adversely affect the visual appearance of the ruins.[175]

A specific problem at Knossos has also reappeared at Akrotiri. The rotten timber reinforcement beams, jambs and lintels have left gaps which have threatened the structural stability of the excavated buildings.[176] At Knossos Piet de Jong employed reinforced concrete to prevent the walls from collapsing. This solution, executed in the 1920s was still regarded as the best method when the same problem occurred at Akrotiri in the 1960s. Thus, reinforced concrete was employed to recreate beams and lintels and, as at Knossos, the concrete beams were stained to simulate the appearance of wood. Despite the shelter, which prevented the weather from affecting the structures to the same degree that it had at Knossos, this work was still necessary in order to prevent their collapse. The conservation problem at Akrotiri was almost identical to the one at Knossos and, consequently, the solution developed by Piet de Jong 40 years earlier was copied.

[173]Marinatos, 1970; 1971; 1972. See figure 103.
[174]Doumas, 1997, p. 36 f.
[175]See plates 227 and 228.
[176]Compare Doumas, 1998, p. 32.

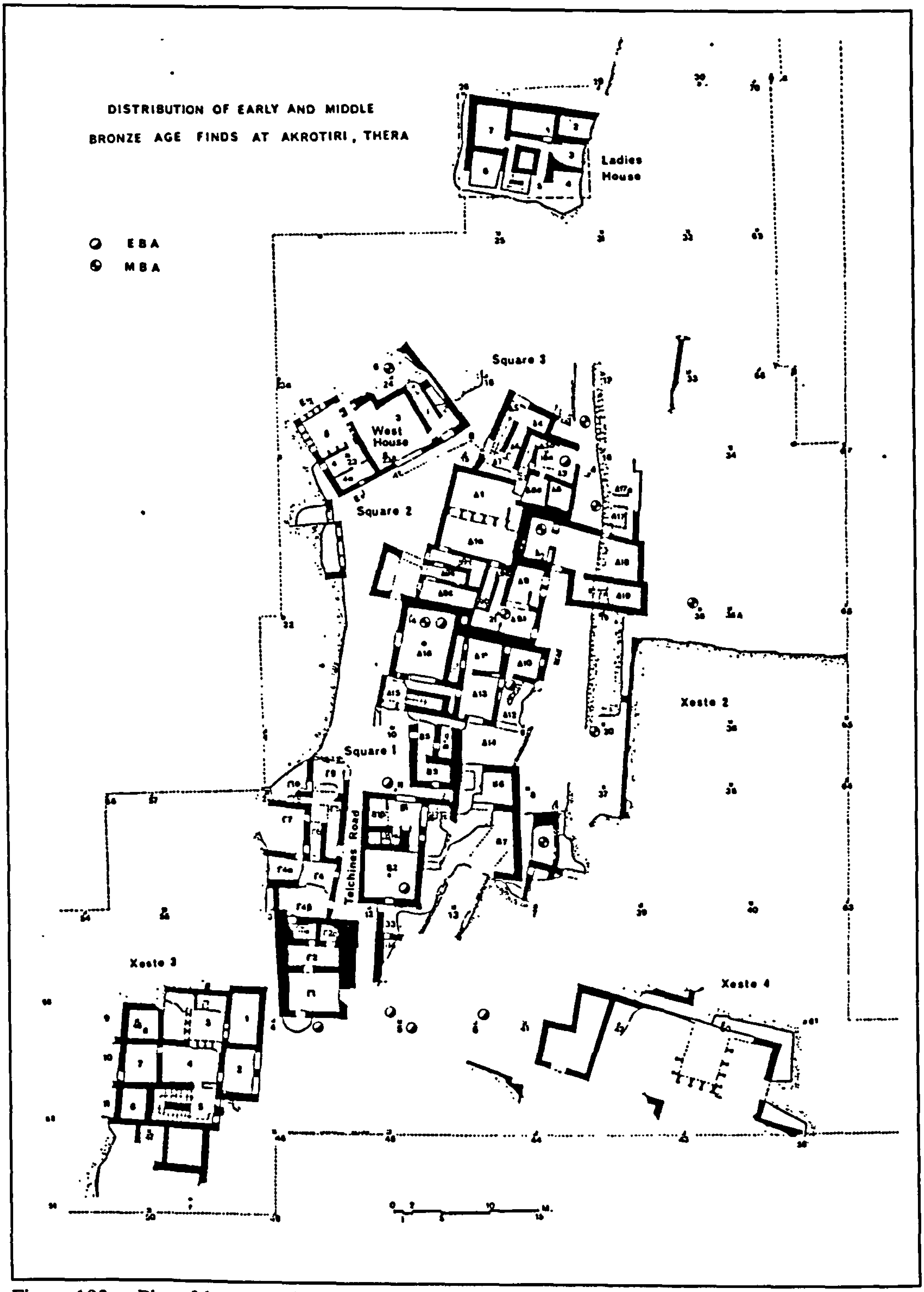


Figure 103 Plan of the excavations at Akrotiri, Thera. The dotted line shows the extend of the protection shelter; the numbered squares indicate support pillars of Dexion Profiles.

Most of this work was executed in the 1960s and early 1970s when concrete was still seen as an appropriate building material but the specific problems of this method are known today.[177] The further use of reinforced concrete must be strongly discouraged but so far no other method has been developed which could fulfill its function. The excavated walls with cavities of rotted beams need structural support which unobtrusively fits into the excavated landscape. Prior to future excavation work research is necessary to develop a system which provides the necessary strength for the walls without causing the problems of reinforced concrete.

7.6.3 The Reconstructions at Knossos and the Charter of Athens

The main criticism directed at Evans was the sheer amount of reconstruction work he executed at Knossos; but he was also criticised for the actual shape of the reconstructions. For example, many scholars could not accept the downward tapered columns in the palace. The more distant the critics were from the work - in time and place - the harsher their criticism. The chief basis for this criticism is the tenets of conservation put forward in the Charter of Athens and successive charters, principally the Charter of Venice. The Charter of Athens was concluded in 1931, one year after the work at the palace was finished. Therefore, the actual text of the Charter of Athens cannot be employed as a measure to assess the reconstruction work. However, the accepted spirit of what is good and bad in conservation existed before the actual meeting.[178] Furthermore, the meeting in Athens was geographically and chronologically close to the reconstruction work at Knossos that had just been finished. In fact, Knossos influenced the Charter of Athens instead of being influenced by it.

The conference in Athens was organised by the International Museums Office. It took place between 21 and 30 October 1931 and included a visit to the Acropolis and a cruise

[177]Compare page 367 ff.

[178]See discussion of conservation ideas in the nineteenth century Britain in Chapter One and see also Iamandi, 1997, p. 18.

to Mycenae, Delos, Knossos and Phaistos.[179] The meeting was attended by architects and archaeologists from various European countries but was not attended by Arthur Evans. However, a friend of Evans, the Italian archaeologist Luigi Pernier who excavated at Phaistos, participated and delivered a paper. His paper was entitled *The Conservation of the Minoan Palaces of Crete* and tackled, besides Phaistos, the work of Evans and his architects at Knossos.[180]

In his paper he pointed out that the Minoan structures, unlike classical monuments, were fragile and featured numerous elements of upper stories, which were found in position. He summarises the reconstruction history of Knossos, from timber and iron I-beams to concrete, and explains the advantages of concrete construction. Pernier also discussed the general problems of reconstructions: the Minoan style, as it was known then, has been created through the reconstructions but not enough was known from the past. Furthermore, Pernier regretted that the picturesque ruins had been altered. However, in the end he strongly defends both aspects of the work at Knossos: the conservation and the presentation. He further explains that the amount of original fabric left and the nature of the original building materials and techniques demanded conservation action and he concludes that the work at Knossos must be seen as the best possible solution. Furthermore he points out that Evans's collaboration with architects, technicians and artists was beneficial for the conservation of the site.

Pernier's paper on the conservation work at Minoan palaces and another paper by Paquet on the use of reinforced concrete presented positive experiences of the use of this material. They were reflected in the final recommendations of the Athens Charter in which the judicious use of reinforced concrete was approved in the first paragraph of section IV.[181] The cooperation between architect and archaeologists on site, which was described as beneficial in Pernier's paper is recommended in section VI of the Athens Charter. In 1920 trees were planted around the palace and, indeed, section III of the

[179]Imandi, 1997, p. 18.

[180]See Pernier, 1933, pp. 266 - 273.

[181]See charter of Athens, Appendix 4, p. 517.

Charter suggests to enhance the site with ornamental vegetation.[182] Despite some shortcomings, the work at Knossos was accepted by the expert participants of the Athens conference as good practice and was recommended to be repeated.[183] Section I of the Charter noted a "tendency to abandon restorations in toto". However, it is not known whether it was the work at Knossos or Balanos' restorations at the Acropolis which caused this reaction. Most likely the work at both places along with other projects illustrated the danger of restoration work and led to this conclusion.

7.7 Conclusion

It has been discussed in this chapter that the reconstructions at Knossos were neither the result of a single design process nor were they simply Evans's work. Over a period of thirty years different architects with different attitudes to conservation designed the reconstructions. The work on site must be seen as a process and not as a single event. New reconstructions reflected knowledge gained from earlier conservation measures and criticism by outside experts. Financial limitations and new materials and techniques altered the shape of the reconstructions, but the basic idea of protection and presentation remained the same throughout the process.

The cultural significance of the work at Knossos lies in the combination of both the conservation and the presentation of the site in one structure. The 'protective reconstructions' at Knossos are a milestone in the development of conservation and presentation at archaeological sites. Their cultural significance is documented in many aspects which have been discussed in this chapter:

[182]Compare letter Mackenzie to Evans, 25 Sept. 1920. Ashmolean Museum, Evans Archive.

[183]The actual discussion between the participants has not been properly recorded. It can be assumed that the reconstructions at Knossos were discussed by the participants both at Athens and later on site. However, the final conclusions indicate that they were finally endorsed.

- The reconstructions at Knossos anticipate current ideas of presentation. The work at Knossos was executed in the first three decades of this century, at a time when mass tourism did not exist. Its huge popularity with tourists today shows that it presents the Minoan culture in an accessible way to untrained visitors. It was understood that archaeology is not the sole domain of archaeologists but of the public as well.

- A team of experts was employed on site (archaeologists, architects, artists, etc.) who all contributed their skills and knowledge. It has been shown that only a team can satisfactorily fulfill the complex task of reconstructing and presenting a site. This demand was later adopted by the Charter of Athens.

- Careful research was undertaken and many areas were re-examined a second time after World War I prior to any reconstruction work. The research for the reconstructions drew on all the sources available.

- In trial and error the work on site moved slowly from soft materials and limited reconstruction to hard materials and comprehensive reconstructions. Only after the softer version failed was a more rigid system chosen.

- The reconstruction and conservation work was well documented at various parts of the *Palace of Minos* and other reports and many photographs were taken. Unfortunately, the information was scattered throughout the various publications and many of the photographs have never been published. Thus, the extent of the reconstruction work, the materials used and the reasons for its execution were not easily understood. However, it was a first step toward the modern demand that all conservation and reconstruction work must be properly documented.

- The reconstructions were executed at a time when the restoration movement of the nineteenth century was slowly disappearing and the conservation movement in the modern sense began to gain momentum. In their partial and fragmented shape the reconstructions reflect an indecisive middle way between the two extremes. Thus, it became a leading example for a common attitude today: a complete reconstruction is unacceptable but the reconstruction of parts giving some impression of the original structure is accepted and practised widely.[184]

Evans recognised and accepted his duty to preserve the remains of the excavation site for the future and he employed architects and initiated conservation and reconstruction programme. Although, technical faults were made as discussed in the previous chapter the main criticism was that the reconstructions would predetermine the visitors perception of Minoan culture. In short, the work at Knossos would reflect Evans's ideas of the Minoan past rather than the reality.

It has been explained that Evans and the architects spent considerable amounts of effort to establish a correct representation of the Minoan past. In some parts they were proven right and in other parts they were proven wrong, but in the majority of the reconstructions one can only say that they probably correctly reflect the original structures. Too little is known from the Minoan past to give a fully detailed picture but most archaeologists agree that Knossos generally gives a fairly good picture of Minoan palaces.

Interpretation is a dangerous endeavour. Evans's decision to have protective shelters designed with the recreation of Minoan building elements can be challenged. But whoever challenges it must be asked for the alternatives which had been possible in early twentieth century Crete. The audience for which the reconstructions were designed were wealthy and sophisticated travellers, intellectual people with an interest in antiquities. Hitchcock claimed that the untrained eye of the modern visitor could not recognise the reconstructions and personal experience shows that indeed there are visitors who fail to recognize the concrete reconstructions as part of a later addition.[185] But is this visitor,

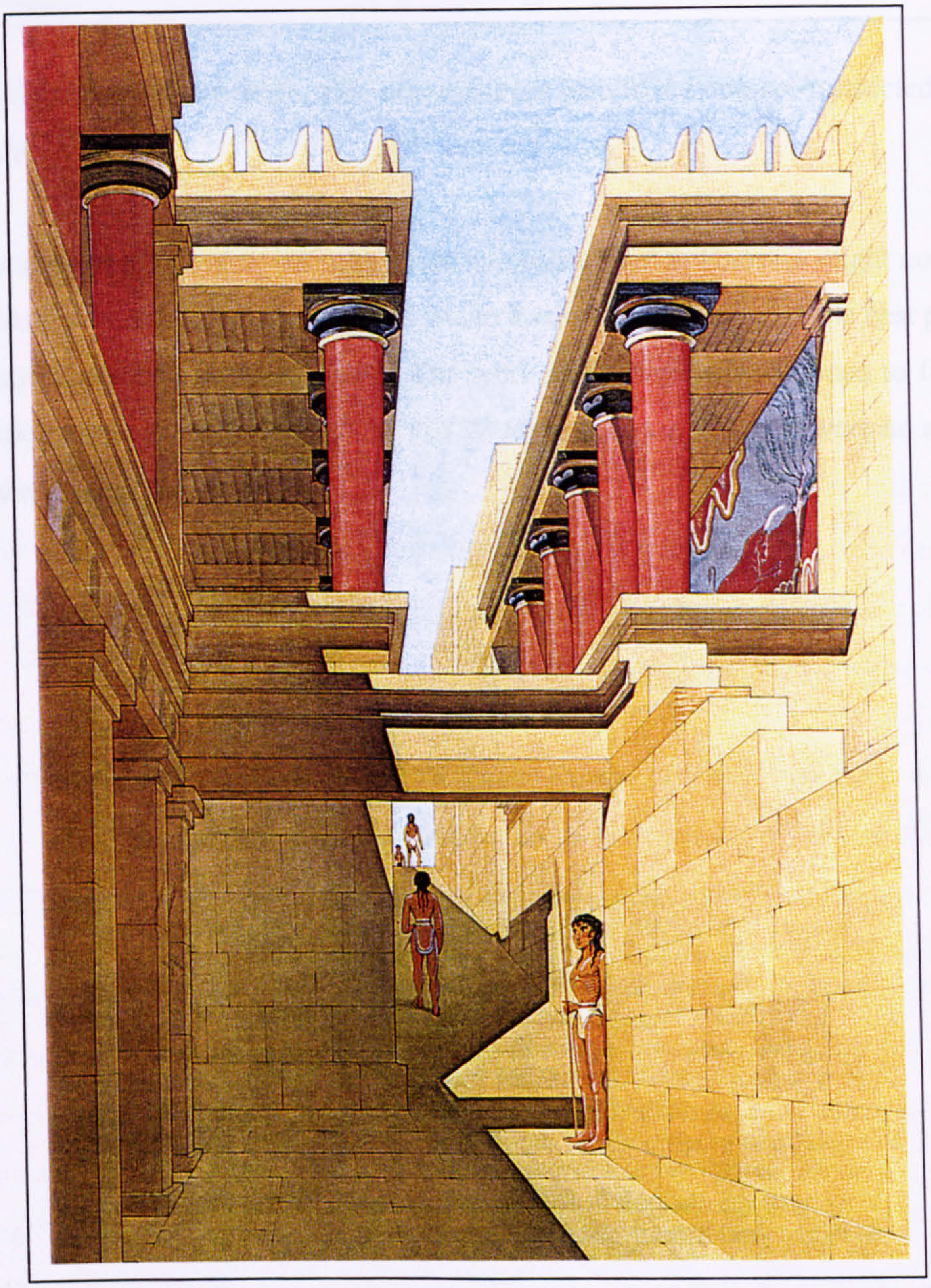
[184]See Schmidt. For example Pergamon Trajaneum, Assos, Ephesos, etc.

[185]While I recorded the reconstructions, I have been approached by visitors who believed that the concrete floors were from the Minoan period. However, they were a minority and without a detailed visitor survey it will be impossible to know what the vast majority of them thinks.

who cannot recognise concrete, able to reconstruct ideally the non-reconstructed palace in his imagination?

From a modern perspective, the 'protective reconstruction' at Knossos might not be the best solution for the problems of the site, but to Evans's mind they were the best possible and most logical choice at the time. The work at Knossos was intended to facilitate protection and to illustrate the finds. Arthur Evans was aware that they were no accurate reproductions of the past.

Conclusions



Between the idea and the reality,
Between the motion and the act,
Falls the shadow

(T.S. Eliot)

Summary and Conclusions

The results of the previous chapters are summarised in the following paragraphs, recapitulating their findings. In the second part of this chapter the individual ideas of the different chapters will be unified in order to answer the study's central question:

> *How can the reconstructions at the Palace of Minos at Knossos be evaluated in both their functional and their aesthetic aspects as an appropriate response to the demands of the original design brief?*

The original design brief does not survive and has had to be established from different sources such as the writings of Arthur Evans and the executed work. Arthur Evans published his book *The Palace of Minos* in four volumes between 1921 and 1935 and also wrote numerous articles and papers. The information which enables us to understand his design brief for the reconstruction is spread throughout these publications but can generally be described as serving two functions: providing protection for the excavated ruins and giving the visitor an idea of the former palace. However, he was frequently accused of having a hidden agenda in his reconstructions with the main motivation for their execution being to create a memorial to himself or to support his own interpretation of the past.

Sir Arthur Evans has been described as a romantic and as someone who enjoyed seeing himself as a benevolent aristocrat.[1] This assessment was frequently supported by people

[1] See for example Bintliff, 1984, p. 35.

who knew him personally, such as James Candy[2] or Piet de Jong.[3] Some scholars have suggested that Evans's interpretation of the Minoan past was influenced by his Victorian upper class background.[4] In *The Palace of Minos* Evans reconstructed a peaceful Minoan society with benevolent aristocratic rulers which, according to Bintliff, reflected the general political, social and emotional 'angst' in Europe at this time.[5] Evans was frequently subject to this criticism because of his imaginative descriptions of the Minoan past which were not firmly supported by archaeological evidence. However, one must distinguish between a reconstructed society and imaginative naming of rooms on the one hand and the physical reconstruction work on the other. One cannot conclude from these questionable over-enthusiastic descriptions that the physical reconstructions were wrong.

Summary

In order to assess the reconstructions, the first two chapters have provided background information on Arthur Evans, on archaeological and conservation practice at his time and on the problems faced on site. Chapters three, four and five described the work on site and followed by a technical evaluation in chapter six and a theoretical assessment in chapter seven.

The first chapter described Arthur Evans's family background as the son of John Evans, a keen numismatist and researcher. Evans' interest in the past culminated in his employment as keeper of the Ashmolean Museum at Oxford. His views on the restoration of St. Albans Cathedral and on the use of replicas in a museum context illustrate his understanding of conservation and the presentation of the past to the wider public. The next section showed that in Evans's time archaeology was developing from a mere treasure hunt to a scientific discipline. Contemporary good examples, for instance

[2]James S. Candy as quoted by Horwitz, 1981, p. 168 ff.
[3]Piet de Jong as quoted in Cottrell, 1953, p. 108.
[4]See Bintliff, 1984 and Hitchcock, 1994.
[5]Bintliff, 1984, p. 35.

those set by Pitt-Rivers in Britain and Petrie in Egypt, were far from perfect; but they must, in a modern understanding, be regarded as early forms of properly conducted scientific excavations. However, academic research, study and teaching in archaeology was at an early stage just beginning at universities such as Oxford and Cambridge.

Furthermore, the chapter presents the contemporary development of conservation philosophy. The restoration of historic monuments increasingly lost public acceptance as modern conservation ideas, as proposed by William Morris in the S.P.A.B. Manifesto, gained ground. Later, Charles Peers, from within the Ministry of Public Works, advocated the concept of a 'frozen monument'. It was shown that all important theoretical conservation concepts had been developed by then, but it must be considered that both restoration and conservation movements were actively defended by their supporters.

Chapter two described the construction materials and techniques of the Minoan palace at Knossos. Comparatively soft bronze tools favoured the use of soft materials such as timber, gypsum and limestone. These materials deteriorate quickly and especially the lavishly used gypsum which suffers when exposed to the rain. The ground floor structures were built predominantly with stone while the upper parts of the palace were constructed with mud brick and timber frames. Timber was used for ceilings, stairs and reinforcement beams. However, the Minoan builders paid more attention to the appearance of the buildings than to their structural quality.

When the palace fell into disrepair and collapsed many of the rooms were filled with debris before the timber structures decayed. This generated a conservation problem after the excavation process. The rotted beams left the upper structures unsupported and also created cavities in the walls. In order to respond to these problems and to prevent the soft gypsum from deteriorating further, immediate conservation actions were necessary.

The third chapter described the reconstruction and conservation work on site as executed by Theodore Fyfe between 1900 and 1904. His work was characterized by the use of traditional materials, identical with the ones employed in the original Minoan construction. He produced flat and pitch-roofed protection shelters at several areas which were in line with modern understanding of recognisably new structures on site. Many of his reconstructions, such as the pillars in the Hall of the Double Axes or the roof above the Throne Room, survived for more than 25 years. They were still functional when they were taken down and replaced with concrete structures which covered a larger area. However, misinterpretation of the Minoan structures, such as the '*impluvium*' of the Throne Room or the 'massive wall' at the lower flight of the Grand Staircase, led to some of the conservation structures being executed in an incorrect way. Furthermore, many of the structures were executed in a provisional fashion during the actual excavation process and were never intended to last. Subsequently they failed and were improved or replaced at a later point. However, Fyfe's conservation attitude was close to the modern ideas of minimal intervention and the use of sympathetic materials.

Christian Doll's work was described in the fourth chapter. His upbringing in a family of architects in the centre of London and his technical, analytical mind determined his approach to the conservation needs at Knossos. Fyfe's timber structures eventually failed and iron-girders were used for the restoration at the Acropolis at Athens, which was accepted as good practice. Subsequently, Doll employed iron girders and brick vaults for his reconstruction work at Knossos. The necessity to prefabricate the iron-frames in Britain required careful recording on site, thus providing a positive side effect. Doll's work seemed to be more durable than Fyfe's but was similarly exposed to the environment in the unsheltered ruins. While Fyfe's timber constructions rotted, Doll's metal frames started to rust. His system was considerably more expensive than Fyfe's timber frames and only few reconstructions were executed. He also constructed the Villa Ariadne, Evans's excavation house at Knossos.

Chapter five discussed Piet de Jong's work at Knossos which started after World War I and continued until 1930. Returning to Knossos in 1921 after seven years of forced absence, Evans realised how the site had deteriorated. This resulted in an increased effort to cover exposed areas with shelters. The first work at the Stepped Portico, following

Christian Doll's method, was executed with iron girders and brick vaults. Subsidence problems at the middle wall led to the use of reinforced concrete, an action regarded by Evans and de Jong as the best method to respond to the problems on site.

De Jong employed reinforced concrete not only at the Palace of Minos but also, on a smaller scale, at the reconstructions at Mycenae, for the repair of the director's house of the British School at Athens and in other places. His work at Knossos was overshadowed by two Earthquakes in 1922 and 1926. This furthered the use of reinforced concrete which seemed to respond well to the forces of the earthquake. Furthermore, the mass production of columns and door and window jambs in reusable shuttering proved to be an economic asset.

Piet de Jong's work was characterized by his attempt to protect large areas of the palace with constructions that require little maintenance but which nonetheless would maintain the aesthetics of an excavation site. To achieve this aim he replaced or covered earlier reconstructions by Fyfe and Doll with modern concrete structures. The ruinous fragmented appearance of the reconstructions which causes so much confusion today was his understanding of a pleasing site.

Chapter six discussed the different structural systems employed on site for the execution of the protective reconstructions. It was explained that reconstructed rubble masonry walls and the early timber framed constructions of Theodore Fyfe caused only minimal intervention in the structure. But those works which were executed as emergency action in the excavation process subsequently failed. Timber, which was used in the original Minoan construction, was not adequate as a reconstruction material. It could not be placed where it originally had been because the structure was no longer a covered building but, rather, was a exposed ruin, thus permitting rainwater to penetrate and damage the timber.

Although the iron-girder and brick-vault constructions of Christian Doll were more durable, the inflexible prefabricated structures required considerable alterations to the historic fabric and their large compound of iron frames caused considerable stress to historic structures. Furthermore, the transport of the girders from Britain to the site and the handling of them once there was very expensive and cumbersome. This building method, established for industrial buildings and large structures, was inadequate and inappropriate for the delicate problems experienced on site. They provided the required protection but were too expensive and insufficiently flexible to adapt to the necessities of the site. Similar to the timber reconstructions, the iron-I-beams needed to be protected from the weather in order to prevent rusting, which the ruined environment on site could not provide.

Finally, Piet de Jong began to use reinforced concrete on site, and this seemed to solve all the problems experienced previously. It did not rust and it was not subject to subsidence as was the experience at the reconstruction of the Stepped Portico. It could be cast in the cavities of the rotten timber reinforcement beams and could also be employed for the mass production of columns and door jambs. Reinforced concrete allowed large areas to be covered at reasonable costs. Some of the problems related to reinforced concrete, such as thermal expansion, were recognised and appropriate counteractive measures were taken in later constructions. So far the concrete reconstructions have caused very little damage to the site. However, the long term problems of this material have only recently been discovered and rusting reinforcement bars will cause considerable problems in the future due to the irreversible nature of the concrete reconstructions.

The philosophical and theoretical aspects of the 'protective reconstructions' were analysed in chapter seven. Arthur Evans, as the owner of the site, employed the architects and paid for the reconstruction work. His experience as keeper of the Ashmolean Museum in Oxford led to the decision to provide for the protection and presentation of the excavated structures. Furthermore, Evans wanted the protection shelters executed in Minoan fashion in order to achieve a minimum of incongruity. Theodore Fyfe's conservation philosophy focussed on the use of traditional materials and techniques and the principle of minimal intervention. By contrast, Christian Doll perceived the conservation problems as technical challenges which could be solved with modern techniques and then clad with boards to recreate the palace's original appearance. Piet de Jong was an aesthete who executed large amounts of new work and overhauled the work of his predecessors to achieve what he perceived to be a pleasant ruined landscape.

Furthermore, it was explained in chapter seven that the aim of the reconstitutions at Knossos varied from place to place. Almost all structures were made for both protection and presentation but these two factors each had differing emphasis in different structures. Furthermore, the sources which were used to design the missing parts for the reconstructions were identified. It was shown that the 'protective reconstructions' were also shaped by other influencing factors such as financial resources and comments from other scholars.

Conclusions

There will be no simple answer stating that the 'protective reconstructions' at Knossos were all good or all bad; in a balanced view both technical and theoretical aspects must be considered. However, the most important point is to understand that the work was executed over a period of thirty years by three different architects. They are not the result of a single master plan, but rather a collection of individual works which were constructed for various reasons, with different techniques and responding to different problems. The site as it presents itself today is a result of Piet de Jong's reworking of the reconstructions in the 1920s. However, under the uniform surface they are individual pieces of work.

The Theatral Area was restored with traditional materials in 1903 by Theodore Fyfe in order to stage dances to impress Wilhelm Dörpfeld. In 1905 Christian Doll reconstructed the Grand Staircase with iron girders because the earlier timber frames failed due to a misinterpretation of the excavated structure. The Hall of the Double Axes was reconstructed in concrete in 1928 to prevent the gypsum paving from further deterioration. I deliberately chose three examples which invert the common idea that the early work was necessary on the grounds of conservation and the later work pure reconstruction. This illustrates the complexity of motivations, philosophies, conservation needs and the materials and techniques employed to respond to them.

The work at Knossos has been subject to much criticism, but almost all scholars who have criticised the 'protective reconstructions' failed to analyse the 'how' and 'why' of the works. They have understood the work on site as reconstructions which exclusively serve presentation and interpretation reasons. Only a few scholars such as Graham or Karo understood the complex nature of the work on site. Karo claimed to be one of the few scholars who knew the conservation problems of Knossos in detail. He believed that at a few points Evans was a victim of the temptation to do too much. But few of the reconstructions can be called unnecessary. Furthermore, Karo states that the work at Knossos had the double function of preventing the ruins from collapsing and presenting them to lay visitors.[6]

It has been clearly established that the design brief for the work at Knossos included both protection and presentation. The work started with the roof above the Throne Room in 1901 where, for a better understanding of the covered space, the supporting columns were executed in a Minoan fashion. In 1930 it ended with the concrete reconstruction of the Throne Room which covered the exposed gypsum paving of the Ante Room, replaced the alien pitched roof of 1904 and provided the Gallery for the exhibition of recreated frescoes. Both aspects, conservation and presentation, were present from the beginning of the work right to the end. The significance of the work at Knossos lies in the attempt to combine both aspects and to create 'protective reconstructions'.

Arthur Evans accepted his responsibility as an excavator and responded to the conservation needs of the site. Protective shelters and support work of a size similar to the ones which were actually executed in Minoan fashion on site were needed. Thus, the

[6] Karo, 1959, p. 24 f.

amount of work undertaken was necessary. It has been suggested that the reconstructions were Victorian rather than Minoan because contemporary fashion had influenced their execution.[7] The wide range of sources employed by the architects and the archaeologist to reconstruct the missing parts showed that there was a comprehensive and genuine quest for determining the original architecture. However, this quest had all the shortcomings and pitfalls which were discussed in respect to church restoration at the end of the nineteenth century in Europe. The work at Knossos is too late to be called Victorian although two aspects of it were typical of this age. It was generally believed that the advances in science and technique would finally solve all problems. Thus, it was believed that the ruins of Knossos could be permanently protected if the right materials and techniques were chosen. Furthermore, the necessary conservation work could not be merely technical, it also had to be aesthetic in its chosen form: the Minoan style. The replacement of the still functional shelters above the Throne Room and the Magazine of the Giant Pithoi toward the end of the 1920's is an indication of this aesthetic feeling.[8]

The architect who replaced the simple but functional roofs at the above named areas was the aesthete Piet de Jong. The conservationist Theodore Fyfe constructed shelters which were adequate for the protection of the historic fabric underneath them but their architectural form impeded the view of the site. Christian Doll, the technician, provided a solution to the conservation problems on site. Arthur Evans initiated and financed the 'protective reconstruction' on site but most of the physical outcome on site is the work of his architects Theodore Fyfe, Christian Doll and Piet de Jong. The reconstructions were influenced by various factors such as the original design brief, the architects and their philosophy, the conservation problems of the original construction, the materials available in Crete, the criticisms of other scholars, the various sources employed to reconstruct the missing forms and the financial limitations.

[7]For example: Bintliff, Farnoux, Hitchcock. MacEnroe suggested Edwardian influences

[8]The small building above the Shrine of the Double Axes was removed after World War II to allow for the construction of the new metal pole and corrugated plastic shelters by Platon and de Jong.

The two main issues of modern excavation site management have been correctly recognised at Knossos: conservation and presentation. The archaeological site of Knossos is a source of information which must be preserved for future generations to study and enjoy. The history of the reconstruction work at Knossos is also the history of a struggle to find a good solution to the problems Evans and the architects were facing. For every new work that became necessary, the previous reconstructions were analysed and the experiences gained from them were included in the design of the new reconstructions. Thus, the reconstructions at Knossos reflect a learning process.

Theodore Fyfe erected the first protective shelters and executed the early restoration work according to the principles of minimal intervention. Timber was employed by the Minoans for columns, reinforcement beams and ceiling constructions, and subsequently Fyfe employed timber for his reconstructions. It failed because, unlike the original palace, the ruins were no longer protected from the weather by a roof. To avoid rot, Doll used iron girders, but these were also affected by penetrating water. To prevent further damage he executed the ceilings in a system of square Maltese slabs instead of broken original slabs. Subsidence problems, complicated by missing wall plates, caused Piet de Jong to chose reinforced concrete for his reconstructions. Furthermore, reinforced concrete promised to require little maintenance a fact which was seen as a major asset, especially after seeing the damage to the ruins after seven years forced absence during World War I. The development of conservation materials and techniques is an understandable and logical process.

What have we learned ?

- The conservation and reconstruction work must be set against both the general conservation methodology and philosophy of its time as well as against the contemporary knowledge of archaeological method. At Knossos a team of experts excavated, documented and preserved the site in a method ahead of its time.

- In order to evaluate the work on site the original design brief must be established. The design brief for different parts of the reconstructions such as the Theatral Area, the North Entrance Passage or the Grand Staircase varied. Consequently, no universal assessment of all reconstruction and conservation work can be made.

- At Knossos conservation and reconstruction form an inseparable unity. Any assessment which focuses exclusively on one of the aspects is unjustified.

- Arthur Evans moved the exhibition of archaeology from the museum context to the actual site. He understood both the need for conservation and the need for presentation.

- The work on site is not exclusively the work of Arthur Evans. He was the owner of the site and the employer of Fyfe, Doll and de Jong, but much of the design of the reconstruction work is due to the architects.

- The current appearance of the site at Knossos is the result of a thirty year process of conservation and not the result of a single perceived design idea. Lessons learnt from earlier conservation work led to changes in later reconstructions.

- The conservation work at Knossos was reaction, not action. At Knossos conservation and reconstruction measures were implemented after decay problems, subsidence or collapse had already occurred on site.

- At Knossos timber, steel and reinforced concrete were successively used. The decisions to switch to other techniques were understandable but in retrospect many of them were taken with an incomplete or mistaken analysis of the problem.

- The specific problems of the site, such as building materials and techniques, decay pattern, and the archaeological remains, demanded conservation efforts different from the ones used at other sites.

- The executed work was subject to financial and technical limitations and is thus incomplete in reflecting the intentions and ambitions of Evans and the architects he employed.

- Careful research was undertaken to facilitate the reconstruction and conservation work on site. Evans employed imaginative descriptions and illustrative comparisons to describe Minoan society, but the data for reconstruction was taken either directly from the ruins or indirectly from archaeological evidence such as the frescoes or the house models.

- Evans frequently mentioned that the greatest threat to the reconstructions was the violent alterations of the Cretan climate. This cannot be upheld. The use of timber in positions where timber was employed in Minoan times failed due to the lack of constructive protection not because of the climatic conditions. Early timber reconstructions in sheltered areas survive even today.

At Knossos, what was attempted was the unification of the two most important tasks at an excavation site after the actual excavation process is completed: preservation and presentation. The results of this attempt are the 'protective reconstructions'. Just as the reality is different from the platonic ideal form, the work at Knossos was imperfect in its execution. On the one hand, financial and technical limitations did not allow for the execution of the work to the desired extent. Rightfully, Schmidt claims that after the work was completed in 1930 there were still considerable parts of the Palace exposed to the weather.[9] On the other hand, Evans claimed that necessary support work had to be executed in the Minoan style in order to achieve the least incongruity as well as to give the visitor an impression of the Minoan past. Today, the reconstructions have aged, and frequently laymen cannot distinguish them from the original. What was supposed to help promote an understanding of the site has, at least in some aspects, turned into a hindrance.

[9]Schmidt, 1993, p. 107

It was certainly one of Evans's great achievements that he turned the excavation site into a museum. Evans understood that the archaeological information of the site gains significance only when it is disseminated to the public, both scholars and laypersons. In order to do this he published numerous articles, wrote his comprehensive book *The Palace of Minos* and he reconstructed the site. Evans had the necessary resources to act, and act he did. Would it have been better not to act? Certainly, it would have been less controversial and Knossos would be one of the thousands of other site which have lost much of their archaeological data. At Knossos, Evans decided to present to the public as much as he could and the place is now visited by millions, a figure he probably did not even dream of.

At Knossos, the rudimentary elements of modern site management were present: conservation and interpretation. The 'protective reconstructions' are not perfect but they are the result of a genuine quest for the best solution for the problems on site. They are a typical product of their time when both archaeology and conservation had a historic development of approximately one hundred years but had not yet become firmly established disciplines. The protective reconstructions were executed at a time when necessary structures were aesthetically designed and when a firm belief in technical advances seemed to promise permanent solutions to every problem. Today we know that the interpretation of the past is a process which continuously changes and concrete interpretations are not able to adapt to this change. Furthermore, we know that we will never solve all problems and that technical solutions are not permanent. They themselves age and will need replacement in the future. The 'protective reconstructions' at Knossos cannot easily be replaced. They are a consistent, logical, and understandable milestone in the development of archaeological site management.

Recommendations

The 'protective reconstructions' at Knossos provide an excellent example with which to study both technical and theoretical issues of conservation at archaeological sites. A wide range of materials and techniques employed for different reasons by various architects offer ample material for research. Furthermore, the rich documentary evidence of the excavation and conservation process in the first three decades of this century allow us to understand the decay processes of original and replacement material.

From the evaluation of the reconstructions at Knossos a number of lessons can be learnt for future conservation work, both there and at other sites. The recommendations are:

- Excavation is an intervention into the archaeology of the site which requires, for ethical reasons, conservation and presentation work. This work cannot exclusively focus on scientific and academic needs but has to consider the aesthetics of the site and the demands of the public as a collective owner of the past.

- Prior to any excavation work it must be considered how the site will be conserved and presented, and resources must be allocated for this work. Evans frequently mentioned how the expenses for the reconstruction of the site drained his resources, and it has been shown elsewhere[10] that the financial commitment towards conservation exceeded the cost of excavation.

- Detailed and comprehensive research into the structure of the excavated ruins is essential for any conservation and reconstruction work. Conservation architects need to be employed from the beginning of the excavation campaign when the evidence is exposed for the first time.

- A retrospective assessment of the interpretation of the site can only be executed if large parts of the site have been conserved adequately and the proposed interpretation by the excavator can be compared with the situation on site. The site must be understood as a document of the past and the conservation of the site is part of this good documentation.

[10]See Kienzle, 1995, p. 62.

- All conservation and reconstruction efforts at archaeological excavations need to be documented. This allows to both assess the success or failure of the conservation efforts and allow for a distinction between new and old. At Knossos, where some of the reconstructions have aged over the last hundred years, the failure to identify reconstructions can lead to misinterpretations.

- The problems of concrete were not known at the time of the execution of the reconstructions. The abilities and the lasting qualities of the material were grossly overestimated. Consequently the concrete reconstructions were undertaken in an irreversible manner. Irreversible conservation or presentation work must not be executed. All materials which are employed in conservation and reconstruction work must be assessed on their compatibility to the original material in a short term perspective as well as in a long term perspective.

- The aging problems of concrete have only recently been discovered and have not yet greatly affected the reconstructions on site. Further research into the aging process of reinforced concrete on excavation sites and on possible solutions of treatment, removal or replacement must be conducted.

- The original timber beams lasted well in the sheltered parts of the Minoan Palace but the replacement beams decayed quickly in exposed positions within the ruin. Materials identical with the original ones might not be adequate for the conservation of archaeological ruins. While this attitude is honourable in the conservation of historic buildings, it does not necessarily work at excavation sites because the circumstances of the structures have changed.

- Reconstructions age like any other building structure, and sometimes more quickly, because they are less protected by roofs. They must be designed for repair or replacement without harm to the original fabric.

Besides the recommendations for practical application at excavation sites, other recommendations can be made for the further research in the area of conservation and reconstruction at Knossos and at other excavation sites.

- Architectural work which includes conservation and reconstruction work must not be understood as the result of a single perceived design idea. The physical architecture must be understood as the result of a process influenced by numerous factors such as the architect's abilities as well as his personal taste, design brief, available materials, and financial limitations.

- This research presents a historic architectural perspective of the reconstruction work at Knossos. Today's importance of the reconstructions include its appreciation by modern visitors and its impact on tourism in Crete. A complete understanding of the 'protective reconstructions' includes both the historic-architectural aspect as well as the modern tourism aspect.

- One difficulty in writing this thesis was the lack of a comprehensive history of the Minoan architectural style. Unless a synthetic Minoan architectural history is written, the assessment of how correct the reconstructions are will always be uncertain.

- In the future it will be important to explain to the visitors that Evans had not intended to create a exact replica of the lost Minoan structures but to give some impression of how the palace may have looked. This can be done with the modern means of heritage interpretation such as a visitor centre or information panels. The tour guides who work at Knossos must be trained on this issue.

- Earthquakes were important for the construction technique in Minoan times, the destruction of the palace and, finally in influencing the reconstruction programme in the twentieth century. However, no plans were made to determine how the site would withstand future earthquakes which, without doubt, will occur at Knossos.

- Excavations of Minoan structures face today the same problem Evans and the architects faced at Knossos: the cavities left by rotten timber beams must be filled with a load-bearing material.[11] Today, the aging problems of concrete are known and a method must be developed to remove the concrete with the least harm to the original fabric. For future excavations of Minoan structures a reversible system must be developed to support the walls without the use of concrete.

The aim of this thesis and, may I say, the aim of all historic research is to learn from the past for the future. The site of Knossos with its comprehensive documentation was an excellent example from which to learn about the reconstruction and conservation work of an important excavation site. This knowledge must now be employed to prevent the repetition of these mistakes at new sites and must show the areas necessitating further research.

[11]For example: Marinatos at his excavation at Akrotiri, Thera.

Author's Declaration

I declare that this thesis is my own unaided work. It is being submitted for the degree of Doctor of Philosophy at the University of York. It has not been submitted before for any degree or examination at any other university.

Peter Kienzle

27 October 1997

Glossary

Glossary

abacus (pl.: abaci)	A rectangular slab of stone, marble or terracotta used on top of columns in order to give them a broader head, and so afford a better support to the beams which rest on them.
anastylosis	The action of re-assembling the parts of a ancient structure without the addition of any new material.
astyvídes	Branches of bushes which form the ceiling above the *skíses* in the vernacular Cretan house.
cella	The interior of a temple; the part comprised by the four walls.
chthonic	Refers to dwellings in or beneath the earth.
fils	Son (French).
impluvium	A cistern in the floor of the atrium in a roman house, into which rain was conducted.
kamára	A middle wall or arch supporting flat roofs or ceilings in the vernacular Cretan house.
kamaróspito	A vernacular house with one arch supporting the roof.
kéntis	A vertical post supporting the main beams of a ceiling or roof in the vernacular Cretan house.
lepída	Clay-rich upper earth layer on top of the flat mud-roof of the vernacular Cretan house.
messodóki	Main beam in the vernacular Cretan house.
naos	The interior apartment of a Greek temple; the *cella* of a Roman temple.
narthex	The vestibule of a church.

opisthdomos	A small chamber placed at the back of a temple, to which the priests alone had access.
opisthonaos	See opisthdomos
pediment	The triangular crowning of a portico, usually supported by a row of columns.
père	Father (French).
piloródoma	Lower basic earth layer on a flat mud roof in vernacular Cretan houses.
pithos (pl: pithoi)	A large earthenware jar
pronaos	The space in front of a temple enclosed by the side walls and a portico.
pteron	Wing. The colonnaded side wings of a Greek temple.
skíses	Timber joists used in the construction of flat mud roofs in the vernacular Cretan house.
sphákes	Reeds or branches of bushes which form the ceiling above the *skíses* in the vernacular Cretan house.
spolia	Booty taken away in war; used also for building material of earlier structures which was reused for new building work.
státis	Vertical post supporting the *messodóki* in the vernacular Cretan house.
tsunami	Gigantic coastal floodwave caused by volcanic underwater eruption or underwater earthquakes.
vivarium	A general term for any artificially created place in which live animals are kept.

Bibliography

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Bibliography

ADAMS, Henry (1894). "The **Practical Designing of Structural Ironwork**" E. & F.N. Spon, London, United Kingdom.

ADDYMAN, Peter V. (1994). "Reconstruction as interpretation: the example of the Jorvik Viking Centre, York" in: GATHERCOLE, P. and LOWENTHAL, D. (eds.) **The Politics of the Past.** Routledge, London, United Kingdom.

ALEXIOU, Stylanos (n.d.). "**A Guide to the Minoan Palaces Knossos - Phaestos - Mallia**". Second Edition, Alexiou, Herakleion, Greece.

ANDERSON, J. and SPIERS, R.P. (1907). "**The Architecture of Greece and Rome. A Sketch of its Historic Development**" B.T. Batsford, London, United Kingdom.

anon. (1879). "**Notes on Building Construction. Arranged to meet the Requirements of the Syllabus of the Science & Art Department of the Committee of Council on Education, South Kensington. Part III. Materials**" Rivingtons, London, Oxford and Cambridge, United Kingdom.

anon. (1914). "**Who's Who in Architecture 1914**"

anon. (1923). "**Who's who in Architecture 1923**"

anon. (1925). "**The Making & Testing of Portland Cement and Concrete**" G. & T. Earle Ltd, Wilmington, Hull, United Kingdom.

anon. (1930). "**Who's Who, 1930**"

anon. (1934). "School Principals: Theodore Fyfe. Cambridge University, School of Architecture" in **The Architect's Journal**, 18 January 1934, p. 124.

anon. (1941). "**West Yorkshire Society of Architects. Green Book 1941**", West Yorkshire Society of Architects, Leeds, United Kingdom.

APOSKITOU, Marthas (1979). "Μινος Καλοκαιρινος" (in Greek) in: Κρητολογια 8, pp 81 - 94.

AŞKIN, Mustafa (1988). "**Troja (Ilion). Ausführlicher Führer zu der Ruinenstätte und Umgebung, Fakten und Legenden**" (in German). Galeri Troya, Troya Harabeleri, Çanakkale, Turkey.

ÅSTRÖM, Paul; PALMER, L.R. and POMERANCE, Leon (1984). "**Studies in Aegean Chronology**" Paul Åströms Förlag, Göteborg (Gothenburg), Sweden.

ASHURST, John and DIMES, Francis G. (1990). "**Conservation of Building and Decorative Stone.**" (Two Volumes). Butterworth-Heinemann, London, United Kingdom.

BAATZ, Dietwulf (1985). "Die Saalburg - ein Limeskastell 80 Jahre nach der Rekonstruktion"(in German) in: ULBERT,G and WEBER, G. **Konservierte Geschichte? Antike Bauten und ihre Erhaltung.** Konrad Theiss Verlag, Stuttgart, Germany.

BAATZ, Dietwulf (1990). "Die Saalburg, Probleme einer 90 Jahre alten Rekonstruktion"(in German) in: **Sinn und Unsinn archäologischer Restaurierungen und Rekonstruktionen.** Kolloquium im Rahmen der Jahrestagung 1990, Verband der Landesarchäologen der Bundesrepublik Deutschland.

BANHAM, Reyner (1965). "Convenient Benches and Handy Hooks. Functional Considerations in the Criticism of the Art of Architecture" in: WHIFFEN, Marcus. **The History, Theory and Criticism of Architecture.** pp 91 - 105. The M.I.T. Press, Massachusetts Institute of Technology, Cambridge, USA.

BINDA, L. And ANZANI, A. (1997). "Structural Behaviour and Durability of Stone Masonry" in: BAER, S and SCHNETHLAGE, R. (Eds.) **Saving our Architectural Heritage. The Conservation of Historic Stone Structures.** Dahlem Workshop Report. John Wiley and Sons, Chichester, New York, Weinheim, Brisbane, Singapore, Toronto.

BINTLIFF, John l. (1984). "Structuralism and Myth in Minoan Studies" in: **Antiquity,** Vol. LVIII, pp. 33 - 38.

BLEGEN, Carl W. and RAWSON, Marion (1973). "**The Palace of Nestor at Pylos in Western Messenia. Vol. III**". Princeton University Press, Princeton, USA.

BOARDMAN, John (1963). "the Date of the Knossos Tablets" in **On the Knossos Tablets,** Clarendon Press, Oxford, United Kingdom.

BOSANQUET, R. C. (1912). "The Palaces of Crete" in: **Proceedings of the Llandadno and District Field Club**, Volume VI, 1911/12, pp. 14 - 32.

BOSINEKI - DIDONI, Paraskevi (1985). "**Griechische Traditionelle Architektur: Kreta**" (in German) Verlag Melissa, Athens, Greece.

BOSSERT, Helmut Theodor (1923). "**Die ältesten Kulturen des Mittelmeerkreises. Band 1: Altkreta.**" (in German). Ernst Wasmuth, Berlin, Germany.

BOURAS, Charalambos (1984). "Areas of concern. Athens: The Parthenon" In: **Monumentum**, Vol 27, No. 2.

BOURAS, Charalambos (1994). "Restoration Work on the Parthenon and Changing Attitudes towards the Conservation of Monuments" in: TOURNIKITOS, Panayotis (ed.) **The Parthenon and its Impact in Modern Times.** Melissa Publishing House, Athens, Greece.

BOWDEN, Mark (1991). "**Pitt Rivers. The life and archaeological work of Lieutenant-General Augustus Henry Lane Fox Pitt Rivers, DCL, FRS, FSA**". Cambridge University Press, Cambridge, United Kingdom.

BOWER, Mim (1995). Marketing Nostalgia. An exploration of heritage management and its relation to the human consciousness" in: COOPER, M., FIRTH, A., CARMAN, J. and WHEATLEY, D. (eds.) **Managing Archaeology.** Routledge, London, United Kingdom.

BRANIGAN, Keith (1970). "**The Foundation of Palatial Crete**". Routledge, London, United Kingdom.

BRANIGAN, Keith (1983). "Craft Specialization in Minoan Crete" in: KRZYSZKOWSKA, Olga and NIXON, L. (eds) **Minoan Society: Proceedings of the Cambridge Colloquium 1981.** Bristol Classical Press, Bristol, United Kingdom.

BRITISH ARCHITECTURAL LIBRARY, Royal Institute of British Architects (1993). "**Directory of British Architects. 1834 - 1900**" Compiled by: Alison Felstead, Jonathan Franklin, Leslie Pinfield. Mansell, London, United Kingdom.

BROWN, Baldwin (1905). "**The care of Ancient Monuments**". Cambridge University Press, Cambridge, United Kingdom.

BROWN, Ann (1986). "I propose to begin at Gnossos" In: **The Annual of the British School at Athens**, Vol 81, pp 37 - 44.

BROWN, Ann (1993). "**Before Knossos...Arthur Evans's travels in the Balkans and Crete**" Ashmolean Museum, Oxford, United Kingdom.

BROWN, Ann (1994). "**Arthur Evans and the Palace of Minos**" Ashmolean Museum, Oxford, United Kingdom.

BRUNSKILL, Ronald W. (1990). "**Brick Building in Britain**" Victor Gollancz Ltd. London, United Kingdom.

BURROWS, Ronald M. (1907). "**The Discoveries in Crete and their Bearing on the History of Ancient Civilisation**" John Murray, London, United Kingdom.

CADOGAN, Gerald (1980). "**Palaces of Minoan Crete**" (corrected edition) Methuen & Co, London, United Kingdom.

CADOGAN, Gerald (1992a). "Ancient and Modern Crete" in: MYERS, MYERS, CADOGAN (eds.) **The Aerial Atlas of Ancient Crete**. The University of California Press, Berkeley and Los Angeles, USA.

CADOGAN, Gerald (1992b). "Knossos" in: MYERS, MYERS, CADOGAN (eds.) **The Aerial Atlas of Ancient Crete**. The University of California Press, Berkeley and Los Angeles, USA.

CADOGAN, Gerald (1992c). "Gournia" in: MYERS, MYERS, CADOGAN (eds.) **The Aerial Atlas of Ancient Crete**. The University of California Press, Berkeley and Los Angeles, USA.

CAMERON, M. A. S. (1968). "Unpublished Paintings from the 'House of the Frescoes' at Knossos" in: **Annual of the British School at Athens**, Vol. 63, pp 1 - 31.

CARMAN, John (1995). "The Importance of Things. Archaeology and the Law" in: COOPER, M. A., FIRTH, A. , CARMAN, J., WHEATLEY, D. (eds.) **Managing Archaeology**. Routledge, London, United Kingdom.

CASTLEDEN, Rodney (1990a). "**The Knossos Labyrinth. A new View of the 'Palace of Minos' at Knossos**". Routledge, London, United Kingdom.

CASTLEDEN, Rodney (1990b). "**The Minoans. Life in Bronze Age Crete**". Routledge, London, United Kingdom.

CERAM, C. W. (n.d.). "**Götter, Gräber und Gelehrte. Roman der Archäologie**" (in German), Bertelsmann Lesering,

CHAMBERLIN, E. R. (1979). "**Preserving the Past**" J.M. Dents & Sons Ltd. London, United Kingdom.

COBURN, Andrew; HUGHES, Richard; POMONIS, Antonios and SPENCE, Robin (1995). "**Technical Principles of Building for Safety**". Intermediate Technology Publications, London, United Kingdom.

COLEMAN, John E. (1977). "**Keos. Results of excavations conducted by the University of Cincinnati under the auspices of the American School of Classical Studies at Athens. Volume I**", American School of Classical Studies, Princeton, New Jersey, United States.

COTTRELL, Leonard (1953). "**The Bull of Minos**". Evans Brothers Limited, London, United Kingdom.

COULTON, J. J. (1977). "**Greek Architects at Work**". Elek Books, London, United Kingdom.

CRAMER, Johannes (1984). "**Handbuch der Bauaufnahme**" (in German). Deutsche Verlags Anstalt, Stuttgart, Germany.

CUMMER, W. Wilson and SCHOFIELDS, Elizabeth (1984). "**Keos. Vol. III. Ayia Irini: House A**". Phillip von Zabern, Mainz, Germany.

CUSACK, Patricia (1987). "Agents of Change: Hennebique, Mouchel and Ferro-Concrete in Britain, 1897 - 1908" in: **Construction History**, Vol. 3, pp. 61 - 73.

DANIEL, Glyn (1975). "**A Hundred and Fifty Years of Archaeology**". Duckworth, London, United Kingdom.

DANIEL, Glyn (1981). "**A Short History of Archaeology**". Thames and Hudson, London, United Kingdom.

DARVILL, Timothy (1995). "Value Systems in Archaeology" in: COOPER, M. A.,FIRTH, A. , CARMAN, J., WHEATLEY, D. (eds.) **Managing Archaeology.** Routledge, London, United Kingdom.

DAVARIS, Costis (1976) "**Guide to Cretan Antiquities**". Noyes Press, Park Ridge, New Jersey, USA.

DICKINSON, Oliver T. P. K. (1994). "**The Aegean Bronze Age**" Cambridge World Archaeology, Cambridge University Press, Cambridge, United Kingdom.

DIMES, Francis G. (1989). "The nature of building and decorative stones" in ASHURST, J. and DIMES, F. (eds) **Conservation of Building and Decorative Stone**, Butterworth-Heinemann, London, United Kingdom.

DI VITA, Antonio (1996). "Earthquakes and Civil Life at Gortyn (Crete) in the Period between Justinian and Constant II (6-7th Century AD) ." in: STIROS, S. and JONES, R. E. (eds.): **Archaeoseismology**, Fitch Laboratory Occasional Paper 7, British School at Athens, London, United Kingdom.

DÖRPFELD, Wilhelm (1905). "Die Kretischen, Mykenischen und Homerischen Paläste" (in German) in: **Athener Mitteilungen**, Vol. XXX, P. 257-297, Deutsches Archäologisches Institut Athen.

DÖRPFELD, Wilhelm (1907). "Die kretischen Paläste" (in German) in: **Athener Mitteilungen**, Vol. XXXII, P.576 - 603. Deutsches Archäologisches Institut Athen.

DOUMAS, Christos (1978). "The Stratigraphy of Akrotiri" in DOUMAS, C. and PUCHELT, H.C. (eds.) **Thera and the Aegean World, Volume I**. Thera Foundation, London, United Kingdom.

DOUMAS, Christos (1992). "**The Wall Paintings of Thera**". The Thera Foundation - Petros M. Nomikos, Athens, Greece.

DOUMAS, Christos (1997). "Management Considerations at a Mediterranean Site: Akrotiri, Thera" in: DE LA TORRE, Martha (ed.) **The Conservation of Archaeological Sites in the Mediterranean Region**, The Getty Conservation Institute, Los Angeles, USA.

DOUMAS, Christos (1998). "**Santorini. A Guide to the Island and its Archaeological Treasures**". Ekdotike Athenon, Athens, Greece.

DRIESSEN, Jan (1987). "Earthquake-Resistant Construction and the Wrath of the 'Earth-Shaker'" in: **Journal of the Society of Architectural Historians**, Vol. XLVI, pp. 171 - 178.

DRIESSEN, Jan (1990). "**An Early Destruction at the Mycenaean Palace at Knossos**". Acta Archaeologica Louveniensia, Monographia 2, Leuven, Belgium.

DRIESSEN, Jan and MACDONALD, Colin F. (1997). "**The Troubled Island. Minoan Crete before and after the Santorini Eruption**". AEGAEUM 17, Annales d'archéologie égeénne de l'Université de Liège et UT-PASP, Université de Liège, Belgium.

DROOP, J. P. (1915). "**Archaeological Excavation**". Cambridge University Press, Cambridge, United Kingdom.

DURM, Josef (1895). "**Der Zustand der Antiken Athenischen Bauwerke auf der Burg und in der Stadt**" (in German). Ernst und Korn, Berlin, Germany.

DURM, Josef (1910). "**Die Baukunst der Griechen**" (in German). Alfred Körner Verlag, Leipzig, Germany.

EARL, John (1996). "**Building Conservation Philosophy**". The College of Estate Management, Reading, United Kingdom.

EMERICK, Keith (1997). "Archaeology and Architecture: A Tradition of Collaboration" in: **Journal of Architectural Conservation**, Vol. 3, No. 1, March 1997, pp. 52 - 66.

EVANS, Arthur J. (1884). "**The Ashmolean Museum as a Home for Archaeology in Oxford. An inaugural lecture**". Parker & Co., Oxford, United Kingdom.

EVANS, Arthur J. (1900). "Knossos. Summary Report of the Excavations in 1900" in **Annual of the British School at Athens**, Vol VI, p. 1 - 70, British School at Athens, London, United Kingdom.

EVANS, Arthur J. (1901). "The Palace of Knossos. Provisional Report of the Excavations for the Year 1901" in **Annual of the British School at Athens**, Vol VII, p. 1 - 120, British School at Athens, London, United Kingdom.

EVANS, Arthur J. (1902a). "The Palace of Knossos. Provisional Report of the Excavations for the Year 1902" in **Annual of the British School at Athens**, Vol VIII, p. 1 - 124, British School at Athens, London, United Kingdom.

EVANS, Arthur J. (1902b). "A Bird-eyes view of the Minoan Palace of Knossos, Crete" in: **Journal of the Royal Institute of British Architects**, Vol. X, P. 97 - 106, RIBA, London, United Kingdom.

EVANS, Arthur J. (1903). "The Palace of Knossos. Provisional Report of the Excavations for the Year 1903" in **Annual of the British School at Athens**, Vol IX, p. 1 - 153, British School at Athens, London, United Kingdom.

EVANS, Arthur J. (1904). "The Palace of Knossos. The Campaign of 1904" in **Annual of the British School at Athens**, Vol X, p. 1 - 44, British School at Athens, London, United Kingdom.

EVANS, Arthur J. (1905). "The Palace of Knossos and its Dependencies. Provisional Report for the Year 1905" in **Annual of the British School at Athens**, Vol XI, p. 1 - 26, British School at Athens, London, United Kingdom.

EVANS, Arthur J. (1906). "**Essai de Classification des Époques de la Civilisation Minoenne**". London, United Kingdom.

EVANS, Arthur J. (1911). "Restored Shrine on the central Court of the Palace of Knossos" in: **Journal of the Royal Institute of British Architects**, Vol. XIX, P. 289 - 295, RIBA, London, United Kingdom.

EVANS, Arthur J. (1921). "**The Palace of Minos at Knossos. Volume I**". MacMillan, London, United Kingdom. (PM I).

EVANS, Arthur J. (1922). "New Discoveries at Knossos" in: **The Antiquaries Journal**, Vol. II, pp 319 - 329.

EVANS, Arthur J. (1927). "Work of Reconstitution in the Palace of Knossos" in: **The Antiquaries Journal**, Vol. VII, pp 258 - 267.

EVANS, Arthur J. (1928). "The Palace of Knossos and its Dependencies in the light of Recent Discoveries and Reconstitutions" in: **Journal of the Royal Institute of British Architects**, Vol. XXXVI, No. 3, P. 90 - 102, RIBA, London, United Kingdom.

EVANS, Arthur J. (1928a). "**The Palace of Minos at Knossos. Volume II**". MacMillan, London, United Kingdom.(PM II).

EVANS, Arthur J. (1929). "Knossos" in **Annual of the British School at Athens**, Vol XXX, p. 268 - 270, British School at Athens, London, United Kingdom.

EVANS, Arthur J. (1930). "Sir Arthur Evans' Excavation at Knossos" in **Annual of the British School at Athens**, Vol XXX, p. 289 - 290, British School at Athens, London, United Kingdom.

EVANS, Arthur J. (1930a). "**The Palace of Minos at Knossos. Volume III**". MacMillan, London, United Kingdom. (PM III).

EVANS, Arthur J. (1931). "Knossos" in **Annual of the British School at Athens**, Vol XXXI, p. 191 - 192, British School at Athens, London, United Kingdom.

EVANS, Arthur J. (1935). "**The Palace of Minos at Knossos. Volume IV**". MacMillan, London, United Kingdom. (PM IV).

EVANS, Joan (1943). "**Time and Chance: the story of Arthur Evans and his Forebears**". Longmans, Green and Co., London, United Kingdom.

EVANS, Joan (1950). "Sir Arthur Evans and Knossos" in: **Archaeology**, Vol. 3, pp. 134 - 139.

EVELY, R. D. G. (1993). "**Minoan Crafts. Tools and Techniques. An Introduction**". Paul Åströms Förlag, Göteborg, Sweden.

FABRICIUS, Ernst (1886). "Alterthümer auf Kreta, IV Funde der mykenäischen Epoche in Knossos" (in German) in: **Athener Mitteilungen**, Vol II, p. 135 - 147. Deutsches Archäologisches Institut, Berlin, Germany.

FABRICIUS, Ernst (1897). "Die Insel Kreta" (in German) in: **Geographische Zeitschrift**, Volume III, p. 361 - 507.

FARNOUX, Alexandre (1996). "**Knossos. Unearthing a Legend**". New Horizons, Thames and Hudson, London. United Kingdom.

FELSTAED, Alison, FRANKLIN, Jonathan and PINFIELD, Leslie (1993). "**Directory of British Architects 1834 - 1900**". British Architectural Library, Royal Institute of British Architects, London, United Kingdom.

FILTZINGER, Phillip, PLANCK, Dieter and CÄMMERER, Bernhard (1986). "**Die Römer in Baden-Württemberg**" (in German). Konrad Theiss Verlag, Stuttgart, Germany.

FIMMEN, Dietrich (1909). "**Zeit und Dauer der kretisch-mykenischen Kultur**" (in German). B.G. Teubner Verlag, Leipzig und Berlin, Germany.

FIMMEN, Dietrich (1921). "**Die Kretisch-Mykenische Kultur**" (in German). B.G. Teubner Verlag, Tübingen, Germany.

FIRE PROTECTION ASSOCIATION (n.d.). "**Heritage under Fire. A guide to the protection of historic buildings**" Fire Protection Association, London, United Kingdom

FITTON, J. Lesley (1995). "**The Discovery of the Greek Bronze Age**" British Museum Press, London, United Kingdom.

FLADMARK, Magnus (1994). "**The Wealth of a Nation**" The Robert Gordon University, Aberdeen, United Kingdom.

FORSYTH, W. A. (1914). "The Repair of Ancient Buildings" in **The Architectural Journal** Vol. 21, 3rd Series, p. 109 - 137.

FOTOU, Vassilikis (1997) "Η αρχειακή έρευνα" (in Greek) in: Η ΚΑΘΗΜΕΡΙΝΗ, Sunday 20 April 1997, pp 21 - 22.

FYFE, Theodore (1902). "Painted Plaster Decoration at Knossos with Special Reference to the Architectural Schemes" in: **Journal of the Royal Institute of British Architects**, Vol. X, P. 107 - 131, RIBA, London, United Kingdom.

FYFE, Theodore (1903a). "An Italian Tour" in: **Architectural Association Notes**, No. 197, July 1903, P. 98 - 100, Architectural Association, London, United Kingdom.

FYFE, Theodore (1903b). "An Italian Tour continued" in: **Architectural Association Notes**, No. 198, Aug 1903, P. 109 - 112, Architectural Association, London, United Kingdom.

FYFE, Theodore (1903c). "An Italian Tour concluded" in: **Architectural Association Notes**, No. 199, September 1903, P. 130 - 131, Architectural Association, London, United Kingdom.

FYFE, Theodore (1911). "The Atelier versus the Builder's Yard" in: **Architectural Association Journal**, Vol. XXVI, No. 289, P. 49 - 55, Architectural Association, London, United Kingdom.

FYFE, Theodore (1926a). "The Palace of Knossos: An Example of Conservation" in: **Journal of the Royal Institute of British Architects**, Vol. XXXIII, P. 479 - 480, RIBA, London, United Kingdom.

FYFE, Theodore (1926b). "Glastonbury Abbey Excavations, 1926" in: **Proceedings of the Somersetshire Archaeological and Natural History Society**, Vol. 72, p. 20 - 22. United Kingdom.

FYFE, Theodore (1927). "Glastonbury Abbey Excavations, 1927" in: **Proceedings of the Somersetshire Archaeological and Natural History Society**, Vol. 73, p. 86 - 87. United Kingdom.

FYFE, Theodore (1936). "**Hellenistic Architecture. An Introductory Study**". Cambridge University Press, Cambridge, United Kingdom.

FYFE, Theodore (1942). "**Architecture in Cambridge. Examples of English architectural styles from Saxon to Modern Times**" Cambridge University Press, Cambridge United Kingdom.

GALANOPOULOS, A. G. And BACON, Edward (1969). "**Atlantis. The Truth behind the Legend**" Nelson, London, United Kingdom.

GALLAS, Klaus (1984). "**Kreta. Ursprung Europas**" (in German). Hirmer, München, Germany.

GALLAS, Klaus (1985). "**Kreta. Von den Anfängen Europas zur kretovenizianischen Kunst**" (in German). DuMont, Köln, Germany.

GARDNER, Percy (1931). " The Palace of Minos" in **Antiquity**, Vol. 5, pp. 315 - 321.

GEORGIOU, Hara (1979). "**The Late Minoan I Destruction of Crete: Metal Groups and Stratigraphic Considerations**". Monograph IX, Institute of Archaeology, University of California, Los Angeles, USA.

GERNER, Manfred (1994). "**Fachwerk. Entwicklung, Gefüge, Instandsetzung**" (in German). Deutsche Verlags Anstalt, Stuttgart, Germany.

GORYS, Erhard (1989). "**Handbuch der Archäologie**" (in German). Weltbild Verlag, Augsburg, Germany.

GLASGOW, G. (1923). "**The Minoans**", Jonathan Cape, London, United Kingdom.

GOUVOUSSIS, N. (1994). "**Knossos. The Palace of Minos. Perspective drawing.**" Gouvoussis, Athens, Greece

GRAHAM, J. Walter (1956). "The Phaistos Piano Nobile" in: **American Journal of Archaeology** Vol. 60, pp 151 - 157.

GRAHAM, J. Walter (1957) " The Central Court as Minoan Bull Ring" in: **American Journal of Archaeology** Vol. 61, pp 255 - 262.

GRAHAM, J. Walter (1959) " The Residential Quarter of the Minoan Palace" in: **American Journal of Archaeology** Vol. 63, pp 47 - 52.

GRAHAM, J. Walter (1960a) "Windows, Recesses and the Piano Nobile in Minoan Palaces" in: **American Journal of Archaeology** Vol. 64, pp 329 - 333.

GRAHAM, J Walter (1960b) "The Minoan Unit of Length and Minoan Palace Planning" in: **American Journal of Archaeology** Vol. 64, pp 335 - 341.

GRAHAM, J Walter (1961) "The Minoan Banquet Hall" in: **American Journal of Archaeology** Vol. 65, pp 165 - 172.

GRAHAM, J Walter (1979) "Further Notes on Minoan Palace Architecture" in: **American Journal of Archaeology** Vol. 83, pp 49 - 69.

GRAHAM, J Walter (1987) "**The Palaces of Crete**" Princeton University Press, Princeton, New Jersey, USA.

GRAY, Stuart A. (1985). "**Edwardian Architecture. A Biographical Dictionary**". Duckworth & Co, London, United Kingdom.

GRUBEN, Gottfried (1986) "**Die Tempel der Griechen**" (in German). Hirmer Verlag, München, Germany.

HALLAGER, Erik (1977). "**The Mycenaean Palace at Knossos**". Medelhausmuseet Memoir 1, Stockholm, Sweden.

HAMILTON, David (1978). "**The Thames and Hudson Manual of Architectural Ceramics**". Thames and Hudson, London, United Kingdom.

HARDEN, D. B. (1983). "**Sir Arthur Evans 1851 - 1941. A Memoir**". Ashmolean Museum, Oxford, United Kingdom.

HARRIS, Richard (1993). "**Discovering Timber-Framed Buildings**". Shire Publications, Ltd., Princes Risborough, Buckinghamshire, United Kingdom.

HITCHCOCK, Louise (1994) "**Virtual Discourse: Arthur Evans and the Reconstruction of the Minoan Palace at Knossos**". Unpublished paper presented at the Inaugural Meeting of the European Association of Archaeologists, Ljubljana, Slovenia 22 - 25 September 1994.

HOPPER, R. J. (1953). 'The Laurion Mines" in **The Annuals of the British School** at Athens, Vol. XLVIII, pp. 200-254.

HOPPER, R. J. (1968). "The Laurion Mines in Attica" in **The Annuals of the British School** at Athens, Vol. LXIII, pp. 293-326.

HOOD, Sinclair (1967) "**The Home of the Heroes. The Aegean before the Greeks**". Thames and Hudson, London, United Kingdom.

HOOD, Sinclair (1994) "Knossos. Soundings in the Palace Area". In: **The Annual of the British School at Athens**, Vol 89, pp 101 - 102.

HOOD, Sinclair and SMYTH, David (1981) "**Archaeological Survey of the Knossos Area**". Supplementary Volume 14, British School of Archaeology in Athens, London, United Kingdom.

HOOD, Sinclair and TAYLOR, Wiliam (1981). "**The Bronze Age Palace at Knossos. Plan and Sections**" Supplementary Volume 13, British School at Athens, London, United Kingdom.

HORWITZ, Sylvia L. (1981). "**The Find of a Lifetime. Sir Arthur Evans and the Discovery of Knossos.**" Weidenfeld and Nicolson, London, United Kingdom.

HOUBEN, Hugo and GUILLAUD, Hubert (1994). "**Earth Construction. A Comprehensive Guide**". CRATerre-EAG, Intermediate Technology Publications, London, United Kingdom.

HURST, B. L. (1996). "Structural use of cements in England before 1890" in: **Structures and Buildings. Proceedings of the Institution of Civil Engineers**, Vol. 116, No 3 & 4, pp 283 - 294.

IMANDI, Christina (1997). "The Charters of Athens of 1931 and 1933. Coincidence, controversy and convergence" in **Conservation and Management of Archaeological Sites**, Vol. 2, No. 1, pp. 17 - 28.

JOHNSON, Paul-Allan (1994). "**The Theory of Architecture. Concepts, Themes and Practices**". Van Nostrand Reinhold, New York, USA.

JOKILEHTO, Jukka (1986). "**A history of Architectural Conservation**". Unpublished PhD Thesis, Institute of Advanced Architectural Studies, University of York, United Kingdom.

JONES, Bernard E. (1913). "**Cassell's Reinforced Concrete**", The Waverly Book Company, London. United Kingdom.

JUDGE, Joseph (1978). "Minoans and Mycenaeans. Greece's brilliant Bronze Age" in: **National Geographic**, Vol. 153, No. 2, pp. 142 - 185.

KARETSOU, Alexandra (1997). "Το ανάκτορο μετά τον Evans"(in Greek) in: Η ΚΑΘΗΜΕΡΙΝΗ, Sunday 20 April 1997, pp. 18 - 20.

KARO, Georg (1904). "Altkretische Kultstätten" (in German) in: **Archiv für Religionswissenschaft**, Vol VII, p. 117-156.

KARO, Georg (1904). "Neue Fund von Knossos" (in German) in: **Archiv für Religionswissenschaft**, Vol VIII, p. 1-4.

KARO, Georg (1906). "Archäologische Funde und Forschungen" (in German) in: **Archiv für Religionswissenschaft**, Vol VIII, p. 511-525.

KARO, Georg (1959). "**Greifen am Thron, Erinnerungen an Knossos**" (in German). Bruno Grimm, Baden-Baden, Germany.

KIENZLE, Peter (1995). "**Umm Qais. A Management Plan for the Excavation Site and the Ottoman Settlement of a Northern Jordanian Village**". Unpublished MA-Dissertation, University of York, York, United Kingdom.

KIENZLE, Peter (1997). "Conservation and Reconstruction at the Palace of Minos at Knossos" in: **Conservation and Management of Archaeological Sites, Vol. II**, No. 2, pp. 121 - 124.

KIOSSE, Chara (1998). "Ο αγγλικός κήπος της Κνώσού" (in Greek) in: **Το Βημα**, 5 April 1998, Part 3 p. 11.

KOEHL, Robert B. (1990). "A Letter from Evans to Droop on the 'Problem' of Wace" in: **The Classical Journal**, October / November 1990, Vol. 86, No. 1, p. 45 - 52.

KONDARATOS, Savas (1994). "The Parthenon as Cultural Ideal" in: TOURNIKITOS, Panayotis (ed.) **The Parthenon and its Impact in Modern Times**. Melissa Publishing House, Athens, Greece.

KORRES, Manolis (1994a). "The Construction of Ancient Greek Temples" in: ECONOMAKIS, Richard (ed.) **Acropolis Restoration. The CCAM Interventions**. Academi Editions, London, United Kingdom.

KORRES, Manolis (1994b). "The History of the Acropolis Monuments" in: ECONOMAKIS, Richard (ed.) **Acropolis Restoration. The CCAM Interventions.** Academi Editions, London, United Kingdom.

KORRES, Manolis (1994c). "The Restoration of the Parthenon" in: ECONOMAKIS, Richard (ed.) **Acropolis Restoration. The CCAM Interventions.** Academi Editions, London, United Kingdom.

KORRES, Manolis (1994d). "The Parthenon from Antiquity to the 19th Century". in: TOURNIKITOS, Panayotis (ed.) **The Parthenon and its Impact in Modern Times.** Melissa Publishing House, Athens, Greece.

KOZIELSKI, Antoni and SOSNOWSKI, Stanislaw (1989). "Traditional Earthquake Protection in the Casbah Citadel in Algiers" in: **Proceedings of the 1st International Seminar on Modern Principles in Conservation and Restoration of Urban and Rural Cultural Heritage in Seismic Prone Regions,** RZZSK, IZIIS, ICCROM, Skopje, Yugoslavia.

KUNIHOLM, Peter Ian; KROMER, Bernd; MANNING, Stuart W.; NEWTON, Maryanne; LATINI, Christine E.; BRUCE, Mary Jaye. (1996) "Anatolian Tree rings and the absolute chronology of the eastern Mediterranean, 2220 - 718 BC" in: **Nature,** Vol 381, 27 June 1996, pp 780 - 783.

KUTTRUFF, Carl (1994). "Fort Loudoun, Tennessee, a mid-18th century British fortification: a case study in research archaeology, reconstruction, and interpretive exhibits" in: GATHERCOLE, P. and LOWENTHAL, D. (eds.) **The Politics of the Past.** Routledge, London, United Kingdom.

LANGENBACH, Randolph (1989). "Bricks, Mortars and Earthquakes. Historic Preservation vs. Earthquake Safety" in: **APT Bulletin. The Journal of Preservation Technology,** Vol XXI, No. 3&4, pp 30 - 43.

LAPOURTAS, Andreas (1997). "Arthur Evans and the Palace of Minos" in: **Museum Archaeologist,** Vol. 22, pp. 71 - 82.

LA ROSA, Vincenzo (1992). "Phaistos" in: MYERS, MYERS, CADOGAN (eds.) **The Aerial Atlas of Ancient Crete.** The University of California Press, Berkeley and Los Angeles, USA.

LAWRENCE, Arnold Walter (1957). "**Greek Architecture**" Penguin Books, Harmondsworth, United Kingdom.

LLOYD, Seton and MÜLLER, Hans Wolfgang (1987). "**Weltgeschichte der Architektur. Ägypten und Vorderasien**" (in German). DVA, Stuttgart, Germany.

LOGIADOU-PLATONOS, Sosso (n.d.). "**Knossos. The Minoan Civilisation**". I. Mathioulakis & Co., Athens, Greece.

LOWENTHAL, David (1994). "Conclusion" in: GATHERCOLE, P. and LOWENTHAL, D. (eds.) **The Politics of the Past**. Routledge, London, United Kingdom.

LUCE, J.W. (1969). "**The End of Atlantis**", Thames and Hudson, London, United Kingdom.

MACENROE, John (1995). "Sir Arthur Evans and Edwardian Archaeology" in **Classical Bulletin**, Vol. 71, p. 3-18.

MACMILLAN, George A. (1905). "Exploration in Crete" in: **The Times**, 12 April 1905, p 4.

MANNING, Stuart W. (1990). "The Eruption of Thera: Date and Inplications" in: HARDY, D. A. and RENFREW, A. C., "**Thera and the Aegean World. Vol. III: Chronology**", pp. 29-40. The Thera Foundation, London, United Kingdom.

MAISONNEUVE, Patrick de (1989). "Old Buildings in Zones of High Seismic Risk" in: **Proceedings of the 1st International Seminar on Modern Principles in Conservation and Restoration of Urban and Rural Cultural Heritage in Seismic Prone Regions**, RZZSK, IZIIS, ICCROM, Skopje, Yugoslavia.

MALLOUCHOU-TUFANO, Fani (1994). "The History of Interventiuons at the Acropolis" in: ECONOMAKIS, Richard (ed.) **Acropolis Restoration. The CCAM Interventions**. Academi Editions, London, United Kingdom.

MARINATOS, Spyridon (1935). "Ausgrabungen und Funde auf Kreta 1934 - 1935" (in German) in: **Archäologischer Anzeiger**, No. 1/2, pp 244 - 259.

MARINATOS, Spyridon (1939) "The Volcanic Destruction of Minoan Crete" in: **Antiquity**, Vol. 13, pp 425 - 439.

MARINATOS, Spyridon (1959). "**Kreta und das Mykenische Hellas**" (in German). Hirmer, München, Germany.

MARINATOS, Spyridon (1968). "**Excavation at Thera. First Preliminary Report. 1967 Season**" Βιβλιοθεκε τες εν Αθηναις Αρχαιολογικες Εταιρειας Αριθ. 64, Athens, Greece.

MARINATOS, Spyridon (1969). "**Excavation at Thera II. Preliminary Report. 1968 Season**" Βιβλιοθεκε τες εν Αθηναις Αρχαιολογικες Εταιρειας Αριθ. 64, Athens, Greece.

MARINATOS, Spyridon (1970). "**Excavation at Thera III. Preliminary Report. 1969 Season**" Βιβλιοθεκε τες εν Αθηναις Αρχαιολογικες Εταιρειας Αριθ. 64, Athens, Greece.

MARINATOS, Spyridon (1971). "**Excavation at Thera IV. Preliminary Report. 1970 Season**" Βιβλιοθεκε τες εν Αθηναις Αρχαιολογικες Εταιρειας Αριθ. 64, Athens, Greece.

MARINATOS, Spyridon (1972). "**Excavation at Thera V. Preliminary Report. 1971 Season**" Βιβλιοθεκε τες εν Αθηναις Αρχαιολογικες Εταιρειας Αριθ. 64, Athens, Greece.

MARTIN, Roland (1986). "**Weltgeschichte der Architektur. Griechenland**" (in Gereman). Deutsche Verlags Anstalt, Stuttgart, Germany.

McADAM, Ellen (1995). "Trying to make it happen" in: COOPER, M., FIRTH, A., CARMAN, J. and WHEATLEY, D. (eds.): **Managing Archaeology**. Routledge, London, United Kingdom.

MELLERSH, H.E.L. (1970). "**The Destruction of Knossos. The Rise and Fall of Minoan Crete.**" Barnes and Noble, New York, U.S.A.

MERTENS, Dieter (1984). "Planning and Executing Anastylosis of Stone Buildings" in: PRICE, Nicholas Stanley (ed.) **Conservation on Archaeological Excavations**. ICCROM, Rome, Italy.

MICHAILIDOU, Anna (1995). "**Knossos. A complete Guide to the Palace of Minos**". Ekdotike Athenon, Athens, Greece.

MIDDLETON, Robin and WATKIN, David (1987). "**Weltgeschichte der Architektur. Klassizismus und Historismus**" (in German). Deutsche Verlags Anstalt, Stuttgart, Germany.

MIRIÉ, Sieglinde (1979). "**Das Thronraumareal des Palastes von Knossos**" (in German) Saarbrücker Beiträge zur Altertumskunde, Band 26, Rudolf Habelt Verlag, Bonn, Germany.

MURRAY, Peter (1989). "**Weltgeschichte der Architektur: Renaissance**" (in German). DVA, Stuttgart, Germany.

MYERS, J. Wilson; MYERS, Eleanor E.; CADOGAN, Gerald (1992). "**The Aerial Atlas of Ancient Crete**". University of California Press, Berkeley and Los Angeles, USA.

MYLONAS, George (1981). "**Mycenae. A guide to its Ruins and its History**". Ekdotike Athenon, Athens, Greece.

NETOLITZKY, Fritz (1934). "Pflanzliche Nahrungsmittel und Hölzer aus dem prähistorischen Kreta und Kephallonia" (in German) in **Buletinul Facultati de Stinte Din Cernauti**, Vol VIII, pp. 172 - 178.

NIEMEIER, Wolf-Dietrich (1994). "Knossos in the New Palace Period (MM III - LM IB)" in: EVELY D., HUGHES-BROCK, H. and MOMIGLIANO, N. (eds.): **Knossos. A labyrinth of History. Papers in Honour of Sinclair Hood.** British School at Athens, London, United Kingdom.

NÖRLING, Thomas (1995). "**Altägäische Architekturbilder**" (in German). Archaeologica Heidelbergensia, Vol 2, Verlag Phillip von Zabern, Mainz, Germany.

O'CONELL, Geoffrey (1990). "**Groc's candid Guide to Crete and Mainland Ports**". Ashford Buchan & Enright, Sheffield , United Kingdom.

PAGE, D. L. (1970). "**The Santorini Volcano and the Destruction of Minoan Crete**". The Society for the Promotion of Hellenic Studies, Supplementary Paper No. 12.

PALEVOU, Claires (1997). "Η πορεία των επισκεπτών"(in Greek) in: Η ΚΑΘΗΜΕΡΙΝΗ, Sunday 20 April 1997, pp. 23 - 25.

PALMER, L.R. (1963) "**On the Knossos Tablets. The Find Places of the Knossos Tablets**". Clarendon Press, Oxford, United Kingdom.

PALMER, L.R. (1969) "**The Penultimate Palace at Knossos**". Edizioni dell' Ateno, Rome, Italy.

PAPADOPOULOS, John K. (1997). "Knossos" in: TORRE, Martha de la (ed.) **The Conservation of Archaeological Sites in the Mediterranean Region**, The Getty Conservation Institute, Los Angeles, USA.

PATERSON, Alexander (1938). "Obituary. Sir John Burnet" in **Journal of the Royal Institute of Architects**, July 1938, pp 893 - 894.

PENDLEBURY, John D.S. (1933). "**A Guide to the Stratigraphical Museum in the Palace at Knossos**". The British School at Athens, London, United Kingdom.

PENDLEBURY, John D.S. (1954). "**A Handbook to the Palace of Minos at Knossos**". New edition, London, United Kingdom.

PENDLEBURY, John D.S. (1963). "**The Archaeology of Crete. An Introduction**". Reprint. Biblio and Tannen, New York, USA.

PERNIER, Luigi (1933). "La Conservation des Palais Minoens en Crète" (in French) in: **La Conservation des monuments d'art et d'Histoire.** Office International des Musées, Paris, France.

PETERS, Tom F. (1996). "**Building the Nineteenth Century**". The MIT Press, Cambridge, Massachusetts, USA.

PETRAKOS, Basil (1993). "**National Museum**". Clio Editions, Athens, Greece.

PETRIE, W M Flinders (1890). "The Egyptian Basis of Greek History" in **Journal of Hellenic Studies**, Vol XI, pp 271 - 277.

PETRIE, W M Flinders (1904). "**Methods and Aims in Archaeology**" . MacMillan & Co, London, United Kingdom.

PETZET, Michael and MADER, Gert (1993). "**Praktische Denkmalpflege**" (in German) Kohlhammer Verlag, Stuttgart, Berlin and Köln, Germany.

PEVSNER, Nikolaus (1952). "**The Buildings England. London, except the Cities of London and Westminster**". Penguin Books, Harmondsworth, Middlesex, United Kingdom.

PLATON, Nikolaos (1959). "**A Guide to the Archaeological Museum of Heraclion**" Third Revised Edition, Kalokairinou, Herakleion, Crete.

PLATON, Nicolas (1966). "**Crete**". Nagel Publishers, Geneva, Switzerland.

PLATON, Nikolaos (1983). "The Minoan Palaces: Centres of Organization of a Theokratic Social and Political System" in: KRZYSZKOWSKA, Olga and NIXON, L. (eds) **Minoan Society: Proceedings of the Cambridge Colloquium 1981**. Bristol Classical Press, Bristol, United Kingdom.

POPHAM, Mervyn R. (1970). "**The Destruction of the Palace at Knossos. Pottery of the Late Minoan IIIa Period.**". Studies in Mediterranean Archaeology (SIMA), Göteborg, Sweden.

POWELL, Dylis (1973). "**The Villa Ariadne**". Hodder and Stoughton, London, United Kingdom.

POWYS, Albert Reginald (1929). "**Repair of Ancient Buildings**". Dent, London, United Kingdom.

PREZIOSI, Donald (1983). "**Minoan Architectural Design. Formation and Signification**". Monton Publishers, Berlin, New York, Amsterdam.

PRICE, Nicholas Stanley (1984). "Excavation and Conservation" in: PRICE, Nicholas Stanley (ed.) **Conservation on Archaeological Excavations.** ICCROM, Rome, Italy.

PRICE, Nicholas Stanley (1994). "Conservation and information in the display of prehistoric sites" in: GATHERCOLE, P. and LOWENTHAL, D. (eds.) **The Politics of the Past.** Routledge, London, United Kingdom.

RADT, Wolfgang (1988). "**Pergamon. Geschichte und Bauten, Funde und Erforschungen einer antiken Metropole**" (in German). DuMont, Köln, Germany.

RAISON, Jaques (1988). "**Le Palais du second Millénaire à Knossos. Le Quartier Nord**" (in French). École Française d' Athènes, Paris, France.

RAISON, Jaques (1993) "**Le Palais du second Millénaire à Knossos. Le Front Ouest at ses Magasins**" (in French). École Française d' Athènes, Paris, France.

RATHGEN, Dr. Friedrich (1905). "**The Preservation of Antiquities**" (translated by G.A. Auden and H.A. Auden) Cambridge University Press, Cambridge, United Kingdom.

REED, Sheila B. (1995). "**Introduction to Hazards**" Disaster Management Training Programme, UNDP.

REHAK, Paul and YOUNGER, John G. (1998). "Review of Aegean Prehistory VII: Neopalatial, Final Palatial and Postpalatial Crete" in: **American Journal of Archaeology.** Vol. 102.

RENFREW, Colin (1996). "Kings, tree rings and the Old World" in: **Nature**, Vol 381, 27 June 1996, pp 733 - 734.

REYNOLDS, Charles E. (1945). "**Concrete Construction**" Second Edition, Concrete Publications Limited, London, United Kingdom.

ROBERTS, Neil (1979). "The Location and Environment of Knossos" in: **The Annual of the British School at Athens**, Vol. LXXIV, pp 231 - 240.

ROIKOS, ? (1986). "Reconstruction of Arkhanes" in: **Archaeological Reports for 1985 - 86**, Council of the Society for Promotion of Hellenic Studies and the Managing Committee of the British School at Athens 1986, p 125 - 126.

RUSKIN, John, (1849). "**The Seven Lamps of Architecture**". Smith, London, United Kingdom.

SAKELLARAKIS, J.A. (1994). "**Herakleion. Das Archäologische Museum**" (in German). Ekdotike Athenon, Athens, Greece.

SCHACHERMEYR, Fritz (1964). "**Die minoische Kultur des alten Kreta**" (in German). W. Kohlhammer, Stuttgart, Germany.

SCHÄFER, Carl (1984). "**Deutsche Holzbaukunst**" reprint (in German). Gerstenberg Reprint, Hildesheim, Germany.

SCHÄFKE, Werner (1983). "**Englische Kathedralen. Eine Reise zu den Höhepunkten englischer Architektur von 1066 bis heute**" (in German). DuMont, Köln, Germany.

SCHINÁ, Athená (1988). "**Knossos. The Palace of Minos. The Minoan Civilization**" (Translated by Catherine Tassoúli). N. Gouvoússis, Athens, Greece.

SCHMIDT, Hartwig (1985). "Antike Bau- und Bodendenkmalpflege - vom Sinn und den Möglichkeiten ihrer Erhaltung und Gestaltung"(in German) in: ULBERT,G and WEBER, G. **Konservierte Geschichte? Antike Bauten und ihre Erhaltung.** Konrad Theiss Verlag, Stuttgart, Germany.

SCHMIDT, Hartwig (1988). "**Denkmalpflege an Archäologischen Stätten 1: Schutzbauten**"(in German). Architekturreferat des Deutschen Archäologischen Instituts, Konrad Theiss Verlag, Stuttgart, Germany.

SCHMIDT, Hartwig (1990). "Konservierung, Restaurierung, Rekonstruktion. Denkmalpflegerische Konzepte für den Umgang mit Ruinen"(in German) in: **Sinn und Unsinn archäologischer Restaurierungen und Rekonstruktionen.** Kolloquium im Rahmen der Jahrestagung 1990, Verband der Landesarchäologen der Bundesrepublik Deutschland.

SCHMIDT, Hartwig (1993). "**Denkmalpflege an Archäologischen Stätten 2: Wiederaufbau**" (in German). Architekturreferat des Deutschen Archäologischen Instituts, Konrad Theiss Verlag, Stuttgart, Germany.

SCHMIDT, Hartwig (1997). "Reconstruction of Ancient Buildings" in: DE LA TORRE, Martha (ed.) **The Conservation of Archaeological Sites in the Mediterranean Region**, The Getty Conservation Institute, Los Angeles, USA.

SCHOEP, Ilse (1994). " 'Home sweet Home'. Some comments on the so-called House Models from the Pre-Hellenic Aegean" in: **Opuscula Atheniensia**, Vol XX, No. 13, pp. 189 - 210.

SCHWAB, Jürgen (1976). "**Das Große Buch vom Holz**" (in German). Schuler Verlag, Herrsching, Germany.

SEKHNIASHVILI, E. A. (1988). "From the Experience of Earthquake Engineering in Georgia and the Organization of the Protection of the Relics of History and Culture in the USSR" in: **Proceedings of the 1st International Seminar on Modern Principles in Conservation and Restoration of Urban and Rural Cultural Heritage in Seismic Prone Regions**, RZZSK, IZIIS, ICCROM, Skopje, Yugoslavia.

SHAW, Joseph W. (1973). "Minoan Architecture: Materials and Techniques" in: **Annuario dell Scuola Archeologica di Athene e delle Missione Italiane in Oriente**, Volume XLIX, Nuova Serie XXXIII (1971), Instituto Poligrafico dello Stato, Roma, Italy.

SPIERS, R. Phené (1903a). "The Palace at Knossos, Crete" in: **The Architectural Review**, Vol 13, pp. 196 - 200.

SPIERS, R. Phené (1903b). "The Palace at Knossos, Crete" in: **The Architectural Review**, Vol 14, pp. 91 - 97.

STEVENSON, John James (1881). "Historical Documents" in **Transactions of the Royal Institute of British Architects**, Session 1880 - 1881, pp. 175 - 192.

STIROS, Stathis C. (1996). "Identification from Earthquakes from Archaeological Data: Methodology, Criteria and Limitations." in: STIROS, S. and JONES, R. E. (eds.): **Archaeoseismology**, Fitch Laboratory Occasional Paper 7, British School at Athens, London, United Kingdom.

STRATTON, Michael and TRINDER, Barrie (1997). "**English Heritage Book of Industrial England**". B. T. Batsford / English Heritage, London, UK.

ŠUMANOV, Lazar (1988). "Conservation, Restoration, Revitalization and Increasing the Resistance of Structural System of Konak (temporary Lodgment) in St. Joakim Osogovski Monastery near Kriva Palanka, Yugoslavia" in in: **Proceedings of the 1st International Seminar on Modern Principles in Conservation and Restoration of Urban and Rural Cultural Heritage in Seismic Prone Regions**, RZZSK, IZIIS, ICCROM, Skopje, Yugoslavia, pp. 321 - 330.

ŠUMANOV, Lazar (1990). "A possible Outline for both to Increase the Strengthening and to Keep the Value of Cultural Property" in **Pact**, Vol. 28, pp. 185 - 194.

ŠUMANOV, Lazar (1990). "Conservation, Restoration, Revitalization and Increasing the Resistance of Structural System - "Bondruk" - (Timber framing Construction) of Konak (temporary Lodgment) in St. J. Osogovski Monastry near Kriva Palanka, Yugoslavia" in **Pact**, Vol. 28, pp. 195 - 203.

SUTHERLAND, R.J.M. (1996). "Understanding Historical Concrete" in: **Structures and Buildings. Proceedings of the Institution of Civil Engineers**, Vol. 116, No 3 & 4, pp 283 - 294.

TAFURI, Manfredo and DAL CO, Francesco (1988). "**Weltgeschichte der Architektur: Klassische Moderne**" (in German). Deutsche Verlags Anstalt, Stuttgart, Germany.

THE CRETAN EXPLORATION FUND (1905). "**Report for the Season 1904 - 5. Mr. Evans' Excavations at Knossos in 1905**" . Oxford?, United Kingdom

THE CRETAN EXPLORATION FUND (1907). "**The Palace of Minos and the Cretan Exploration Fund**" . Oxford?, United Kingdom

THOMPSON, M. W. (1977). "**General Pitt-Rivers. Evolution and Archaeology in the nineteenth Century**". Moonraker Press, Bradford on Avon, United Kingdom.

THOMPSON, M. W. (1981). "**Ruins. Their Preservation and Display**". British Museum Publications, London, United Kingdom.

TORRE, Martha de la (ed). (1997). "**The Conservation of Archaeological Sites in the Mediterranean Region**". An International Conference organised by the Getty Conservation Institute and the J. Paul Getty Museum, May 1995. The Getty Conservation Institute, Los Angeles, U.S.A.

TOURNIKIOTIS, P. (ed). (1994). "**The Parthenon and its Impact in Modern Times**", Melissa, Athens, Greece.

TURNER, Eric G. (1974). "Knossos" in: WHEELER, Sir Mortimer (ed.), **Swan Hellenic Cruises, Cruise Handbook**, Swan Hellenic Ltd. London, United Kingdom.

TRIGGER, Bruce G. (1989). "**A History of Archaeological Thought**". Cambridge University Press, Cambridge, United Kingdom.

UNITED NATIONS (1995). "**Introduction to Hazards. Trainers Guide**" Disaster Management Training Programme, Department of Humanitarian Affairs, United Nations.

VALLIANOU, Despina (1996). "New Evidence of Earthquake Destructions in Late Minoan Crete." in: STIROS, S. and JONES, R. E. (eds.): **Archaeoseismology**, Fitch Laboratory Occasional Paper 7, British School at Athens, London, United Kingdom.

VANDENABELLE, Frieda (1992). "**Malia. The Palace of Malia and Chersonissos**". Ekdotike Athenon, Athens, Greece.

VASSILAKIS, Antonis (no date). "**Phaistos**". Mathioulakis & co., Athens, Greece.

VAUGHAN, Agnes Carr (1959). "**The House of the Double Axe. The Palace at Knossos**". Weidenfeld and Nicolson, London, United Kingdom.

VENEČANIN, Srdjan (1990). "Thermal Incompatibility of Concrete Components and Thermal Properties of Carbonate Rocks" in: **ACI Materials Journal**, American Concrete Institute, November - December 1990, p. 602 - 607.

WACE, Alan J.B. (1964). "**Mycenae. An Archaeological History and Guide.**" Biblio and Tannen, New York, United States.

WACE, Alan J. B. (1979). "**Excavations at Mycenae 1939 - 1955**". Edited by Elizabeth French. Reprinted from the Annuals of The British School at Athens, Volumes 45 - 56. The British School at Athens, Supplementary Volume 12, London, United Kingdom.

WARREN, Peter (1985). "**The Aegean Civilisations. From Ancient Crete to Mycenae**". Phaidon, Oxford, United Kingdom.

WARREN, Peter and HANKEY, Vronwy (1989). " **Aegean Bronze Age Chronology**". Bristol Classical Press, Bristol, United Kingdom.

WARREN, Peter (1990). "Summary of Evidence for the Absolute Chronology of the Early Part of the Aegean Bronze Age Derived from Historical Egyptian Sources" in: HARDY, D. A. and RENFREW, A. C., "**Thera and the Aegean World. Vol. III: Chronology**", pp. 26 - 29. The Thera Foundation, London, United Kingdom.

WARREN, Peter (1991). "The Destruction of the Palace of Knossos" in: **The Civilizations of the Aegean and their Diffusion in Cyprus and the Eastern Mediterranean, 2000 - 600 B.C.. Proceedings of an International Symposium**. Pierides Foundation Larnaca, Larnaca, Cyprus.

WARREN, Peter (1992). "Knossos Revisited" in: **The Classical Review**. New Series, Vol XLII, No.1, pp. 137 - 139.

WATERHOUSE, Helen (1986). "**The British School at Athens. The First Hundred Years**" The British School at Athens Supplementary Volume No. 19, Thames and Hudson, London, United Kingdom.

WEISS, Günter (1994). "**Peloponnes. Zu den Ursprüngen der europäischen Kultur im Süden Griechenlands**" (in German). DuMont, Köln, Germany.

WHINNEY, Margaret (1971). "Wren". Thames and Hudson, London, United Kingdom.

WOLTERS, P. (1910). "Ausgrabungen in Knossos" (in German) in: **Prähistorische Zeitschrift**. Vol. II, pp. 417 - 419.

WOOD, Michael (1985). "**In Search of the Trojan War**". British Broadcasting Company, London, United Kingdom.

WUNDERLICH, Hans G. (1975). "**The Secret of Crete**", Souvenir Press, London, United Kingdom.

YEOMANS, David (1997). "**Construction since 1900: Materials**". B.T. Batsford Ltd., London, United Kingdom.

ZENTNER, Christian (1980). "**Geschichtsführer**" (in German). Deutsche Buch Gemeinschaft, Berlin, Germany.

ZEZZA, Fulvio (1994). "Minoan Palace of Knossos: weathering of gypsum stones" in; FASSINA, Vasco; OTT, Heinrich and ZEZZA, Fulvio: **The Conservation of Monuments in the Mediterranean Basin**. Proceedings of the third international Symposium, Venezia, 22-25 June 1994, Soprintendenza ai Beni Artistici e Storici di Venezia, Venice, Italy.

Articles in Newspapers

The Times, Monday, 5 November 1900, p. 9.
The Times, 14 June 1901, p 5 and p. 9.
The Times, Friday, 12 April 1905, p. 4.
The Times, Thursday, 31 October 1905, p. 4.
The Times, Monday, 15 July 1907, p. 8.
The Times, Thursday, 27 August 1908, p. 6.
The Times, Friday, 16 September 1910, p. 4.
The Times, Friday, 14 July 1922, p. 11.
The Times, Tuesday, 28 August 1923, p. 9 f.
The Times, Wednesday, 29 August 1923, p. 11 f.
The Times, Thursday, 16 October 1924, p. 15 f.
The Times, Friday, 17 October 1924, p. 15 f.
The Times, Friday, 9 October 1925, p. 15 f.
The Times, Monday, 20 September 1926, p. 15 f.
The Times, Monday, 5 August 1929, p. 11 f.
The Times, Monday, 13 July, 1931, p. 13 f.

Appendices

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Sir Arthur John Evans (1851 - 1941)

8. 7. 1851	Birth of Arthur John Evans, eldest son to the archaeologist and numismatist John Evans and Harriet Evans (née Dickinson).
1865 - 1870	Harrow School.
1870 - 1874	He graduates in Oxford, Brasenose College.
Spring 1875	Term at University Göttingen.
1875	Travels with brother Lewis in the Balkans.
1877	Balkan correspondent for the *Manchester Guardian.*
1878	Married Margaret Freeman, daughter of the historian E.A. Freeman.
1878 - 1881	Travel, archaeological research and politics in the Balkans.
7. 3. 1882	Imprisoned in Ragusa and later expelled from the Balkan.
17. 6. 1884	Evans becomes Keeper of the Ashmolean Museum in Oxford.
1884 - 1894	Research in Iron Age and Roman Britain.
1893	Evans buys land at Boars Hill to build his House
11. 3.1893	His wife Margaret dies
1894	Ashmolean Museum moves to Beaumont Street and Evans moves to his new House Youlbury at Boars Hill. First travel to Crete. Evans buys a quarter of the Land at Knossos
23. 3. 1900	Evans starts with the excavation at Knossos.
1900 - 1905	First Main excavation campaign at Knossos
1906	Villa Ariadne built at Knossos.

1908	D.G. Hogarth succeeds Evans as Keeper of the Ashmolean Museum in Oxford.
31. 5. 1908	Sir John Evans dies.
28. 10. 1908	Thomas Gordon Dickinson dies.
1911	Awarded Knighthood in King George V's coronation ceremony.
1913	Last excavation term at Knossos before World War I.
1914 - 1919	President of the Society of Antiquaries, London.
1921	Publication of the first volume of *The Palace of Minos*
1922	Returns to Knossos for further excavation and reconstruction work.
1924	Site of Knossos and Villa Adriadne are handed to the British School at Athens.
1926	Earthquake at Knossos.
1928	Evans 'The Taverna' restored as house for the Curator at Knossos. Publication of the second volume of *The Palace of Minos.*
1930	Publication of the third volume of *The Palace of Minos.*
1931	Excavation of Temple Tomb
1935	Last visit to Knossos. Publication of the fourth volume of *The Palace of Minos*
1938	Rearranged Minoan exhibition in the Ashmolean Museum.
11. 7. 1941	Sir Arthur Evans dies in Oxford

Publications:

-- (1884). "**The Ashmolean Museum as a Home for Archaeology in Oxford. An inaugural lecture**". Parker & Co., Oxford, United Kingdom.

-- (1900). "Knossos. Summary Report of the Excavations in 1900" in **Annual of the British School at Athens**, Vol VI, p. 1 - 70, British School at Athens, London, United Kingdom.

-- (1901). "The Palace of Knossos. Provisional Report of the Excavations for the Year 1901" in **Annual of the British School at Athens**, Vol VII, p. 1 - 120, British School at Athens, London, United Kingdom.

-- (1902a). 'The Palace of Knossos. Provisional Report of the Excavations for the Year 1902" in **Annual of the British School at Athens**, Vol VIII, p. 1 - 124, British School at Athens, London, United Kingdom.

-- (1902b). "A Bird-eyes view of the Minoan Palace of Knossos, Crete" in: **Journal of the Royal Institute of British Architects**, Vol. X, P. 97 - 106, RIBA, London, United Kingdom.

-- (1903). 'The Palace of Knossos. Provisional Report of the Excavations for the Year 1903" in **Annual of the British School at Athens**, Vol IX, p. 1 - 153, British School at Athens, London, United Kingdom.

-- (1904). "The Palace of Knossos. The Campaign of 1904" in **Annual of the British School at Athens**, Vol X, p. 1 - 44, British School at Athens, London, United Kingdom.

-- (1905). 'The Palace of Knossos and its Dependencies. Provisional Report for the Year 1905" in **Annual of the British School at Athens**, Vol XI, p. 1 - 26, British School at Athens, London, United Kingdom.

-- (1906). "**Essai de Classification des Époques de la Civilisation Minoenne**". London, United Kingdom.

-- (1911). "Restored Shrine on the central Court of the Palace of Knossos" in: **Journal of the Royal Institute of British Architects**, Vol. XIX, P. 289 - 295, RIBA, London, United Kingdom.

-- (1921). '**The Palace of Minos at Knossos. Volume I**". MacMillan, London, United Kingdom. (PM I).

-- (1922). "New Discoveries at Knossos" in: **The Antiquaries Journal**, Vol. II, pp 319 - 329.

-- (1927). "Work of Reconstitution in the Palace of Knossos" in: **The Antiquaries Journal**, Vol. VII, pp 258 - 267.

-- (1928). "The Palace of Knossos and its Dependencies in the light of Recent Discoveries and Reconstitutions" in: **Journal of the Royal Institute of British Architects**, Vol. XXXVI, No. 3, P. 90 - 102, RIBA, London, United Kingdom.

- (1928a). **"The Palace of Minos at Knossos. Volume II"**. MacMillan, London, United Kingdom.(PM II).

-- (1929). "Knossos" in **Annual of the British School at Athens**, Vol XXX, p. 268 - 270, British School at Athens, London, United Kingdom.

-- (1930). "Sir Arthur Evans' Excavation at Knossos" in **Annual of the British School at Athens**, Vol XXX, p. 289 - 290, British School at Athens, London, United Kingdom.

-- (1930a). **"The Palace of Minos at Knossos. Volume III"**. MacMillan, London, United Kingdom. (PM III).

-- (1931). "Knossos" in **Annual of the British School at Athens**, Vol XXXI, p. 191 - 192, British School at Athens, London, United Kingdom.

-- (1935). **"The Palace of Minos at Knossos. Volume IV"**. MacMillan, London, United Kingdom. (PM IV).

Sources:

BROWN, Ann (1993). **"Before Knossos...Arthur Evans's travels in the Balkans and Crete"** Ashmolean Museum, Oxford, United Kingdom.

BROWN, Ann (1994). **"Arthur Evans and the Palace of Minos"** Ashmolean Museum, Oxford, United Kingdom.

EVANS, Joan (1943). **"Time and Chance: the story of Arthur Evans and his Forebears"**. Longmans, Green and Co., London, United Kingdom.

EVANS, Joan (1950). "Sir Arthur Evans and Knossos" in: **Archaeology**, Vol. 3, pp. 134 - 139.

HARDEN, D. B. (1983). **"Sir Arthur Evans 1851 - 1941. A Memoir"**. Ashmolean Museum, Oxford, United Kingdom.

HORWITZ, Sylvia L. (1981). **"The Find of a Lifetime. Sir Arthur Evans and the Discovery of Knossos."** Weidenfeld and Nicolson, London, United Kingdom.

Theodore Fyfe (1875 - 1945)

3.11.1875	David Theodore Fyfe was born as second son of James Sloane Fyfe and Jane Charlotte Abercrombie Fyfe in Yloilo, Philippine Islands.
?	School at Albany Academy, Glasgow
1890 - 1896	articled to John Burnet, Glasgow
8 Oct. 1897	Nominated member to the Architectural Association
27 Oct. 1897	Elected member to the Architectural association.
1898 - 1899	Architectural Association Travelling Student
1899 - 1900	Architectural Studentship of the British School at Athens
1900	Fyfe is called in to Knossos by A. Evans to do the recording work.
1901	Fyfe introduces a wooden scaffolding to support the walls, while excavating the Hall of the Double Axes. He designs a wooden scaffolding to tunnel under the third flight of the Grand Staircase, keeping the third flight in position. Fyfe designs the first permanent roof for the Throne Room to protect the gypsum floors.
1902	The scaffolding in the Hall of the Double Axes is replaced by wood and rubble pillars, covered with stucco. Work in the Queen's Megaron.
1903	He becomes member of the Society for the Promotion of Hellenic Studies. He restores the Theatral area and erects the observation tower. Upper level in the Domestic Quarter?
1904	Fyfe adds a pitched roof on top of the existing flat roof at the Throne Room. At the end of the 1904 campaign Theodore Fyfe retires from work in Knossos.
1905 - 1912	Co-editor of the AA-Sketchbook
1905 - 1915	Fyfe practises in London and assists Sir John Burnet

1907	Elected fellow of the R.I.B.A.
1908	Fyfe works again for Evans
1911	He marries Mary Nina Brown He moves to 2, Montague Place, Russell Square, WC
25.6.1912	He was elected for the Council of the Society for the Promotion of Hellenic Studies at the Annual Meeting with Sir Arthur Evans in the Chair.
1915	Retires from work with Burnet due to ill health
1915 - 16	He moves to 34 King Street, Chester.
1916	Works as architect for the Ministry of Health at Queensferry
1917	He moves to Llysfasi Manor, Pentre-Celyn, nr. Ruthin, North Wales.
1920	Architect to the Dean and Chapter of Chester Cathedral
1921	Lectures in Greek and Roman Architecture for the Professor of Classical Archaeology in Oxford. Becomes member and Committee member of S.P.A.B.
1922 - 1936	Director of the Cambridge School of Architecture
1926	He revisited Knossos. Supervises the reconstruction of the Royal Villa.
1926 & 1927	Director of the excavations at Glastonbury Abbey
1926 - 1941	Fyfe is university lecturer at Cambridge School of Architecture
1941	Theodore Fyfe retires
1.1.1945	Fyfe dies after an ice skating accident.

Publications:

-- 1901. "**Some Architecture in Crete and Turkey**". Paper read to the Architectural Association, 8 February 1901.

-- 1902. "Painted Plaster Decoration at Knossos with Special Reference to the Architectural Schemes" in: **Journal of the Royal Institute of British Architects**, Vol. X, P. 107 - 131, RIBA, London, United Kingdom.

-- 1902b. Several drawings in the AA-Sketchbook.

-- 1903a. "An Italian Tour" in: **Architectural Association Notes**, No. 197, July 1903, P. 98 - 100, Architectural Association, London, United Kingdom.

-- 1903b. "An Italian Tour continued" in: **Architectural Association Notes**, No. 198, Aug 1903, P. 109 - 112, Architectural Association, London, United Kingdom.

-- 1903c. "An Italian Tour concluded" in: **Architectural Association Notes**, No. 199, September 1903, P. 130 - 131, Architectural Association, London, United Kingdom.

-- 1904 A drawing in the AA-Sketchbook

-- 1911. "The Atelier versus the Builder's Yard" in: **Architectural Association Journal**, Vol. XXVI, No. 289, P. 49 - 55, Architectural Association, London, United Kingdom.

-- 1923. "**Deeside Regional Planning Scheme. Chester and Flinthsire**". The report prepared for the Committee of Local Authorities by P. Abercombie, Sydney Kelly and Theodore Fyfe. London, United Kingdom.

-- 1926a. "The Palace of Knossos: An Example of Conservation" in: **Journal of the Royal Institute of British Architects**, Vol. XXXIII, P. 479 - 480, RIBA, London, United Kingdom.

-- 1926b. "Glastonbury Abbey Excavations, 1926" in: **Proceedings of the Somersetshire Archaeological and Natural History Society**, Vol. 72, p. 20 - 22. United Kingdom.

-- 1927. "Glastonbury Abbey Excavations, 1927" in: **Proceedings of the Somersetshire Archaeological and Natural History Society**, Vol. 73, p. 86 - 87. United Kingdom.

-- 1936. "**Hellenistic Architecture. An Introductory Study**". Cambridge University Press, Cambridge, United Kingdom.

-- 1942. "**Architecture in Cambridge. Examples of English Architectural Styles from Saxon to Modern Times**" Cambridge University Press, Cambridge United Kingdom.

Sources:

The Architects Journal, 18 January 1934, p. 124.

The Builder, 19 January, 1945, p. 59.

R.I.B.A. Journal, February 1945.

The Times, 5 January, 1945

Who's Who in Architecture 1914, p. 85.

Who's Who in Architecture 1923, p. 97.

Who's Who, 1930, p. 1121.

Christian Doll (1880 - 1955)

1880	Born as oldest son to Charles Fitzroy Doll, architect and surveyor to the Bedford Estate, London.
1898	Helped his father to design Hotel Russell, Russell Square.
1904	He is admitted as student to the British School at Athens for the year 1904 - 1905.
1905	Doll employed as excavation architect until 1910. Reconstitution of the Grand Staircase.
1906 - 1907	Doll builds the "Villa Adriadne".
1908	Work in the Domestic Quarter.
1910	Work in the Domestic Quarter and reconstruction of the 4th and the 5th flight of t the Grand Staircase. First use of concrete. Doll joins the office of his father Charles Fitzroy Doll as a Partner.
1913	Member of the Society for the Promotion of Hellenic Studies.
1918	Plan of North Pillar Hall at Knossos.
1930	Begin of political career in London.
1950	Mayor of Holborn.
1951 - 1953	Deputy Mayor of Holborn.
5. 4. 1955	He dies in London.

Publications:

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Sources:

GRAY, Stuart A. (1985). "**Edwardian Architecture. A Biographical Dictionary**". Duckworth & Co, London, United Kingdom.

The Builder, 6 May 1955, p. 761.

Journal of Hellenic Studies, Volume XXXIII, 1913.

Holborn Council Minutes, 27 April 1955.

The Holborn and Finsbury Guardian, 15 Aril 1955.

Who's Who in Architecture, 1923, p. 78.

Piet de Jong (1887 - 1967)

8. 8. 1887	Born in Leeds. He grew up in Leeds and was educated as architect at the Leeds School of Arts.
1911/12	Competed for the Soane Medallion. The prize committee could not decide on one winner and de Jong and his competitor William Friskin were both awarded a Certificate of Honourable Mention.
1912	Admitted as Architectural Student to the British School at Rome for Season 1911/12. Records buildings in Rome, Florence, Perugia and Siena. Some of his drawings were published in the AA Sketchbook 1912 and 1913.
1913 - 1916 (?)	Practising architect in Leeds, employed with Chorley, Gibbon and Foggit. He never became a registered architect or fellow of R.I.B.A. He produced a watercolour of The Church of Christ Scientist in Leeds.
1916 - 1918 ?	Soldier in World War I.
ca. 1919	Takes part in a post-war-reconstruction project in Macedonia which was organised by Austin Harrison.
1921	Participates at Allan Wace's excavation at Mycenae. Piet de Jong's presence is not stated separately, the excavation lasted from 22 May to 27 July. He gets married to Effie from Scotland who teaches English in Greece.
1922	Reconstruction of lower flight of Stepped Portico south of the Throne Room and first eight steps of upper flight. Piet de Jong stays in Knossos until 12 June when he leaves for Mycenae, where he is employed as architect and draughtsman.
1923	Draws plans in Athens from February until 12 May when he went to Knossos. Reconstructed the upper section of the Stepped Portico with reinforced concrete. Excursion to "Fair Haven" with Evans and Mackenzie. Begins to work at Nauplia on 23 August.

1924	Reconstruction of the Caravanserai and the Viaduct. Repair of the Director's House at the British School at Athens.
1924 - 1932	School architect for the British School at Athens.
1925	Reconstruction work of the West Wing, the South-North Corridor and the Pillared Portico.
1926	De Jong and Evans witness the earthquake at Knossos.
1927	No work at Knossos
1928	Reconstruction of the Loggia of the Grand Staircase and roofing the Hall of the Double Axes with a flat concrete roof. This was regarded as to expensive until then.
1929	Base of the North Entrance Portico, The North Lustral Basin.
1930	Completion North Entrance Portico, re-roofing the Throne Room Areal
1931	He restores the Little Palace at Knossos.
WW II	Piet de Jong spends WW II in Britain. He is registered at 'Vinfrey's', Snetterton, Norwich.
1947 - 1952	Curator for the British School at Knossos.
1952	Begins to work for Carl Blegen at the Palace of Nestor at Pylos. He works there for nine seasons.
1965	De Jong works on the island of Keos where he produced numerous watercolour reconstruction drawings of pottery. His wife Effie dies.
1966	Copying Minoan Frescoes for the British School at Knossos
20. 4. 1967	Piet de Jong dies.
1970	The Stratigraphical Museum is build at Knossos funded by the bequest from Piet de Jong.

Publications:

AA Sketchbook 1912, plans 58 - 61	Santa Croce, Florence (together with Foggit).
AA Sketchbook 1912, plans 62 - 63	San Maria del Popolo, Rome.
AA Sketchbook 1912, plan 64	San Maria del Araceli, Rome.
AA Sketchbook 1912, plans 65 - 66	Tempietto di San Pietro in Montorio, Rome. (together with Foggit)
AA Sketchbook 1913, plans 56 - 58	Mediceo Laurentian Library, Florence

Sources:

The Builder, 26 January 1912, p. 85 f. and 2 February 1912, p. 123 f.

Wace, Annual of BSA No. XXV. Session 1921-22; 1922-23, p. 3.

Green Book of the West Yorkshire Society of Architects, 1941, p. 14 f.

Obituary by Sinclair Hood, The Times, 27 April 1967, p. 12.

BLEGEN, Carl W. and RAWSON, Marion (1973). "**The Palace of Nestor at Pylos in Western Messenia. Vol. III**". Princeton University Press, Princeton, USA.

COLEMAN, John E. (1977). "**Keos. Results of excavations conducted by the University of Cincinnati under the auspices of the American School of Classical Studies at Athens. Volume I**", American School of Classical Studies, Princeton, New Jersey, United States.

WATERHOUSE, Helen (1986). "**The British School at Athens. The First Hundred Years**" The British School at Athens Supplementary Volume No. 19, Thames and Hudson, London, United Kingdom.

Chronology of the Excavation Site at Knossos

	Excavation	Conservation and Reconstruction
1878	Throne Room*[1]	
1900	Ante Room, Throne Room[2] Magazines	
1901	Completing West Magazines[3] North Eastern part of Palace [4] Grand Staircase, School Room Court of the Stone Spout Hall of Double Axes	Flat roof Throne Room Support work for Staircase[5] Wooden scaffolding Hall of Double Axes Wooden support East-West Corridor Support Stone Bench
1902	Rest of Residential Quarter[6] Royal Pottery stores East Bastion South East House	First Restoration Hall of the Double Axes
1903	South East House completed[7] Monolithic Pillar Basement cleared	Restoration and retaining wall Theatral area Observation tower New gypsum slabs in Long Corridor.
1904	Below West Court, Cists below Stepped Porch	Pitched roof Throne R. and service wing
1905	Under pavement West Court Royal Road[9] Little Palace	Grand Staircase[8]
1906	*No work*	Villa Ariadne[10]
1907	South Corridor, South Porch[11] Early Hypogaeum[13] Koulouras 1[14]	Villa Ariadne completed[12]

*Excavated by Minos Kalokairinos

1908	South West House[15], South House[16] West Court, Little Palace[18] Supplementary excavation in the DQ[21]	Queen's Megaron incl. light well[17] DQ first floor corridors[19] Window Court of Distaffs[20] Room with the Stone Bench[22]
1909	*No work*	
1910	Stratigraphic tests Little Palace[24]	Grand Staircase fourth flight[23] Replacing parts of Fyfe's work in DQ[25] Roofing in the Little Palace[26]
1911	*No work*	
1912	*No work*	
1913	Under steps in Theatral area Under paving slabs in Hall of the double Axes, Queens Megaron and Dog-Leg-Corridor	
1914	*No work*	
1915	*No work*	
1916	*No work*	
1917	*No work*	
1918	*No work*	
1919	*No work*	
1920	*No work*	
1921	Mackenzie returns to Knossos	Clearance of the site
1922	Additional South Porch and Stairs Stepped Portico	12 Steps of the first flight and 8 steps of second flight of Stepped Portico[27]
1923		Upper part of the Stepped Portico
1926		Royal Villa by Fyfe[28]
1928	Blocking wall in East Corridor removed	Loggia Grand Staircase, begin Fresco[29] Hall of Double Axes[30]

1929	Re-excavation of North Portico Prove of Water runnel East Bastion[33] South Portico (Verandah)[35]	Roofing five of the West Magazines[31] North Lustral Basin[32] East Bastion[34] Completion of the Shield Fresco Loggia Grand Staircase[36] Portico Northern Entrance (lower part)[37]
1930	Enceinte wall West court[38] Koulouras 2 and 3[40]	Northern Entrance[39] Throne Room
1931	Temple Tomb[41] High Priest House[43] Opposite Caravanserai[45]	Temple Tomb[42] Little Palace[44]

Sources:

1. See: Μαϱθασ Αποσκιτου (1979)."Μινος Καλοκαιϱινος" in: Κϱητολογια 8, pp 81 - 94.
2. Evans, 1900, p. 8 ff.
3. Evans, 1901, p. 2 ff.
4. Evans, 1901, p. 54 ff.
5. Evans, 1901, p. 102 ff.
6. Evans, 1902a.
7. Evans, 1903, p. 1 ff.
8. Times, 31 October 1905, p. 4.
9. Times, 31 October 1905, p. 4.
10. See: Letters by Christian Doll to Sir Arthur Evans
11. Times, 15 July 1907, p. 8.
12. See: Letters by Christian Doll to Sir Arthur Evans
13. Times, 15 July 1907, p. 8.
14. Times, 15 July 1907, p. 8.
15. Times, 27 August 1908, p. 6.
16. Times, 27 August 1908, p. 6.
17. Times, 27 August 1908, p. 6.
18. Times, 27 August 1908, p. 6.
19. Times, 27 August 1908, p. 6.
20. Journal of R.I.B.A, 29 August 1908. P. 586
21. Times, 27 August 1908, p. 6.
22. Journal of R.I.B.A, 29 August 1908. P. 586
23. Times, 16 Sept. 1910, p. 4.
24. Times, 16 Sept. 1910, p. 4.

25. Times, 16 Sept. 1910, p. 4.
26. Times, 16 Sept. 1910, p. 4.
27. Times, 14 July 1922, p. 11.
28. PM II, p. 403.
29. RIBA, 1928, p. 97.
30. RIBA, 1928, p. 97.
31. Times, 5 August 1929, p. 11.
32. Times, 5 August 1929, p. 11.
33. Times, 5 August 1929, p. 12.
34. Times, 5 August 1929, p. 12.
35. Times, 5 August 1929, p. 12.
36. Times, 5 August 1929, p. 12.
37. BSA No XXX, p. 268
38. PM IV, p. 48 ff.
39. PM IV, p. 1 ff.
40. PM IV, p. 63 ff.
41. Times, 13 July 1931, p. 13 - 14
42. Times, 13 July 1931, p. 13 - 14
43. PM IV, p. 202
44. PM IV, p. 215
45. PM IV, p. 204

History of Knossos[1]

Knossos is the longest-inhabited place in Crete, having been settled early in Neolithic times, probably before 7000 B.C. It is famous in classical mythology as the home of Minos and in archaeology as the site of the principal Bronze Age palace of Crete. During the New Palace Period it must have been the capital of the island.

Evans started large-scale excavation of the Minoan Palace in 1900, calling the building the palace in the title of his first annual report. He used the periods he observed in stratigraphy in (and around) the palace as the basis of his chronological scheme for the Cretan Bronze Age, which he named Minoan, after King Minos. Excavation and surface exploration still continue at Knossos, and the site is far from fully exposed. Many parts of its long history still need clarifying. The principal lack is probably a detailed and systematic knowledge of the Minoan town around the palace. Reconstructions that show the palace set amid fields are misleading.

The first settlers chose the low freestanding hill in the Kairatos river valley known as Kephala. Near the north coast of Crete and in the Centre of the island, this hill has a good situation as may be conceived for communicating by land with the rest of the island, yet it is sufficiently far from the sea so that people could prepare for, or escape from, enemies attacking from that direction. Its key position is reflected today in Herakleion's economic dominance of the island. The Neolithic settlement is principally known from soundings around Kephala hill, from which the sequence has been divided into ten principal strata (X-I). The first settlement (Stratum X, and possibly earlier) covered a small area (about 0.25 ha) of what was to be the site of the palace. The (Aceramic Neolithic) settlers did not use pottery but did build with mud brick and had a developed

[1] Cadogan in: Myers, Myers, Cadogan, 1992, pp. 124 - 133.

economy with mixed farming. They grew wheat, barley, and lentils and raised sheep and goats, pigs, and some cattle.

During the long Early Neolithic I phase (Strata IX - V) the settlement seems to have grown to cover almost all of the palace site (about 2 ha). During Early Neolithic I the construction of the rectangular buildings changed from mud brick to pisé, or packed mud, laid on a stone foundation; but the principal innovation was in the introduction of fired pottery at the beginning of the phase. Early Neolithic II (Stratum IV) was also a long phase, by the end of which the settlement had grown to about 3 ha. Near the end of the phase, clay spinning and weaving equipment appeared for the first time at Knossos, foreshadowing the great importance that the Linear B tablets show its wool industry had some three thousand years later. Middle Neolithic (Stratum III), with considerable evidence of technological quickening, was followed by Late Neolithic (Strata II - I), by which time the settlement may have covered 5 ha or more. From a Late Neolithic level comes the earliest metal object from Crete, a copper axe; houses had fixed hearths for the first time; and some of the latest (Final Neolithic) pottery shows close similarities with that of Phaistos. Final Neolithic has also been found at Gortyn.

The transition from Neolithic to Early Minoan at Knossos, probably around the middle of the 4th millennium B.C., is not yet understood. The principal evidence of Early Minoan I is a deep well in the northeastern part of the palace filled with badly burned pottery of the phase. Wether the destruction resulted from a small or widespread event is unknown.

The Early Minoan II settlement seems to have been large and prosperous, spreading to both sides of the later Royal Road as well as the south front of the palace, where there are also EM III remains. Finds include imported stone vases from the Cyclades and Egypt and Early Helladic II pottery from Mainland Greece. The best Early Minoan II remains belong to a partly excavated and now backfilled building below the west court, the Early Minoan IIA West Court House, which was destroyed by fire. It may have been a ruler's residence or a centre of the community of some other type: the quality of its pottery suggests a special importance.

Early Minoan III seems to have been a short phase at Knossos leading into Middle Minoan IA. A large building of which walls survive at the northwest corner of the palace may be a predecessor of the Old Palace, a "proto-palace." If so, it would represent an intermediate stage between the West Court House and the Old Palace. The thick-walled Keep at the north end of the Central Court may be related to it. Also contemporary may be the Hypogaeum, an underground cistern or granary below the South Porch.

The settlement grew greatly in Middle Minoan IA, the last phase before the Old Palace, both northeast toward Makryteichos village and 500 m west-northwest up the Acropolis hill. The viaduct and roadway crossing the Vlychia stream south of the Palace and the Stepped Portico leading up the Kephala hill may be of Middle Minoan IA date.

How the Old Palace came into being in Middle Minoan IB (Evans's date) is unclear; and the details of its phasing - and building history - are under scrutiny. Little is preserved of the building beneath the New Palace. Its plan is likely to have been similar to that one of the New Palace, with the structures surrounding an open space, the Central Court. (The Throne Room opening onto the Central Court dates back to the Old Palace.) Whether the Old Palace grew from a collection of blocks, or insulae, as has often been suggested, is difficult to establish. More certain is that it had (at least) two major building phases, in the later of which the West Court was laid out on a terrace outside the palace and the round pits known as the kouloures were constructed in it (which were probably granaries or possibly places for sacred offerings - compare similar pits at Phaistos and the set of eight circular structures at Mallia). The pits were build over houses of the end of the prepalatal period.

The West Court must have been used as a place of public assembly and thus was linked between palace and town. Roads from the town lead in the direction of the palace. Inside the building, there is evidence on the west side of administration (Hieroglyphic tablets), storage (early storerooms), and, probably, cult practice; the Vat Room deposit seems to consist of ritual offerings. (This combination of functions is particularly noticeable on the west side in New Palace times.) Other store rooms were on the east side, where the giant pithoi and the so-called Royal Pottery Stores were located.

The Loom Weight basement on the east side had over four hundred loom weights as substantial evidence for weaving. That almost all the Middle Minoan pottery that went abroad - to the Aegean islands, mainland Greece and the Levant - came from Knossos or Phaistos workshops suggests that one or both palaces were the leaders in trade and foreign relations.

It is difficult to know whether life in the Old Palace had a large religious component or was primarily secular and whether such modern distinctions are valid at all in the Middle Bronze Age. By the time of the new Palaces, sacred and secular often appear completely interlinked. Nor is clear how much Knossos should be seen as the capital of Middle Minoan Crete. The considerable regional cultural diversity of the Old Palace Period may reflect different political units, whereas the island-wide homogeneity of the New Palace period supports domination from one centre, Knossos.

Little has been recovered from the Old Palace period town. A rescue excavation on the slope west of the palace found well-laid architecture and probable water works. Tombs of the period are known on the hill of Ailias east of the palace (the Ailias and Mavro Spelio cemeteries) and on Gypsades on the south.

The Old Palace was destroyed by unknown means at the end of the Middle Minoan III or, more probably, early in Middle Minoan III. It was immediately rebuilt (despite - or after - an earthquake whose date in later Middle Minoan III or even at the transition to Late Minoan IA is still to be agreed). This rebuilding and the number of grand houses build in the town of Knossos in Late Minoan I (the probable period when the palace expanded most), along with the splendour and the variety of the works of art of the New Palace period, give evidence of the great wealth Knossos must have accumulated by the end of the Old Palace period.

The Minoan town reached its greatest extent, perhaps as much as 75 ha, in Middle Minoan III - Late Minoan I, a time when its population is estimated to have been around 12,000, similar to that of medieval Herakleion. Isolated farms have been detected on the edge of the main settlement.

The New Palace period building program may have slowed only in later Late Minoan IA after earthquakes that may be associated with the eruption of Thera. It did not pick up significantly in Late Minoan IB or Late Minoan II. The unexplored mansion, for instance, was left unfinished in Late Minoan IA.

During Late Minoan IB there was a major destruction by fire in the town of Knossos, the palace apparently being unaffected. Signs of the disaster have been observed in excavations north of the lRoyal Road, in the South House below the south west angle of the palace, and, most strikingly, in new excavations behind the Stratigraphical Museum up slope to the west of the Unexplored Mansion. There the bones of at least four children have been found in what appears to be a ritual context. The bones show butchery marks. With them were edible snails and at least one sheep that had been killed. Most likely the evidence denotes ritual cannibalism, perhaps an attempt to avert the disaster that soon overtook the town of Knossos.

Very few tombs are known of Middle Minoan III - Late Minoan I. The most remarkable is the two-storey Temple Tomb, on the east slope of Gypsades, with its burial chamber, courtyard, and pavilion. Late Minoan I saw the last use of the Ailias cemetery and of the Gypsades tholos tomb.

Late Minoan II brought changes in the culture that continued into LM IIIA and further destruction by fire (on two separate occasions, as observed in the Unexplored Mansion). One immediate change was that burial grounds were dispersed and graves usually for single or family use, rather than communal use as before. A new custom, probably derived from mainland Greece, where it is known first in the Late Helladic I Shaft Graves of Mycenae, was burial with weapons in the so-called Warrior Graves, indicating Late Minoan II-IIIA$_1$ squires or officers, and/or burial with large numbers of bronze vessels (notably in the late Minoan IIIA$_1$ Sellopoulo Tombs 3 and 4 and in the Late Minoan IIIA$_2$ Zapher Papoura Tombs 14 and 36). Similar burials with bronzes have been found at Archanes-Phourni, Phaistos (Kalyvia cemetery), and Chania. Some of these bronzes were made by smiths working at the Unexplored Mansion before it burned down during Late Minoan II.

Other changes at Knossos include the introduction of rectangular chamber tombs with long straight dromoi (seen later, for instance, at Armeni) and of built tholos tombs of mainland Mycenaean derivation rather than Early Minoan and Middle Minoan Mesara type (compare Archanes-Phourni, where both varieties of tholos tomb are found). With them should be place the tholos like Royal Tomb at Isopata (destroyed in World War II) and, perhaps, the Tomb of the Double Axes, which has a grave in the floor in the shape of a double axe. Finally, the contents of many late Minoan II - IIIA$_1$ tombs are closely similar to those of tombs in Mainland Greece and on Rhodes.

The biggest change of all was the appearance of the Greek language in the Linear B script, in a large archive of clay tablets dating from just before the destruction of the palace. The decipherment by Ventris (Ventris and Chatwick 1956) of the script as Greek confirms what the other changes of culture suggest, that Mycenaean Greeks were in charge of Knossos and, probably, of all Crete, which they seem to have controlled by an intensive Knossos-based bureaucracy. They most likely came in the aftermath, or as agents , of the Late Minoan IB destruction by fire that occurred through much of the island.

Late Minoan IIIA$_1$ for many scholars, notably Popham (1970) represents the last phase during which the palace of Knossos functioned as a palace. A fierce fire destroyed the palace early in the Late Minoan IIIA$_2$ phase, marking the end of the New Palace period. But others think the Palace was destroyed at the transition from Late Minoan IIIA$_2$ to Late Minoan IIIB, or even in Late Minoan IIIB. Since 1958 the issue has aroused considerable controversy, which has had the benefit of leading to close study both of the stratigraphy and pottery of the destruction deposits in the palace and of their association with the Linear B tablets. Two issues govern individual views on where, between 1370 and 1190 B.C., the tablets are to be dated: what happened in Crete under Mycenaean rule and whether Knossos remained the principal centre of the island after 1370 (with a relationship to Chania in western Crete that has yet to be defined) or ceded its leading role at that time to Chania, where Linear B literacy continued after 1370 B.C.

The new Palace and the buildings in the town may be considered an architectural unity, although the period at Knossos spans two centuries (or three, according to the new "high" chronology). Determining the functions of the different parts of the palace, or of other buildings, depends partly on evidence through the Late Minoan IB phase and partly on Late Minoan II - $III_{1/2}$ evidence, though there is always an uncertainty in extrapolating from one phase to the other. The principle changes of culture are noted above. Life seems to have continued in much the same way after the arrival of the Mycenaeans.

The west side of the palace, at ground level, was devoted to shrines and storage (of farm produce, works of art, and probably precious raw materials and textiles), with (linear B) administration concentrated in the western half of the north end of the building. The parade of store rooms inside the west facade and the great number of boxes (cists) beneath the floors indicate an enormous storage capacity and wealth. The principal shrine may have been the Throne Room, with the Throne used for a priestess (and queen or princess?) As the epiphany of the Minoan goddess, rather than for a king as Evans thought. On the upper floor great staterooms may be reconstructed, with windows opening onto the West Court that could have been used for ceremonial appearances. Internal approaches to the storerooms are restricted, as the plan shows. The main approach to this part of the palace was from the West Court by the Corridor of the Procession Fresco, in which life-size figures are depicted entering the palace carrying gifts or offerings. Among the finds from the west side are female faience figures holding snakes from the Temple Repositories - boxes beneath the floor in a small room immediately south of the staircase ascending to the upper west side from the Central Court and behind (west of) the Tripartite Shrine that faces onto the Central Court.

The north end of the palace is divided by a passage coming up from the North Pillar Hall, above which there may have been a dining hall like those that have been inferred over the pillared halls at the north ends of the Central Courts at Mallia and Zakro.

The West Court continued in use from Old Palace to New palace times (this was not the case at Phaistos). To the northwest is the Theatral Area, used for receptions, assemblies, or performances and approached by the Royal Road from the west. Its line, if prolonged, continues in the street found in the new excavations behind the Stratigraphical Museum.

The East side of the palace has three floor levels preserved, one at the level of the Central Court and two dug into the east slope of the Kephala hill where it drops towards the Kairatos river. Above the level of the Central Court there would have been at least one more floor. The Grand Staircase, a masterpiece of Minoan architecture, descends from the Central Court to the lower floors, which Evans took to be the Residential or Domestic Quarter of the Palace. A complex group of rooms is similar - on a larger scale - to those at the north end of Phaistos.

Drainage and water systems are well preserved on the east side. There was a system that brought clean water to the lavatory attached to the Dressing Room in the Domestic Quarter and removed dirty water as well as removing storm water from the light wells; and a drainhead and stone drains probably took storm water away from the East Hall that is presumed to have been immediately north of the Grand Staircase.

Of the South front little is preserved. As on the east side, terraces supported the palace buildings. The magnitude of the earthquake that occurred in Middle Minoan IIIB (or at the beginning of Late Minoan IA) is clear in the House of the Fallen Blocks close to the south front. Here huge stone blocks fell from the Palace facade into the house, where they are still to be seen. The blocks themselves are also evidence of the imposing scale of the first phase of the New Palace.

Frescoes adorned the walls of both the palace and other buildings in the town. Study of the Late Cycladic I (Late Minoan IA) frescoes at Akrotiri on Thera suggests that the Knossos frescoes have a thematic character centred on the Minoan goddess and her worship. In the later years of the New Palace period, frescoes of chariot driving scenes were painted, probably at the command of the Mycenaean rulers.

Little is known of the town of Knossos in the New Palace period. Most buildings excavated are grand town house, which may be com pared to the grand houses in the country such as those at Makryyialos, Myrtos-Pyrgos, Tylissos, or Vathypetro. Some of the town houses, such as the South House and the House of the Chancel Screen, impinge on the palace almost as much as the houses at Zakro do on the palace there. This might indicate the power of nobility, or it may have some humbler explanation, such as lack of space or force of habit. We know least about places where ordinary people lived. We have some idea of workshops. Kilns, for instance, have been found southeast of the palace and in the excavations behind the Stratigraphical Museum; and the Unexplored Mansion (so called because for a long time it was known to be there but had not been investigated) had a bronze smithy in Late Minoan II.

Post palatial Knossos, though still important, was less so than Chania, which with its evidence for continued Linear B literacy and for trade links with Cyprus and mainland Greece, probably became the capital of Crete when Knossos fell. Ayia Triada, with Kommos nearby, also rose in importance at this time.

Traces of the Late Minoan IIIA$_2$ - IIIB use are found scattered throughout the town, but it is likely that occupation was much less intensive than before. The palace seems to have been a ruin with people inhabiting cleared-out parts; most rooms were full of debris. (This story is different for those who date the destruction of the palace to late in Late Minoan IIIB.) Similarly, the Unexplored Mansion, which had some use in Late Minoan IIIA$_2$, was a ruin by Late Minoan IIIB, with a shrine on the upper floor. Another Late Minoan IIIB shrine, set up in the former lustral Basin of the Little Palace, was furnished with curious natural stone concretions, which Evans interpreted as fetish symbols.

The new excavations behind the stratigraphical Museum have revealed no buildings of Late Minoan IIIB date, but there is a new and extensive Late Minoan IIIC settlement, with several phases continuing into Sub-Minoan, that adds that adds greatly to our hitherto scantly knowledge of this time at Knossos. Finds from nearby rescue excavations suggest that this Late Minoan IIIC - Sub-Minoan settlement west of the palace ruins was quite large and could have served as the nucleus for Knosssians using widely dispersed cemeteries. Unusual discoveries in the new excavations are a horse's skull and intramural burials of babies under the floor, which was a mainland Mycenaean practice(found at Knossos earlier in the Late Minoan II [Mycenaean] use of the Unexplored mansion). These burials along with mainland traits in the pottery suggest that some settlers at this new spot were Mycenaeans. Rooted more in the Minoan tradition is the use of the Spring Chamber next to the Caravanserai just above the Vlychia stream as a shrine, It was a fountain house in the New Palace period.

The principal Late Minoan IIIC - Sub-Minoan evidence is from tombs: in the Gypsades cemetery to the south, the Fortetsa cemetery and the newly excavated North Cemetry to the north, some burials in the Mavro Spelio cemetry to the east, and the reuse of the Kephala tholos tomb and the Royal Tomb at Isopata. The Fortetsa cemetry and the North Cemetry, both about 1.5 km northwest of the palace, came into use in this phase (and Gypsades went out of use), and they continued to be used into the Protogeometric period and for a long time thereafter. At Knossos, then, there was a continuity both of inhabitation during the transition from the Bronze Age to the Iron Age and of occupation of a long-established lowland centre, even if its cemeteries were spread over 5 km. Elsewhere in Crete at this time people retreated to mountain strongholds such as Karphi, Kavousi, and Vrokastro. Political conditions were not the same throughout the island.

The Charter of Athens

Adopted at the First International Congress of Architects and Technicians of Historic Monuments, Athens 1931

At the Congress in Athens the following seven main resolutions were made and called "Carta del Restauro":

1. International organizations for Restoration on operational and advisory levels are to be established.

2. Proposed Restoration projects are to be subjected to knowledgeable criticism to prevent mistakes which will cause loss of character and historical values to the structures.

3. Problems of preservation of historic sites are to be solved by legislation at national level for all countries.

4. Excavated sites which are not subject to immediate restoration should be reburied for protection.

5. Modern techniques and materials may be used in restoration work.

6. Historical sites are to be given strict custodial protection.

7. Attention should be given to the protection of areas surrounding historic sites.

General Conclusions of the Athens Conference

I. -- DOCTRINES. GENERAL PRINCIPLES.

The Conference heard the statement of the general principles and doctrines relating to the protection of monuments.

Whatever may be the variety of concrete cases, each of which are open to a different solution, the Conference noted that there predominates in the different countries represented a general tendency to abandon restorations *in toto* and to avoid the attendant dangers by initiating a system of regular and permanent maintenance calculated to ensure the preservation of the buildings.

When, as the result of decay or destruction, restoration appears to be indispensable, it recommends that the historic and artistic work of the past should be respected, without excluding the style of any given period.

The Conference recommends that the occupation of buildings, which ensures the continuity of their life, should be maintained but that they should be used for a purpose which respects their historic or artistic character.

II. -- ADMINISTRATIVE AND LEGISLATIVE MEASURES REGARDING HISTORICAL MONUMENTS

The Conference heard the statement of legislative measures devised to protect monuments of artistic, historic or scientific interest and belonging to the different countries.

It unanimously approved the general tendency which, in this connection, recognises a certain right of the community in regard to private ownership.

It noted that the differences existing between these legislative measures were due to the difficulty of reconciling public law with the rights of individuals.

Consequently, while approving the general tendency of these measures, the Conference is of opinion that they should be in keeping with local circumstances and with the trend of public opinion, so that the least possible opposition may be encountered, due allowance being made for the sacrifices which the owners of property may be called upon to make in the general interest.

It recommends that the public authorities in each country be empowered to take conservatory measures in cases of emergency.

It earnestly hopes that the International Museums Office will publish a repertory and a comparative table of the legislative measures in force in the different countries and that this information will be kept up to date.

III. -- AESTHETIC ENHANCEMENT OF ANCIENT MONUMENTS.

The Conference recommends that, in the construction of buildings, the character and external aspect of the cities in which they are to be erected should be respected, especially in the neighbourhood of ancient monuments, where the surroundings should be given special consideration. Even certain groupings and certain particularly picturesque perspective treatment should be preserved.

A study should also be made of the ornamental vegetation most suited to certain monuments or groups of monuments from the point of view of preserving their ancient character. It specially recommends the suppression of all forms of publicity, of the erection of unsightly telegraph poles and the exclusion of all noisy factories and even of tall shafts in the neighbourhood of artistic and historic monuments.

IV. -- RESTORATION OF MONUMENTS.

The experts heard various communications concerning the use of modern materials for the consolidation of ancient monuments. They approved the judicious use of all the resources at the disposal of modern technique and more especially of reinforced concrete.

They specified that this work of consolidation should whenever possible be concealed in order that the aspect and character of the restored monument may be preserved.

They recommended their adoption more particularly in cases where their use makes it possible to avoid the dangers of dismantling and reinstating the portions to be preserved.

V. -- THE DETERIORATION OF ANCIENT MONUMENTS.

The Conference noted that, in the conditions of present day life, monuments throughout the world were being threatened to an ever-increasing degree by atmospheric agents.

Apart from the customary precautions and the methods successfully applied in the preservation of monumental statuary in current practice, it was impossible, in view of the complexity of cases and with the knowledge at present available, to formulate any general rules.

The Conference recommends:

1. That, in each country, the architects and curators of monuments should collaborate with specialists in the physical, chemical, and natural sciences with a view to determining the methods to be adopted in specific cases;

2. That the International Museums Office should keep itself informed of the work being done in each country in this field and that mention should be made thereof in the publications of the Office.

With regard to the preservation of monumental sculpture, the Conference is of opinion that the removal of works of art from the surroundings for which they were designed is, *in principle*, to be discouraged. It recommends, by way of precaution, the preservation of original models whenever these still exist or if this proves impossible, the taking of casts.

VI. -- THE TECHNIQUE OF CONSERVATION.

The Conference is gratified to note that the principles and technical considerations set forth in the different detailed communications are inspired by the same idea, namely:

In the case of ruins, scrupulous conservation is necessary, and steps should be taken to reinstate any original fragments that may be recovered (anastylosis), whenever this is possible; the new materials used for this purpose should in all cases be recognisable. When the preservation of ruins brought to light in the course of excavations is found to be impossible, the Conference recommends that they be buried, accurate records being of course taken before filling-in operations are undertaken.

It should be unnecessary to mention that the technical work undertaken in connection with the excavation and preservation of ancient monuments calls for close collaboration between the archaeologist and the architect.

With regard to other monuments, the experts unanimously agreed that, before any consolidation or partial restoration is undertaken, a thorough analysis should be made of the defects and the nature of the decay of these monuments. They recognised that each case needed to be treated individually.

VII. -- THE CONSERVATION OF MONUMENTS AND INTERNATIONAL COLLABORATION.

a) Technical and moral co-operation.

The Conference, convinced that the question of the conservation of the artistic and archaeological property of mankind is one that interests the community of the States, which are wardens of civilisation, Hopes that the States, acting in the spirit of the Covenant of the League of Nations, will collaborate with each other on an ever-increasing scale and in a more concrete manner with a view to furthering the preservation of artistic and historic monuments;

Considers it highly desirable that qualified institutions and associations should, without in any manner whatsoever prejudicing international public law, be given an opportunity of manifesting their interest in the protection of works of art in which civilisation has been expressed to the highest degree and which would seem to be threatened with destruction;

Expresses the wish that requests to attain this end, submitted to the Intellectual Co-operation Organisation of the League of Nations, be recommended to the earnest attention of the States.

It will be for the International Committee on Intellectual Co-operation, after an enquiry conducted by the International Museums Office and after having collected all relevant information, more particularly from the National Committee on Intellectual Co-operation concerned, to express an opinion on the expediency of the steps to be taken and on the procedure to be followed in each individual case.

The members of the Conference, after having visited in the course of their deliberations and during the study cruise which they were able to make on this occasion, a number of excavation sites and ancient Greek monuments, unanimously paid a tribute to the Greek Government, which,
for many years past, has been itself responsible for extensive works and, at the same time, has accepted the collaboration of archaeologists and experts from every country.

The members of the Conference there saw an example of activity which can but contribute to the realisation of the aims of intellectual co-operation, the need for which manifested itself during their work.

b) The role of education in the respect of monuments.

The Conference, firmly convinced that the best guarantee in the matter of the preservation of monuments and works of art derives from the respect and attachment of the peoples themselves;

Considering that these feelings can very largely be promoted by appropriate action on the part of public authorities;

Recommends that educators should urge children and young people to abstain from disfiguring monuments of every description and that they should teach them to take a greater and more general interest in the protection of these concrete testimonies of all ages of civilisation.

c) Value of international documentation.

The Conference expresses the wish that:

1. Each country, or the institutions created or recognised competent for this purpose, publish an inventory of ancient monuments, with photographs and explanatory notes;

2. Each country constitute official records which shall contain all documents relating to its historic monuments;

3. Each country deposit copies of its publications on artistic and historic monuments with the International Museums Office;

4. The Office devote a portion of its publications to articles on the general processes and methods employed in the preservation of historic monuments;

5. The Office study the best means of utilising the information so centralised.

Source: http://www.icomos.org/athens_charter.html

Analysis of Repair Mortars
Palace of Minos, Knossos, Crete.
(AP 206)

For:

The Institute of Advanced Architectural Studies,
The University of York.

18th March 1998

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Introduction

Eight samples of mortar were received by the Scottish Lime Centre in February 1998. The mortar samples were taken from various phases of repair to the Palace of Minos, Knossos, Crete which were carried out between 1900 and 1930. Two main questions were raised:

1 The identity of the binder (lime, cement, clay etc.).

2 The overall strength of the mortar.

Information supplied suggested that there had been three phases of repair, under different architects who had different opinions regarding the conservation of historic buildings. Individual samples were supplied simply with a number in order to avoid subjectivity during the analysis process.

Given the difference in mortar type in this project compared with the majority of samples analysed by the Scottish Lime Centre, the following points are relevant.

1 The aggregate may contain significant quantities of calcium carbonate (limestone), thus distorting the binder : aggregate ratio determined by acid dissolution.

2 The original mortar in the Palace of Minos contains a clay binder; if clay is used as a binder then the identification and quantification of hydraulic or cementitious materials is difficult.

The small sample size (samples 4, 5, 6 and 8 are 12 g or less; a minimum sample size of 50 g is normally requested) means that the composition of the mortar given below is semi-quantitative. There is a danger that the small samples are not representative of the overall composition of the mortar and therefore that the variations observed are not a true representation of the differences in mortar mix specifications.

Mortar analysis by acid dissolution

The samples were examined under a binocular microscope before disaggregation and were then placed in a 10% solution of hydrochloric acid. After acid dissolution was complete, the acid insoluble residue was filtered, dried, disaggregated and passed through British Standard sieves. The results are summarised in Table 1.

Sample examination

Colour

The majority of the samples have an off-white to very pale brown colouration. Sample 2 and to an extent sample 5 have a brown grey colour, while sample 8 has a distinct light pink colour.

Lime inclusions

All samples except numbers 3 and 4 contain lime inclusions (calcium carbonate which represents lime putty of other binder ingredients that were not properly mixed during mortar manufacture). Lime inclusions are not abundant in any sample, and it is probable that they are simply not represented in samples 3 & 4, but are present in all of the mortars.

Fractures

Samples 3, 5, 6 and 7 contain fractures within the binder. These fractures are common in samples 3 and 6.

Lime coatings

Samples 1, 2, 4 and 7 have surfaces which are coated in calcium carbonate.

Other observations

The samples are commonly porous with an aggregate containing dark clasts, possibly a basic igneous rock, and abundant quartz. Samples 5 and 8 had identifiable brick fragments.

The aggregate was observed to be coarse grained and in some samples limestone was identified. Two samples, numbers 2 and 3, may have also contained broken shell fragments. While the limestone aggregate could be identified, it could not be quantified and was lost during acid dissolution.

Samples 1 and 2 were observed to be slightly more resistant to crushing, however the small size of some samples made comparison very difficult.

Residue sieving

The acid insoluble residue can be subdivided into several components.

1 Aggregate (non carbonate).

2 Clay or fine aggregate.[1]

3 Gypsum.

4 Residues from hydraulic limes or cements.

5 Other materials such as coal or brick or tile fragments.

[1] The term clay is here used to denote fine grained material used as a binder as opposed to fines in an aggregate. The distinction is, to an extent, subjective and is based on an assumption of the proportion of fine material which would be expected in a reasonably sorted natural aggregate.

The non carbonate aggregate in all of the samples appears to be similar, containing quartz, a variety of basic igneous rocks with colours (black, green, red) reflecting the complex ferromagnesian silicate mineralogy, feldspar and mica. Quartz is by far the most common, with most igneous rock fragments >0.5 mm and most feldspar and mica fragments <0.5 mm.

The fine fraction (clasts <0.15 mm) contains fine sand and silt as well as clay. A visual estimate was made of the proportions of clay and sand / silt. In most of the samples there is a significant quantity of clay which has an olive brown colouration. In sample 5 all of the residue passed the finest sieve.

Gypsum is only present in sample 1, where it forms a significant part of the mortar composition. The gypsum in the residue is present as fragments of various sizes.

Residues from hydraulic lime or cementitious binders could not be identified during analysis. These residues cannot be distinguished from clay material without detailed chemical analysis which itself is not always conclusive.

All of the samples contain small fragments of coal, this is probably an impurity from the lime burning process. Samples 1, 2, 3, 5 and 8 contain fragments of brick or tile, and sample 2 contains small wood fragments.

Table 1: relative abundances of main mortar constituents.

Sample	1	2	3	4	5	6	7	8
Lime & limestone	7.4	3.2	6.9	20.0	1.6	22.0	4.0	1.1
Gypsum	0.8	0	0	0	0	0	0	0
Clay	0.4	1.5	0.4	1.7	1.0	2.5	0.2	0.1
Sand	1	1	1	1	-	1	1	1

All figures are expressed as proportions relative to the abundance of aggregate (sand).

Discussion

All of the samples appear to have been made up from the following components:

1 An aggregate containing limestone, igneous rock, quartz and other minor minerals.

2 Lime binder, possibly a crudely slaked putty or dry hydrate.

3 Clay, almost certainly added as a binder and not part of the aggregate.

In addition, sample 1 contains significant amounts of gypsum, either a binder or fragments of plaster incorporated into the sample; sample 8 contains common fragments of brick or tile.

There is also evidence for the remobilization of lime in samples 1, 2, 4 and 7. Lime is slightly soluble, and can be dissolved and reprecipitated during weathering. This process can lead to distortions in the apparent lime content of a mortar, and can also cause the mortar to appear to be stronger and better bound.

Conclusions

In answer to the original queries:

1 The identity of the binder (lime, cement, clay etc.).

The binder appears to have been a mixture of clay and lime. Sample 1 also contains a proportion of gypsum (which may be a contaminant). Although this cannot be quantified, many of the samples appear to be binder rich. The evidence of shrinkage in samples 3, 5, 6 and 7 appears to confirm this.

2 The overall strength of the mortar.

The mortars appear to be relatively soft with little evidence of the use of cementitious binders. Samples 1 and 2 appeared to be more resistant to crushing, but also showed evidence of the remobilization of lime which can increase apparent strength.

The mortars cannot be subdivided readily into groups but the following distinctions are probably significant:

Sample 1 can be distinguished by the presence of gypsum, assuming that it is not a contaminant.

Sample 8 has a higher proportion of brick or tile (sufficiently high to give a distinct colour difference).

Samples 4 and 6 have very high lime / limestone : sand ratios, and also have relatively high clay : sand ratios.

Sample 5 has very little (non carbonate) coarse grained aggregate.

As shown by Table 1 the mortar composition is variable over a significant range. This probably reflects both the small sample size (and thus increased analytical error) and the unknown quantity of limestone aggregate.

Alick Leslie
For the Scottish Lime Centre Trust

Φ16 /1938

Αρχαιολογικό Μουσείο
Ηρακλείου Κρήτης

Archaeological Museum
of Heraklion Crete
GREECE

Heraklion 19.5.97

Information: Eleni Banou

To: Peter Kienzle
University of York
The King's Manor
York YO1 2EP
U.S.A.

In reply to your letter of September 7th I must say I find very interesting the results of your research regarding the different phases of reconstruction of various areas of the Palace at Knossos by different architects.

Since the repair mortars you ask permission to analyse are not antique you may proceed with the work in the time of your convenience provided that upon your arrival you contact with us so that we notify the antiquity quards accordingly.

Looking forward to meeting you.

Sincerely yours
The Director

Alexandra Karetsou

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