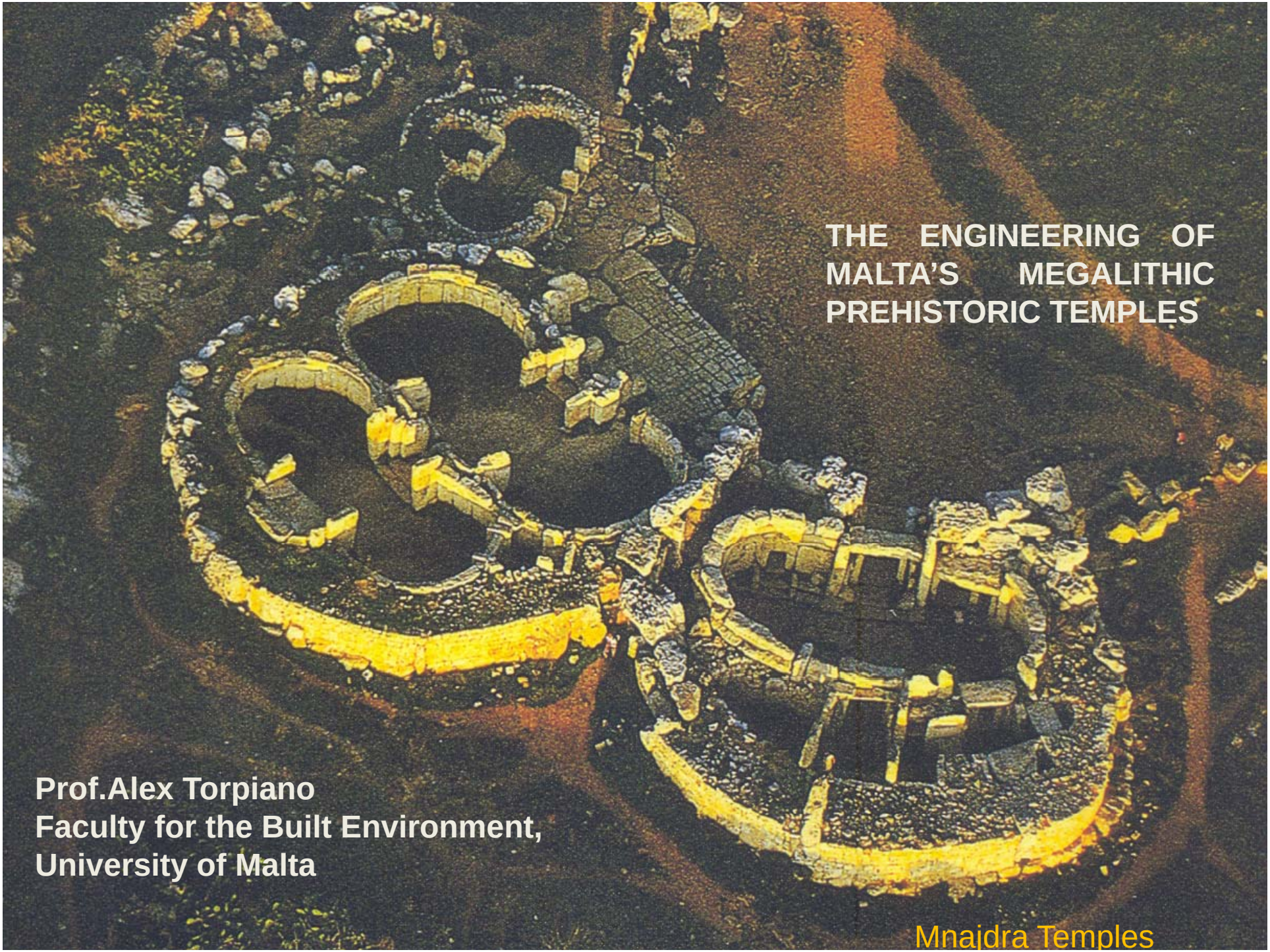
THE ENGINEERING OF MALTA'S MEGALITHIC PREHISTORIC TEMPLES

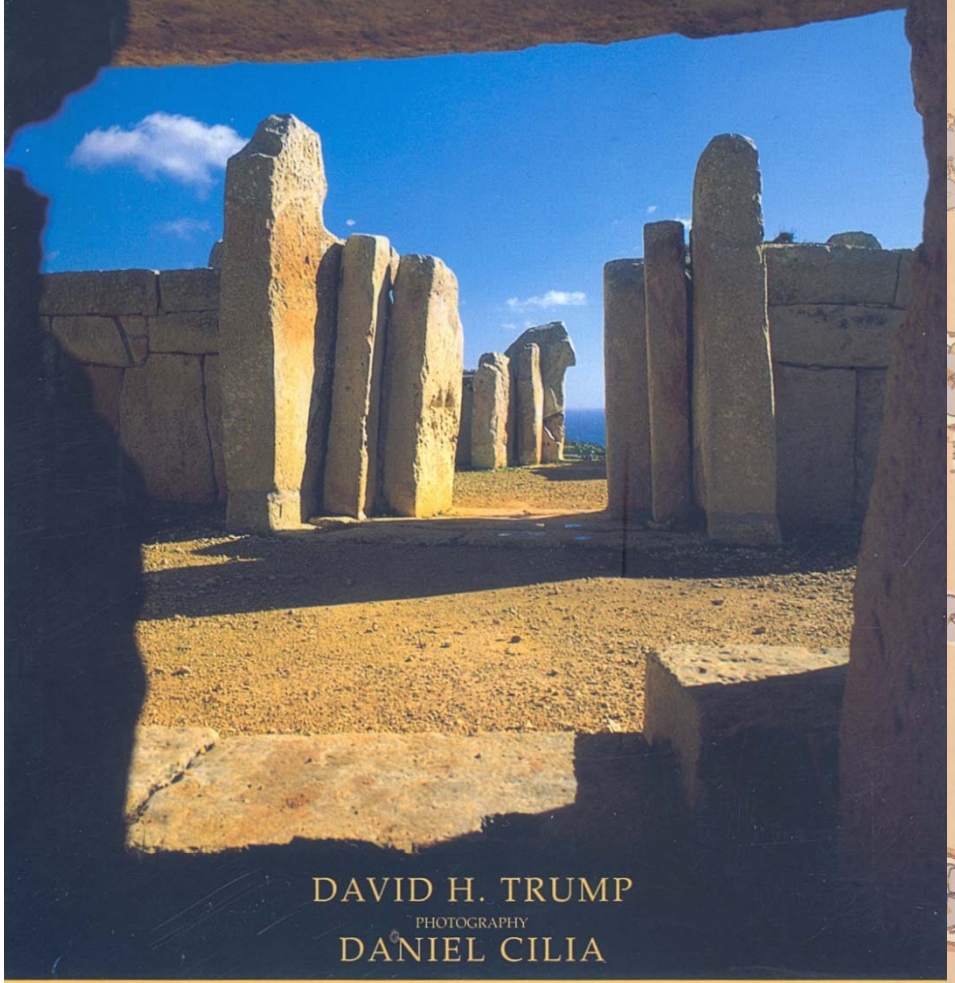
Prof.Alex Torpiano
Faculty for the Built Environment,
University of Malta



Mnajdra Temples

MALTA'S LIVING HERITAGE

MALTA
PREHISTORY AND TEMPLES



DAVID H. TRUMP

PHOTOGRAPHY

DANIEL CILIA

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Acknowledgements:
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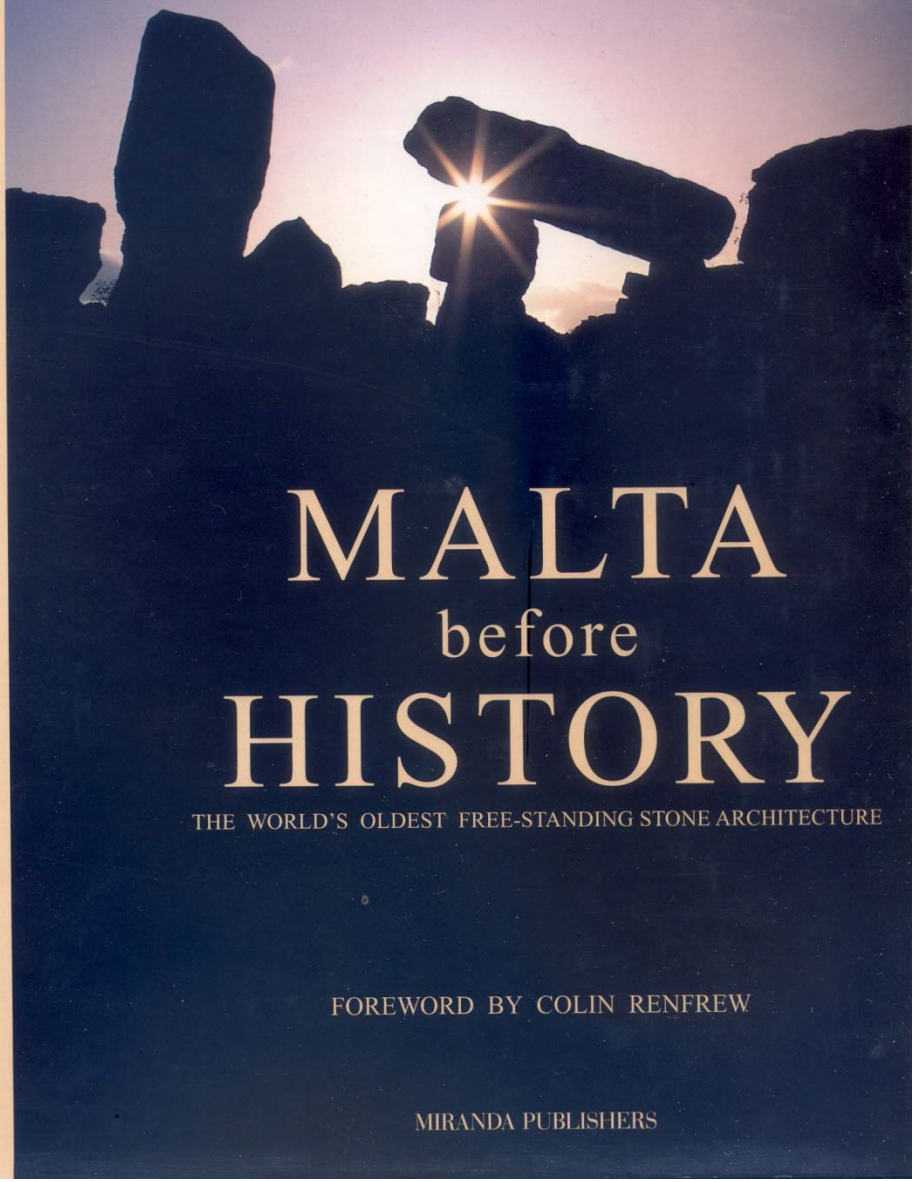


MALTA
before HISTORY

THE WORLD'S OLDEST FREE-STANDING STONE ARCHITECTURE

FOREWORD BY COLIN RENFREW

MIRANDA PUBLISHERS

SUMERIAN CIVILISATION, 4000-3000 BC – birthplace of wheeled vehicles, metalwork, and seagoing navigation

EARLIEST STONE BUILDINGS IN SAQQARA, EGYPT, dated 2600 BC

NEOLITHIC

SITES:
GĦAR DALAM
GĦAJN GĦABDUN (Gozo)
SKORBA

GĦAR DALAM	5200-4500 BC
GREY SKORBA	4500-4400 BC
RED SKORBA	4400-4100 BC

TEMPLE PERIOD

SITES:
XEMXIJA
HAL SAFLIENI
ĠGANTIJA
MNAJDRA
TA' ĦAĠRAT
TARXIEN
ĦAĠAR QIM

ŻEBBUĠ	4100-3800 BC
MĠARR	3800-3600 BC
ĠGANTIJA	3600-3000 BC
SAFLIENI	3300-3000 BC
TARXIEN	3000-2500 BC

BRONZE AGE

SITES:
TARXIEN CEMETERY
BORĠ IN-NADUR FORTIFICATIONS
NUFFARA SETTLEMENT (Gozo)
BAĦRIJA SETTLEMENT

TARXIEN CEMETERY	2500-1500 BC
BORĠ IN-NADUR	1500 BC-?
BAĦRIJA	900 BC-8th Cen

WHEN?

TIME-LINE

by recalibrated radioactive carbon, Prof.J.D.Evans, University of London

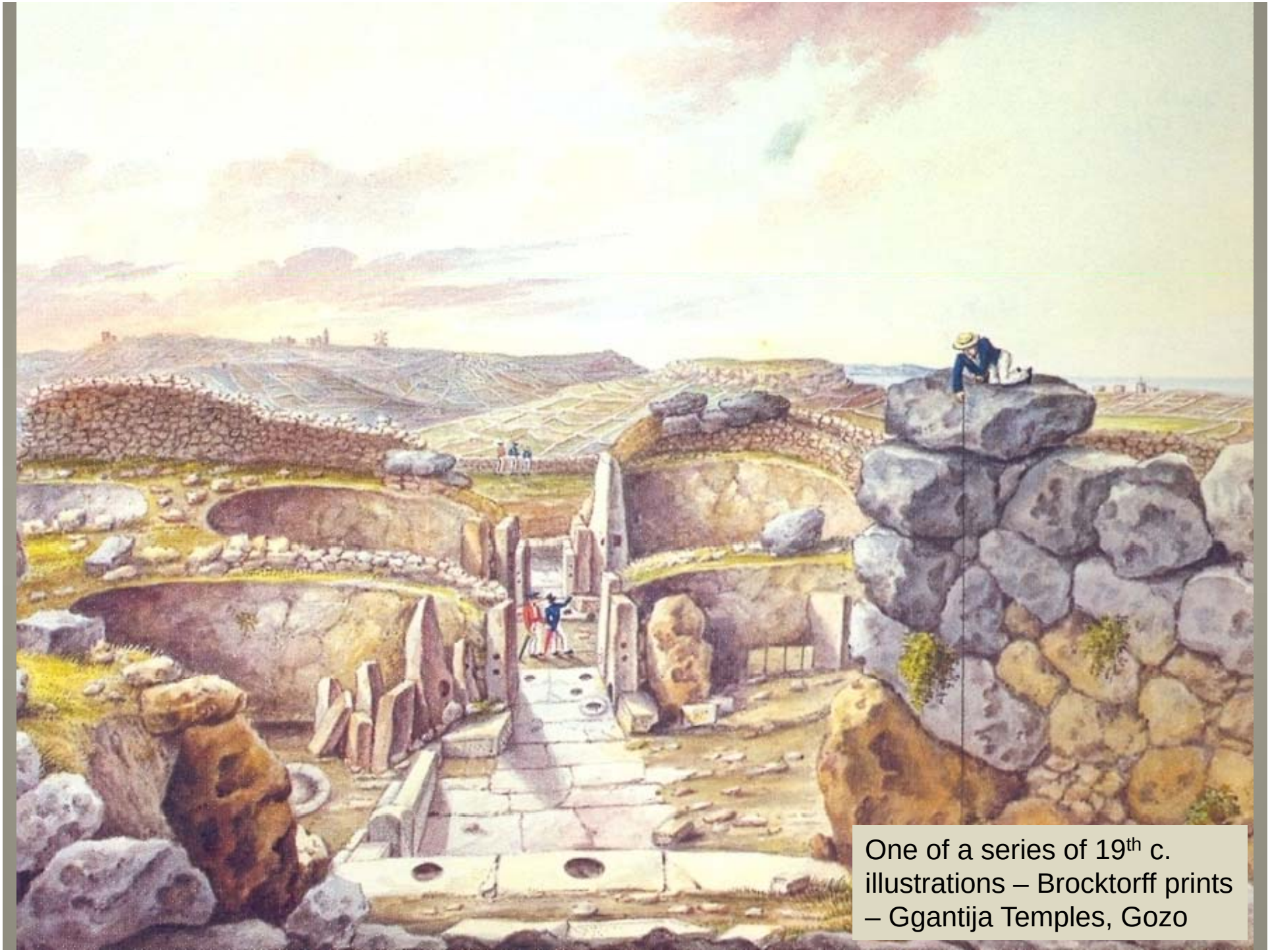
MALTA'S MEGALITHIC PREHISTORIC TEMPLES

WHERE?

Structures with similar characteristics, found in other neighbouring Mediterranean countries, such as the Balearics, the Copper Age Iberian Peninsula, or Sardegna, generally have a much younger pedigree, and, in any case, do not have the whole range of characteristics of the Maltese megalithic structures.

The first human settlers probably came to Malta from Sicily around 5200BC; but no similar complexes of temple structures been found in Sicily.


SANTA VERNA
Gozo
ĠGANTIJA
Of giants
Comino
BUĠIBBA
TAL-QADI
KORDIN III
XROBB L-GĦAĠIN
TARXIEN
TA' MARŻIENA
XAGHRA CIRCLE
BORĠ L-IMRAMMA
TAS-SILĠ
Malta
TA' ĦAĠRAT
SKORBA
MNAJDRA
Filfla
HAL SAFLIENI
HAĠAR QIM
Some thirty prehistoric sites have been uncovered to-date in the barely 124 square miles, (*320 sq.km),* surface area of Malta and Gozo.
Hagar – stones
Qim – worship or upright



One of a series of 19th c. illustrations – Brocktorff prints – Ggantija Temples, Gozo

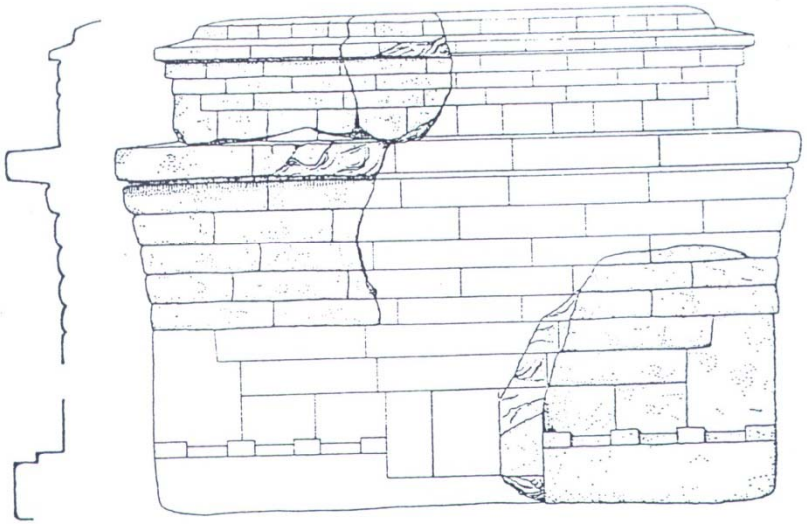
Archaeological discovery in the 19th / early 20th c.

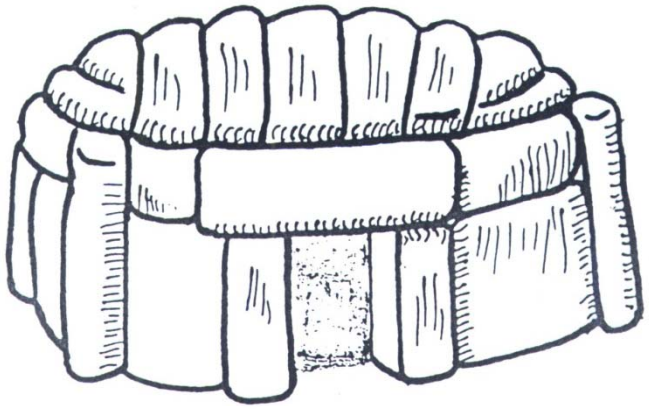
Early photograph of Ggantija South Temple, Gozo


First recorded Site Instruction?
Or early graffiti?

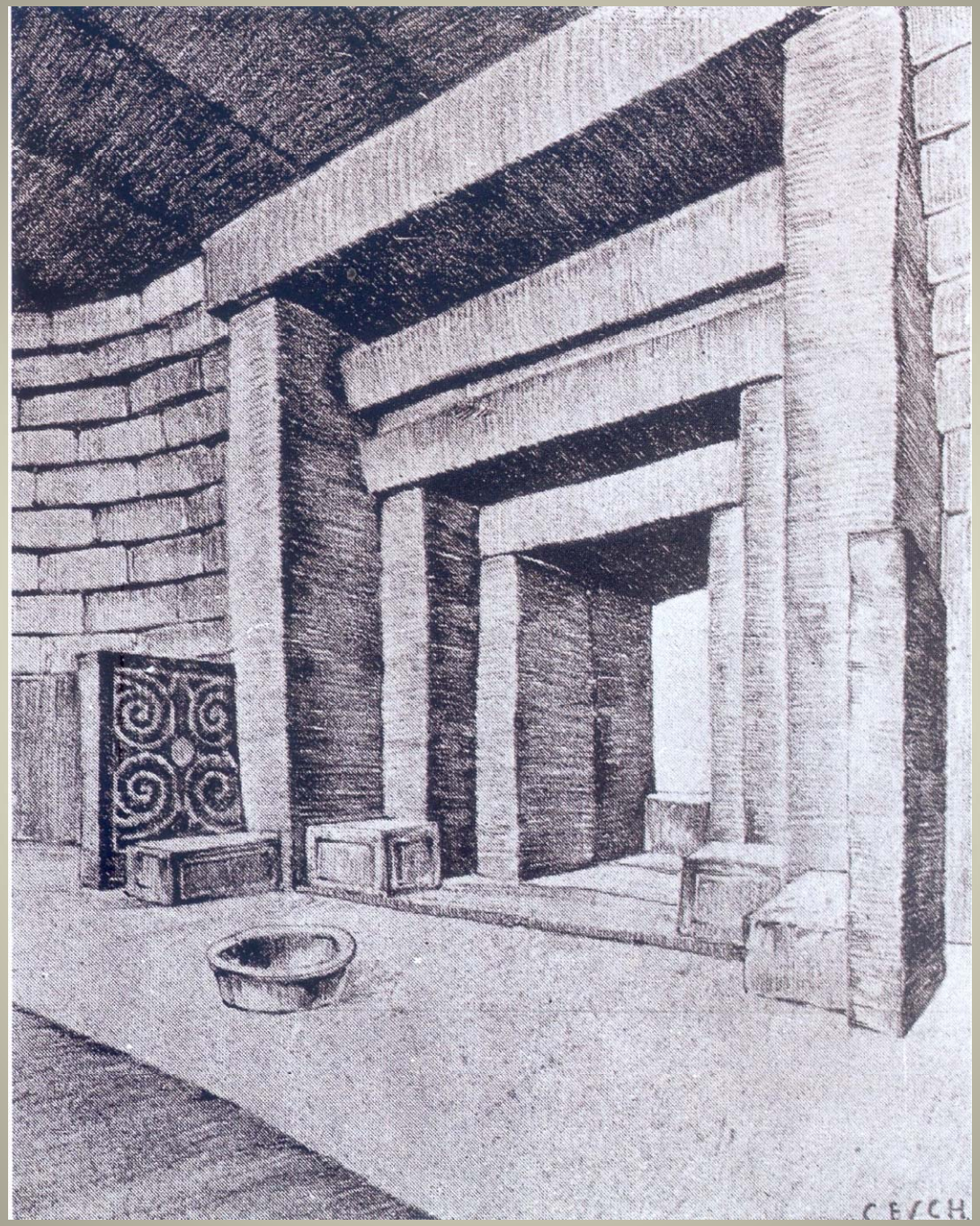
Model of temple? – Probably votive offering.

Reconstruction of temple façade, based on discovered fragments.

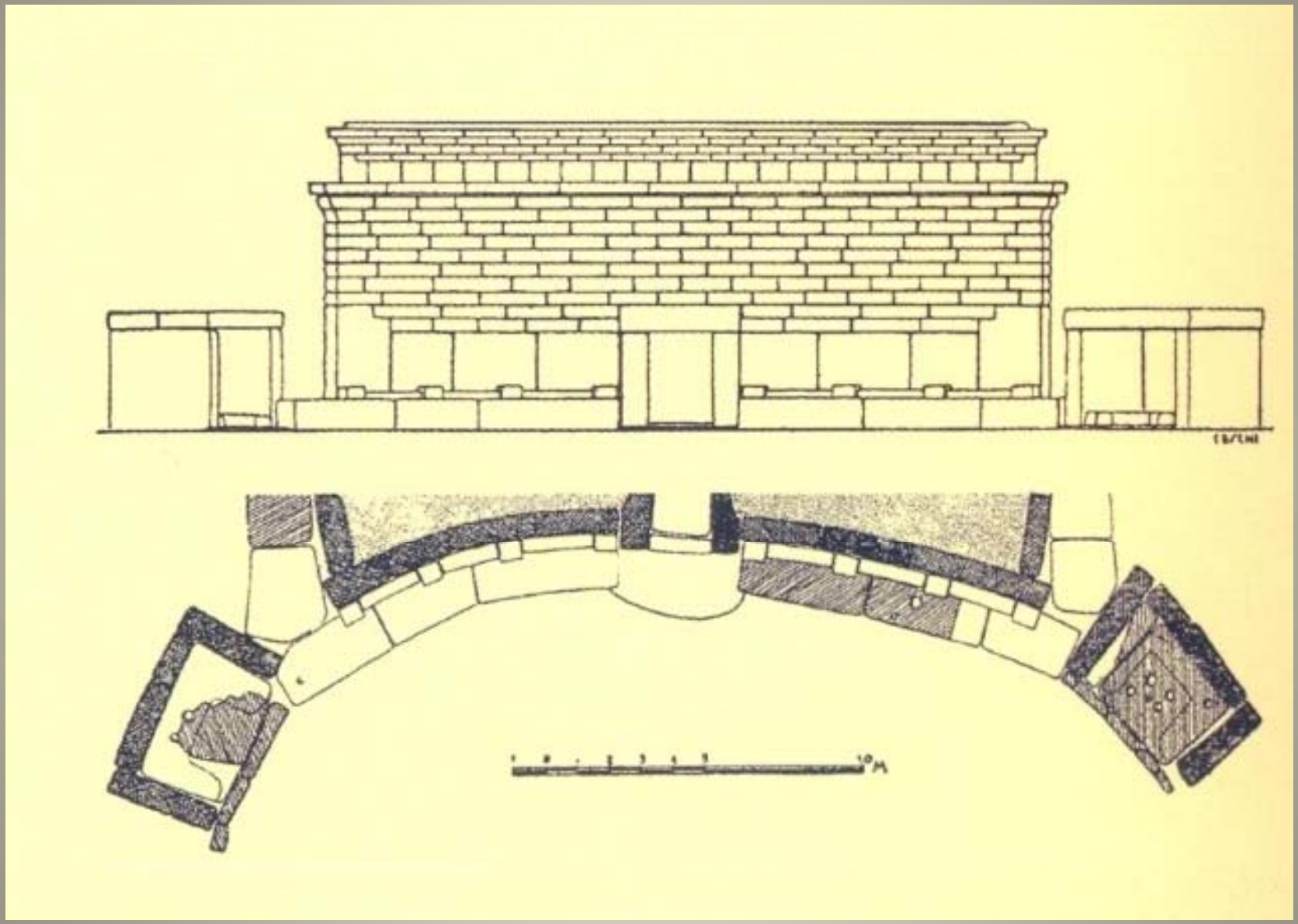




Interior of underground Hypogeum, Tarxien, cut into rock – model of above-ground structures?



Reconstruction by Ceschi, 1939



Reconstruction by Ceschi, 1939

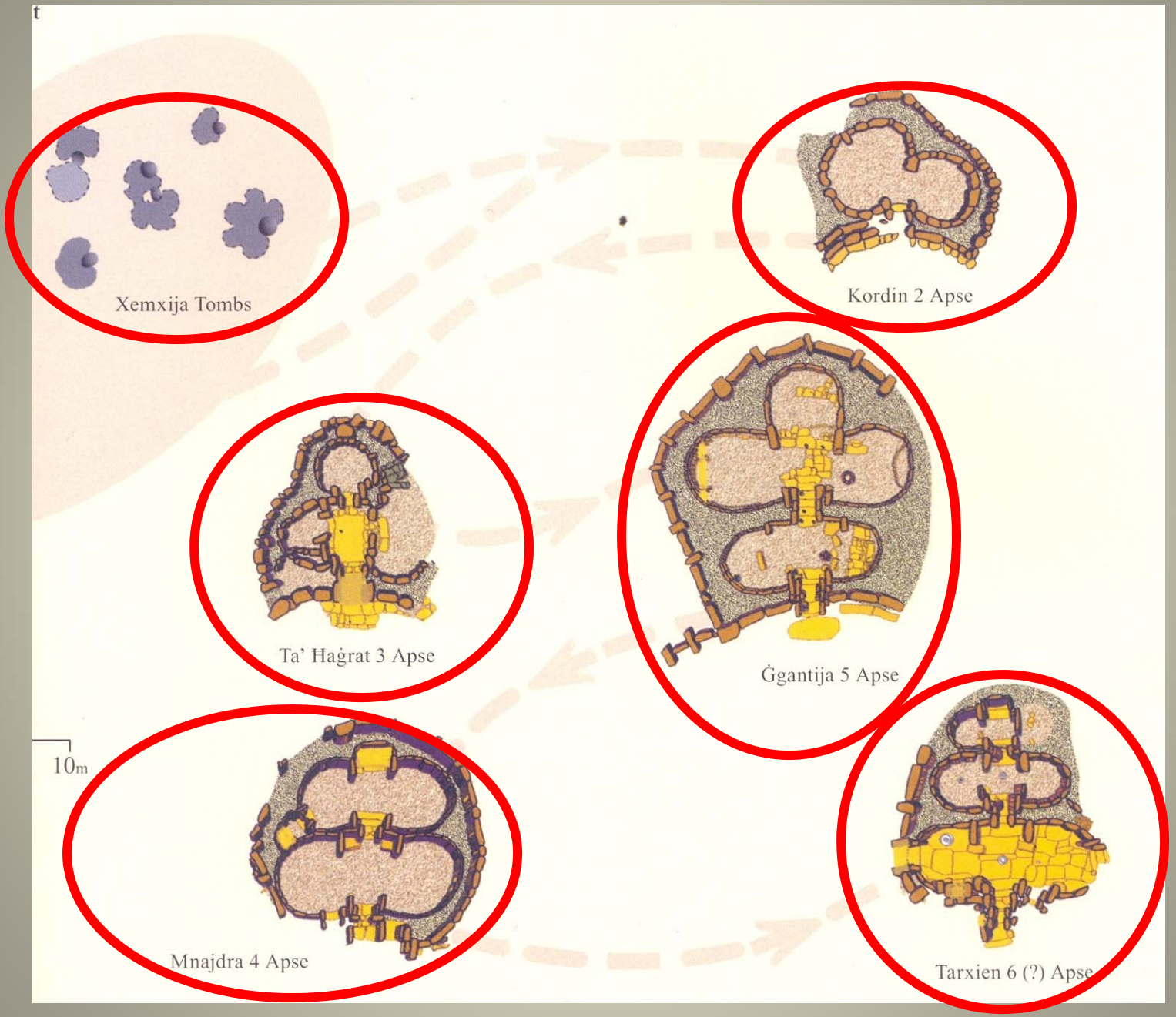
SHAPE AND MODELS

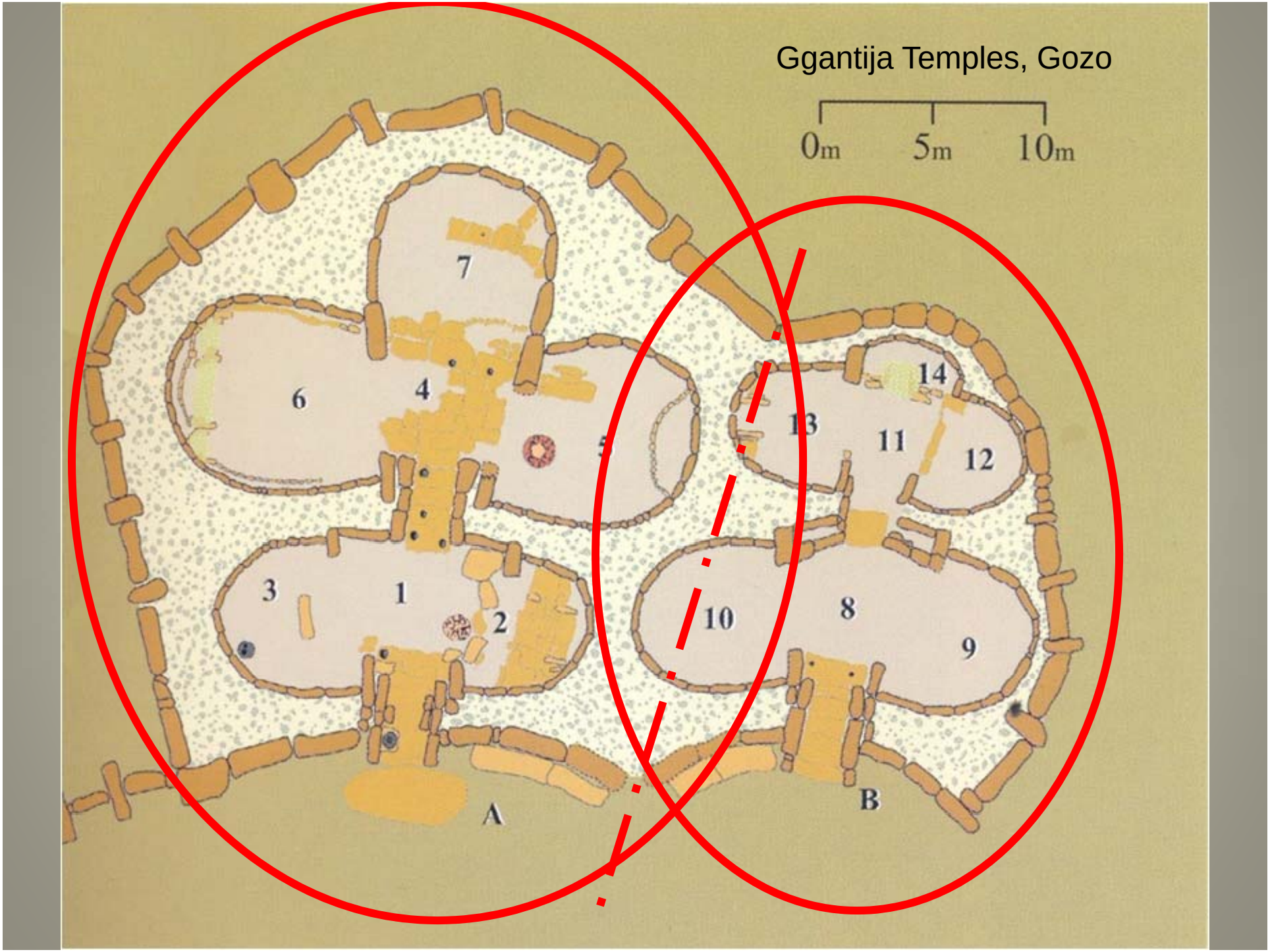
- plan typologies

Note:

The temple plan typologies range from the **trefoil** of Mgarr, or Mnajdra (Upper Temple), through the **five lobes** of Ggantija or Mnajdra (Lower and Middle Temple), to the **seven lobes** of Tarxien. The temples have obviously been modified over the centuries, sometimes extensively. The odd apse, in these configurations, is the one at the end of the axes of the temples – which is more or less developed depending on the site. It is reasonable to presume that the sequence of pairs of apses, along a **linear axis**, owes at least as much to constructional and structural requirements, as to the requirements of ritual.

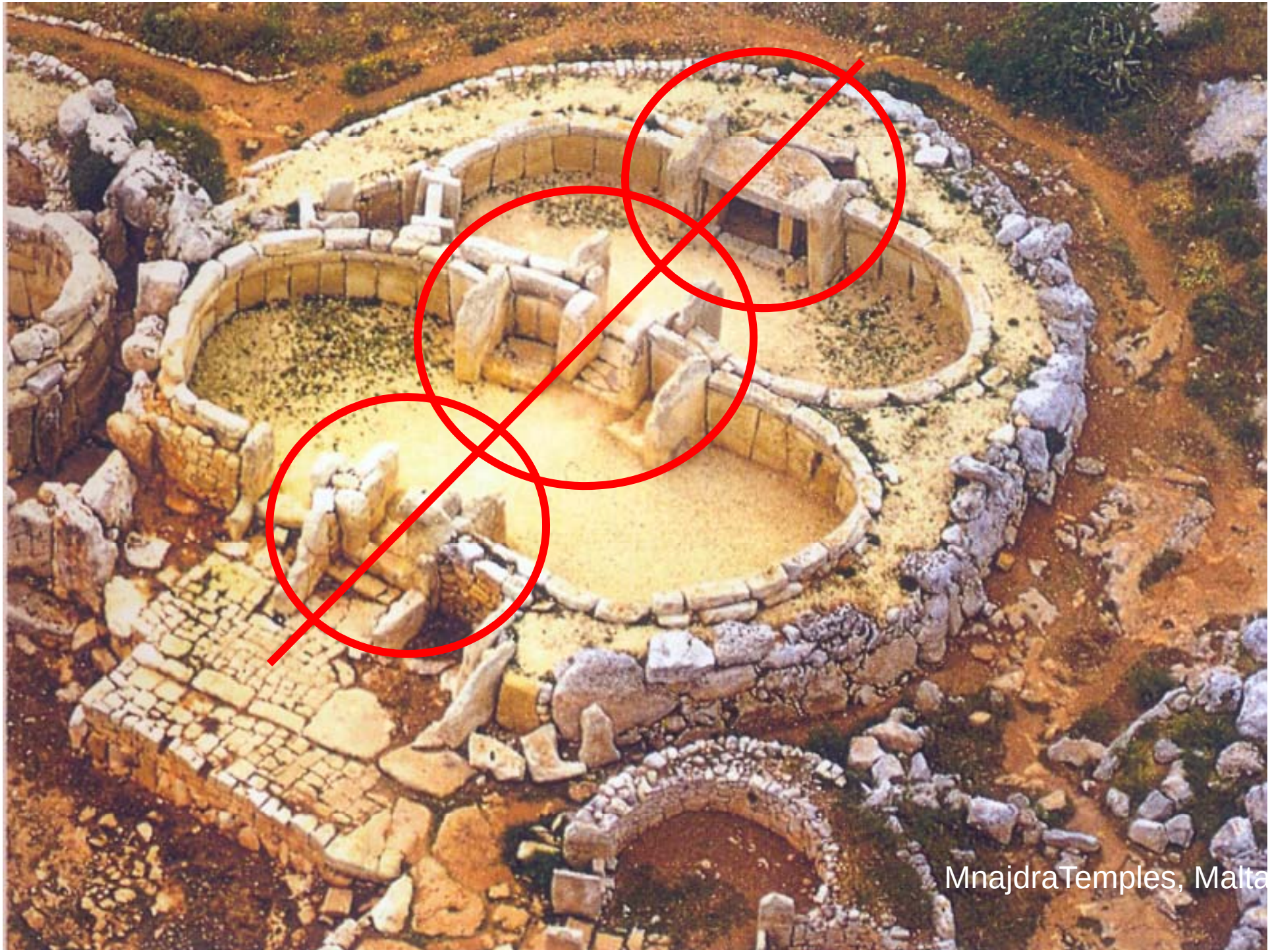
It is reasonable to ascribe the origin of the plan shape to the **multi-lobed underground funerary chambers**, found all over Europe. In the typical configuration, the single-cell funerary chamber gradually develops side spaces, which are spatially and structurally subservient to the main one. Where these underground chambers are not dug into the rock, the main structural unit consists of the ubiquitous conical corbelled dome. In the local temples, this central unit is missing, and the structural unit is, consistently, the pair of apses joined together. The temple structure is thus a sequence of such **paired structural units**.

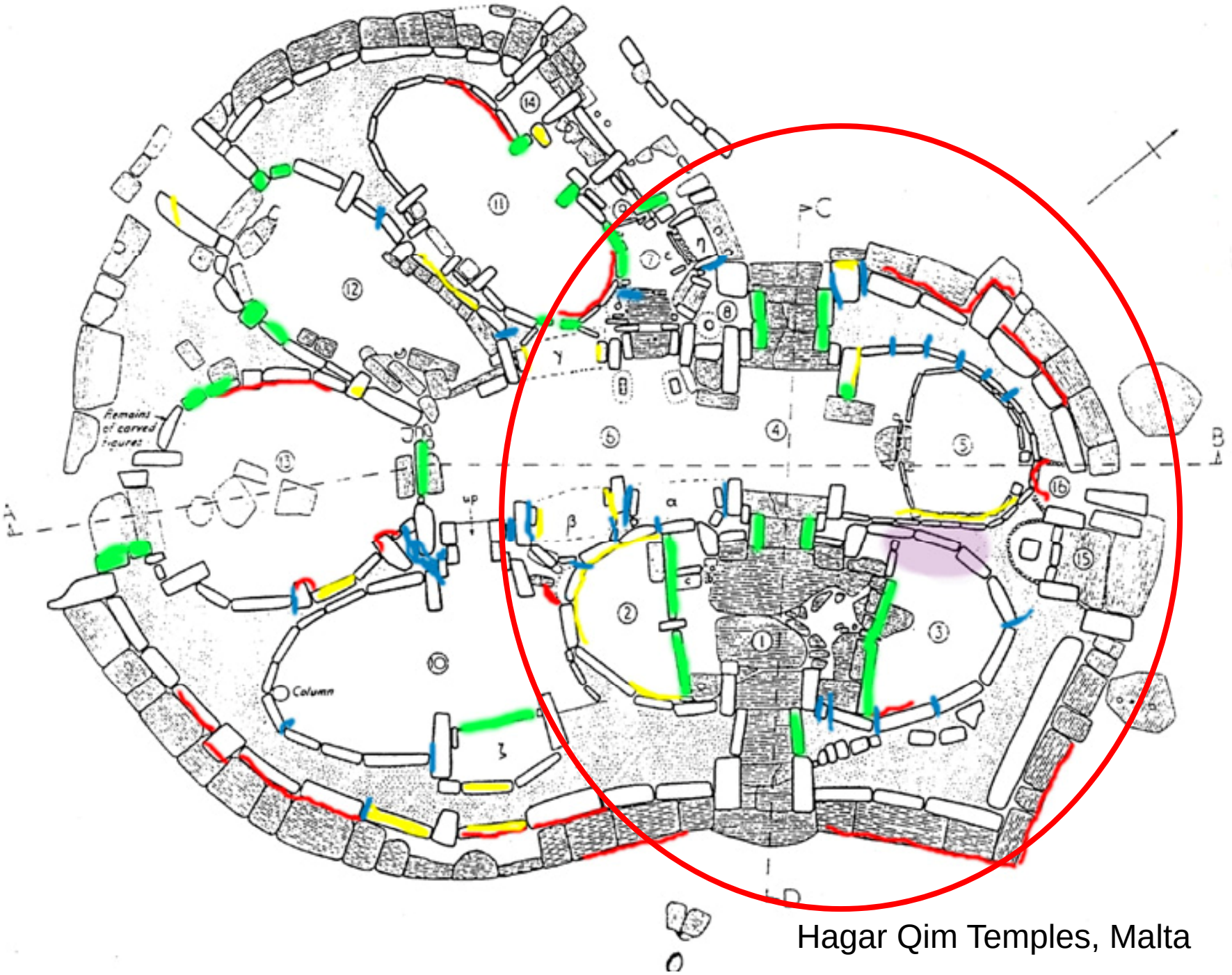

Xemxija Tombs
Kordin 2 Apse
Ta' Ħaġrat 3 Apse
Ġgantija 5 Apse
10m
Mnajdra 4 Apse
Tarxien 6 (?) Apse


Ggantija Temples, Gozo
0m
5m
10m
1
2
3
4
5
6
7
8
9
10
11
12
13
14
A
B

Ggantija Temples, Gozo

MnajdraTemples, Malta

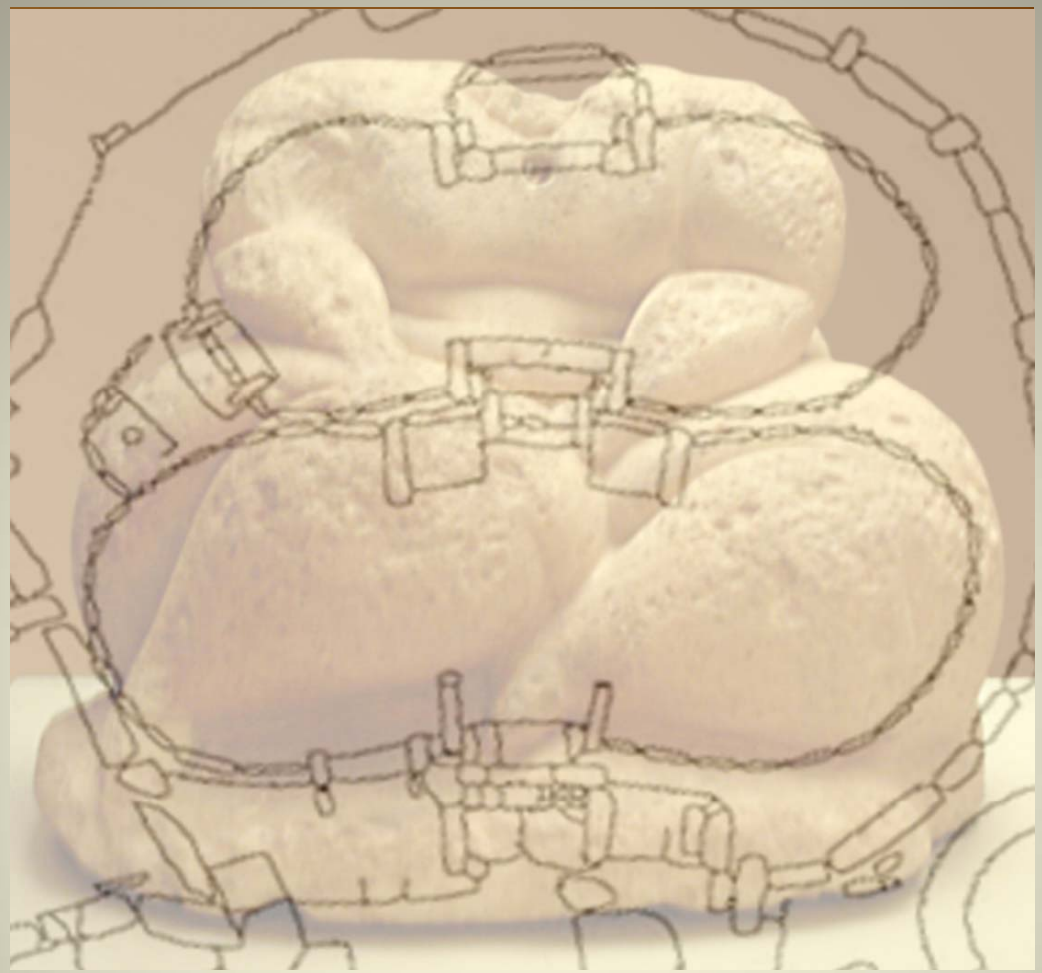

MnajdraTemples, Malta



Hagar Qim Temples, Malta


Hagar Qim Temples, Malta

TarxienTemples, Malta



The multi-lobed plan, particularly the plan with five apses, has been compared to the profile of the famous “Fat Lady” statues that have been excavated from the sites. These statues confirm the importance of the cult of the “Goddess of Fertility”, or of “Mother Earth” for those civilizations. It is also possible that there was some ritual connection between the cult and the architectural volumes in the temples.

However, there is **no evidence** that the plan is a representation of this “Fat Lady”.

STRUCTURE CHARACTERISTICS

The temple structures were built over a period of a thousand years, but with common characteristics.

• The structures are assembled from megaliths, apparently without the use of any bedding mortar, weighing between 1000 and 5000 lbs (0.5 to 2.5 tonnes) but exceptionally even 15500 lbs (7 tonnes).

• The stability of these stone structures therefore depends on the structural form.

• The constructional features include:

- strongly defined **longitudinal axis** (of symmetry?), marked by visually strong "tri-lithon' **portals**, often nested, or repeated;
- inner walls forming **pairs of lateral apses**, or lobes, formed of:
  - upright **free-standing block assemblies**, arranged in "semi-spherical" layouts on either side of the main axis;
  - **horizontal megaliths**, laid in "courses", forming horizontal arches, that corbel in, one course above the other, to form vault, or dome-like structures.

- **outer walls**, defined by :
  - larger stones, often alternating tangential and transverse orientation of the megaliths, enclosing the whole series of apses;
  - external peripheral plinth, or step;

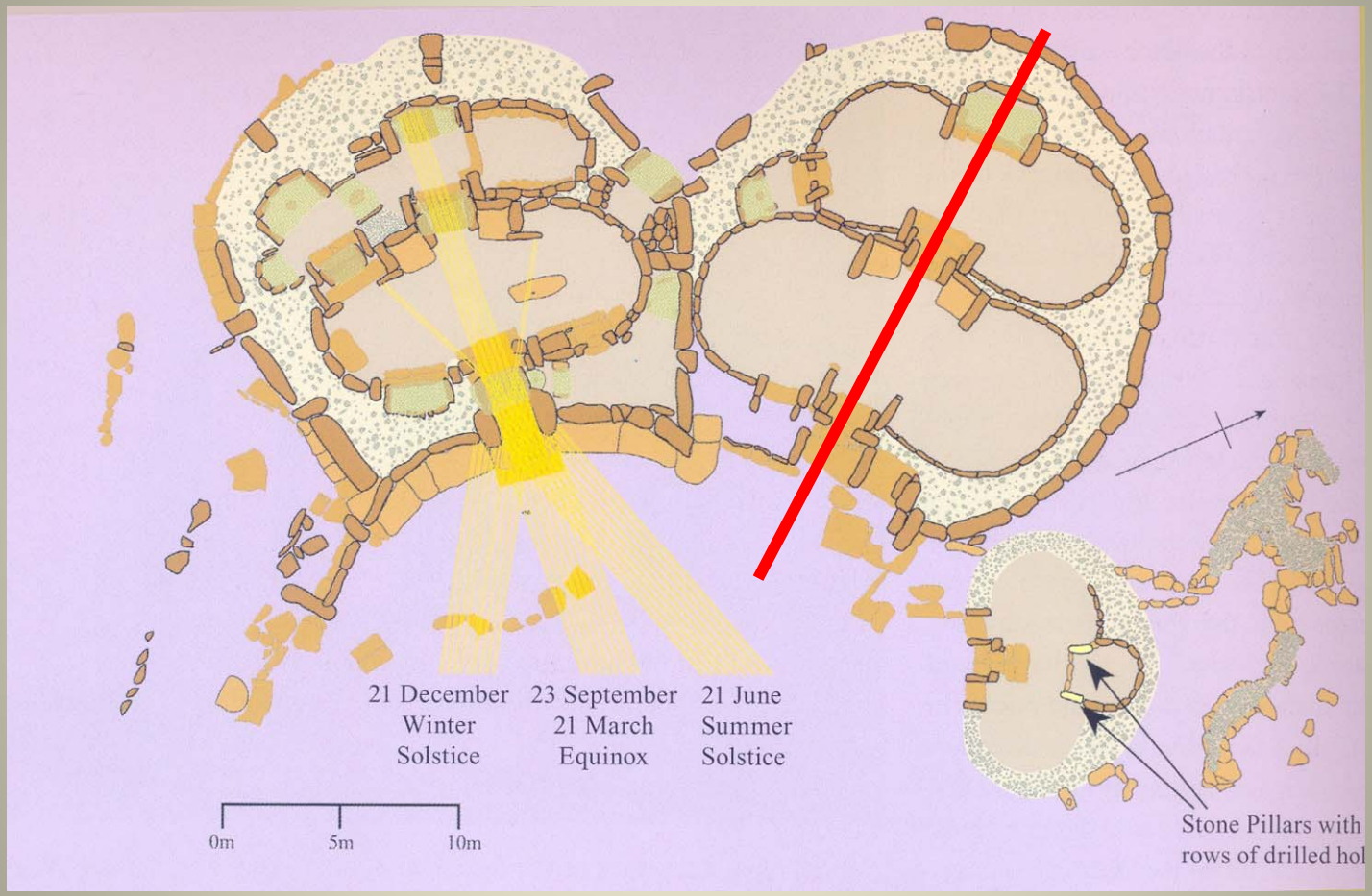
• "solid" **in-filled space** between the inner walls and the outer walls.

• **concave façade** , (facing what? a plaza? the skies?)

• **roof structure?**

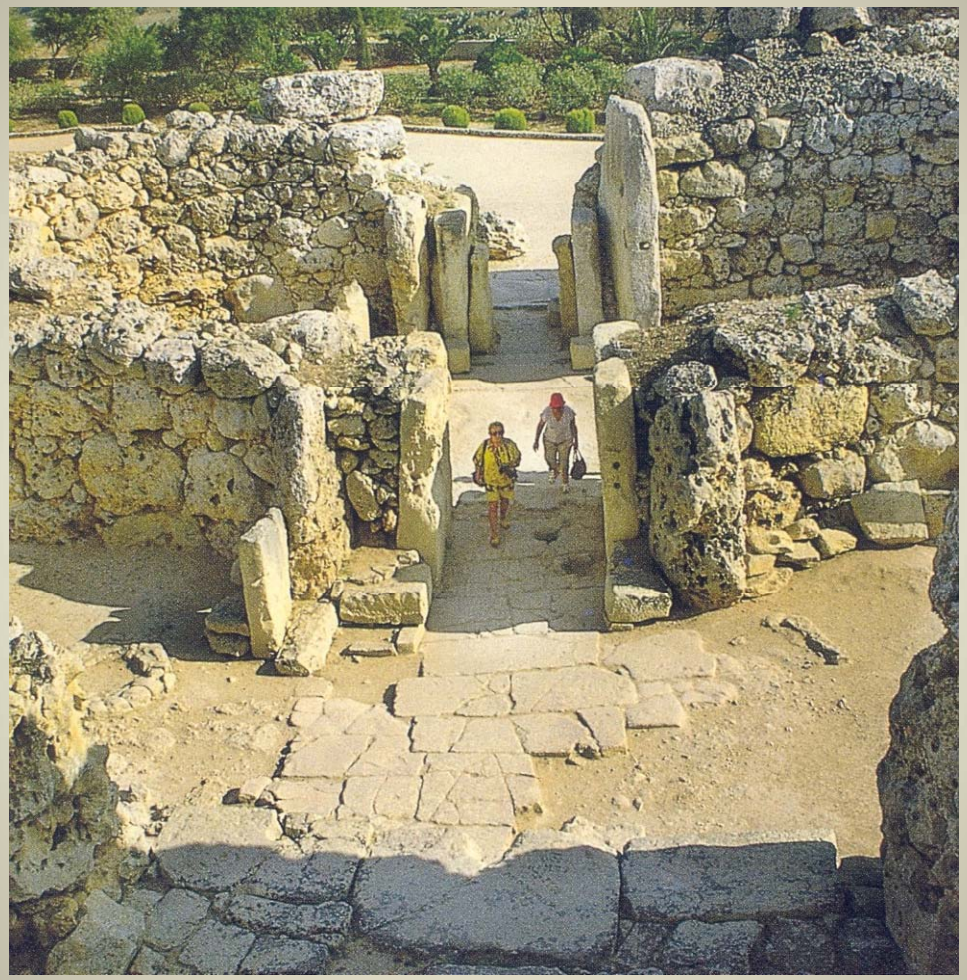
SHAPE AND MODELS

- longitudinal axis:
Is there any special significance about this axis?
Why is it so strong?



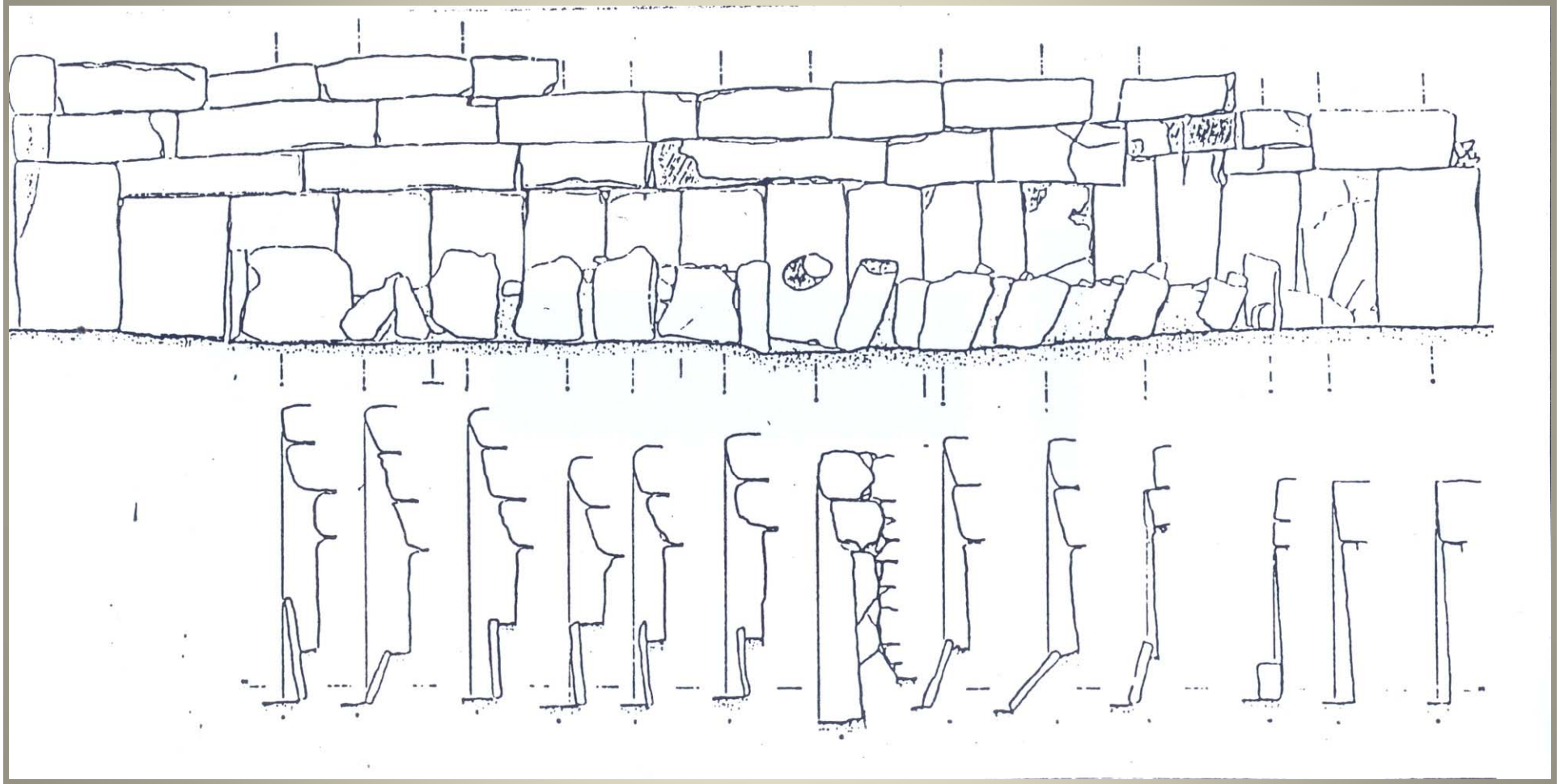
astronomical alignment

to the rising sun, to the spring and autumn equinoxes, to alpha centauri, or beta centauri, to the pleidas – they knew their skies.



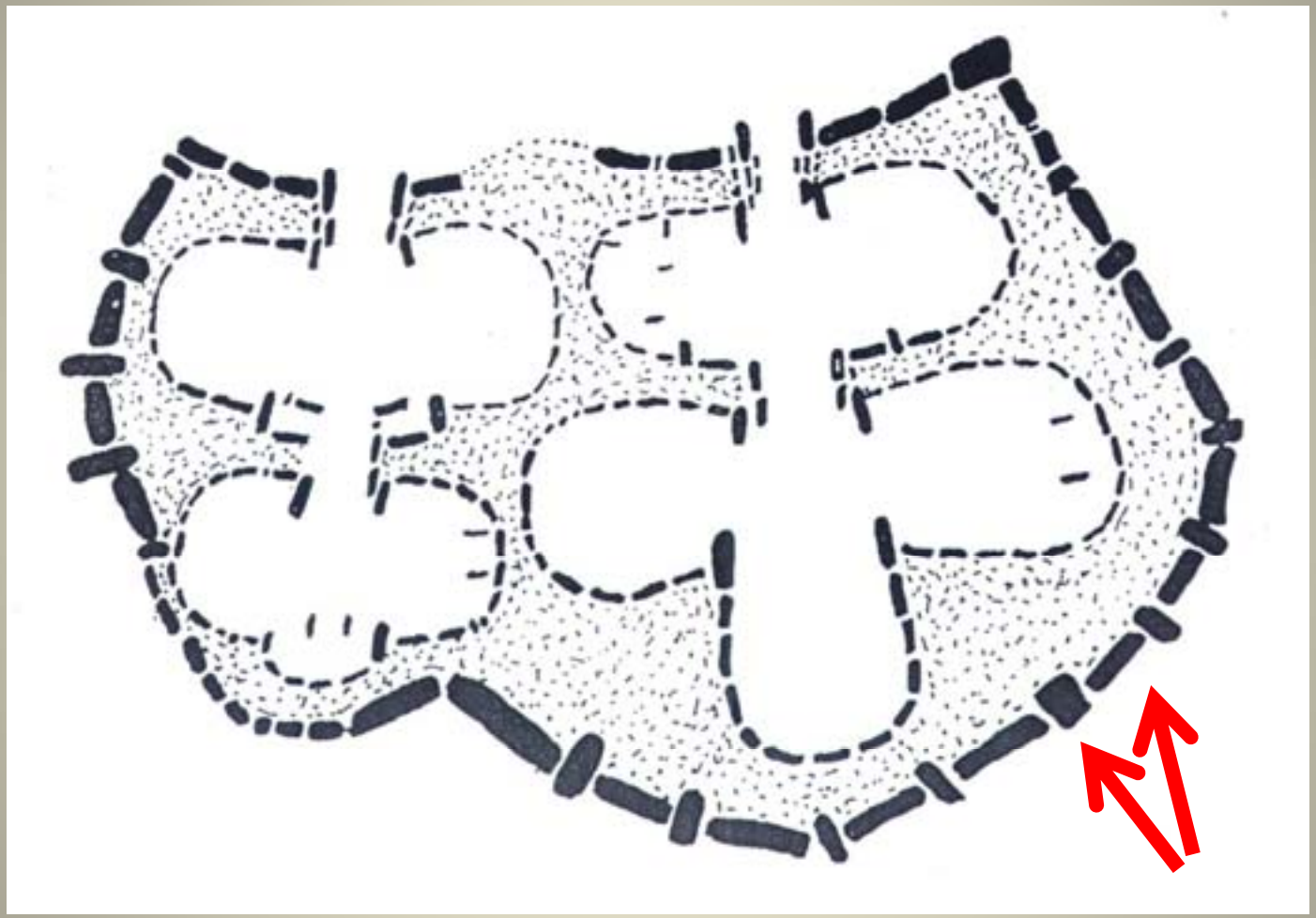
SHAPE AND MODELS

- inner walls – apses – corbelling:
What is the purpose of the corbelling?
Why are some doors in the form of portholes?



SHAPE AND MODELS

- outer walls:
What is the function of the outer walls?
Why the alternation of thin and thick megaliths?
What is the purpose of the peripheral plinth?

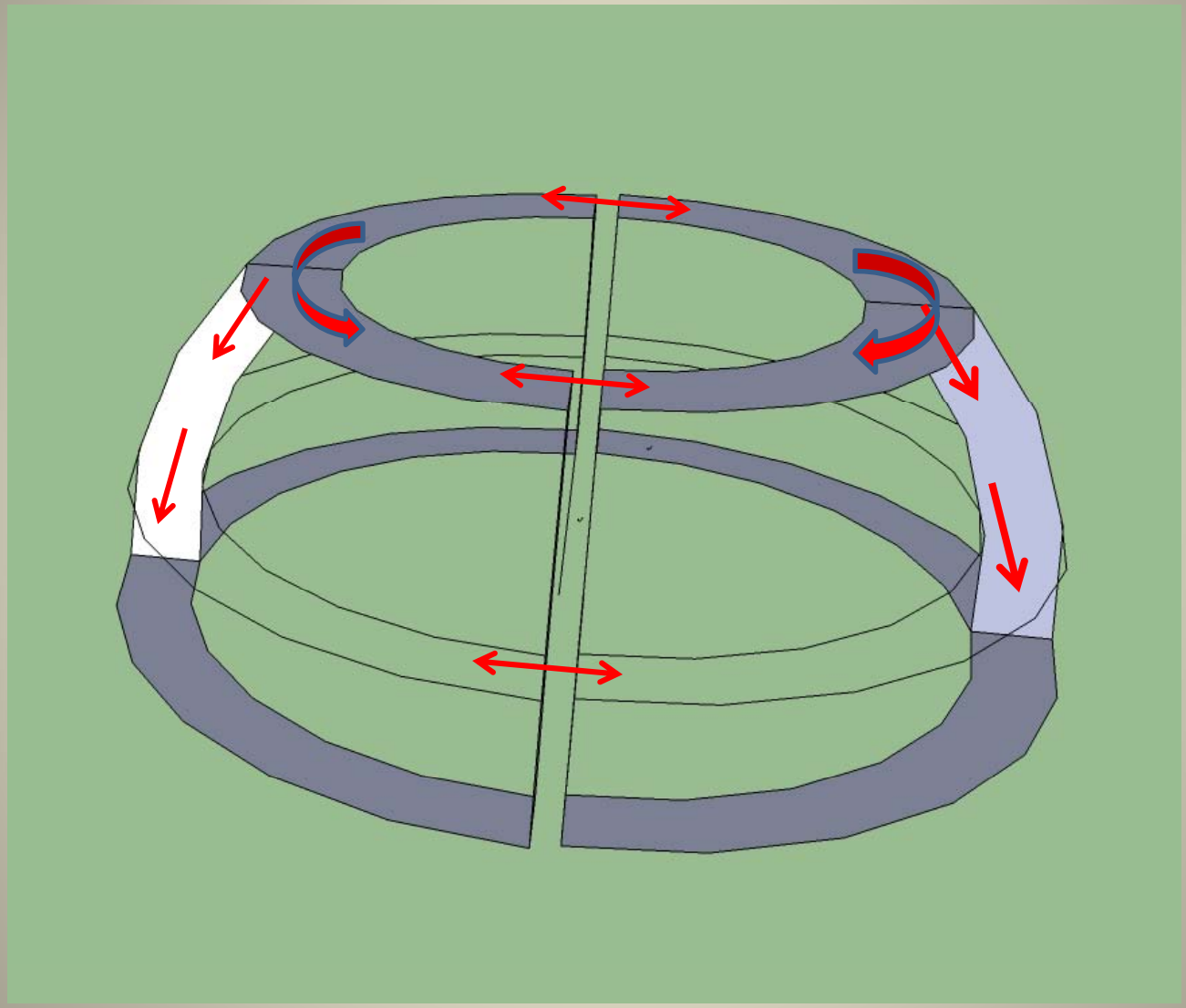


SHAPE AND MODELS

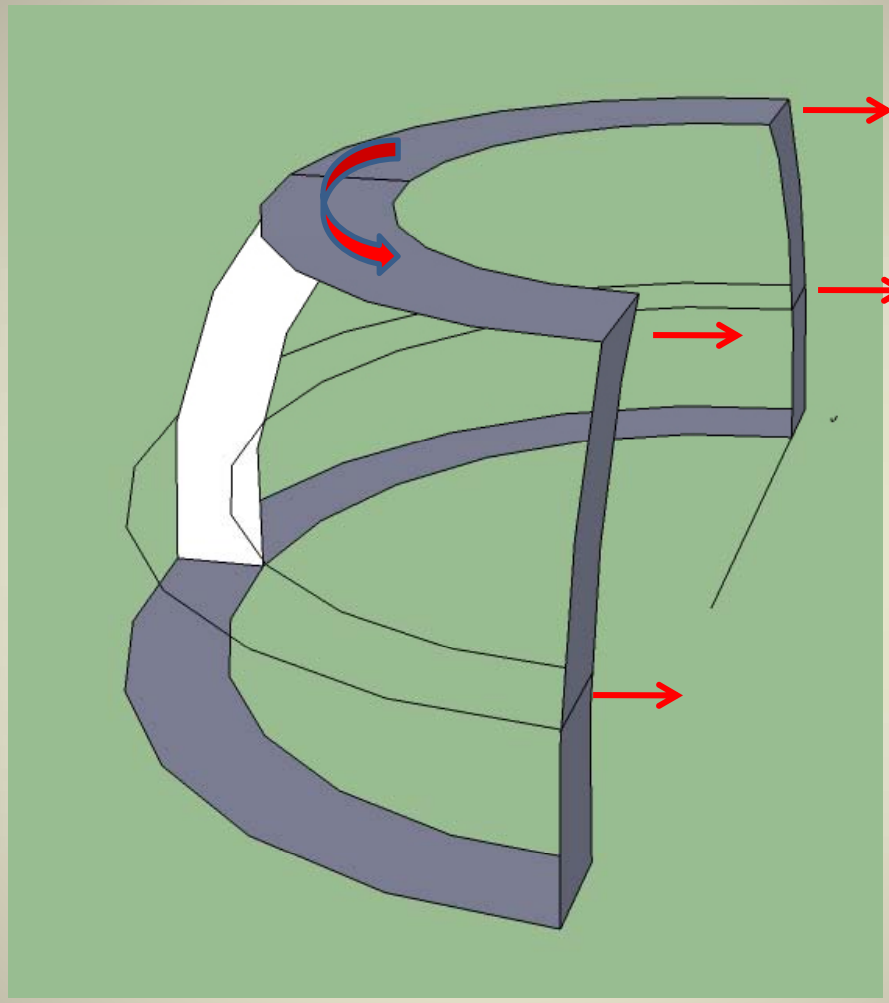
- inner/outer walls – infill

SHAPE AND MODELS

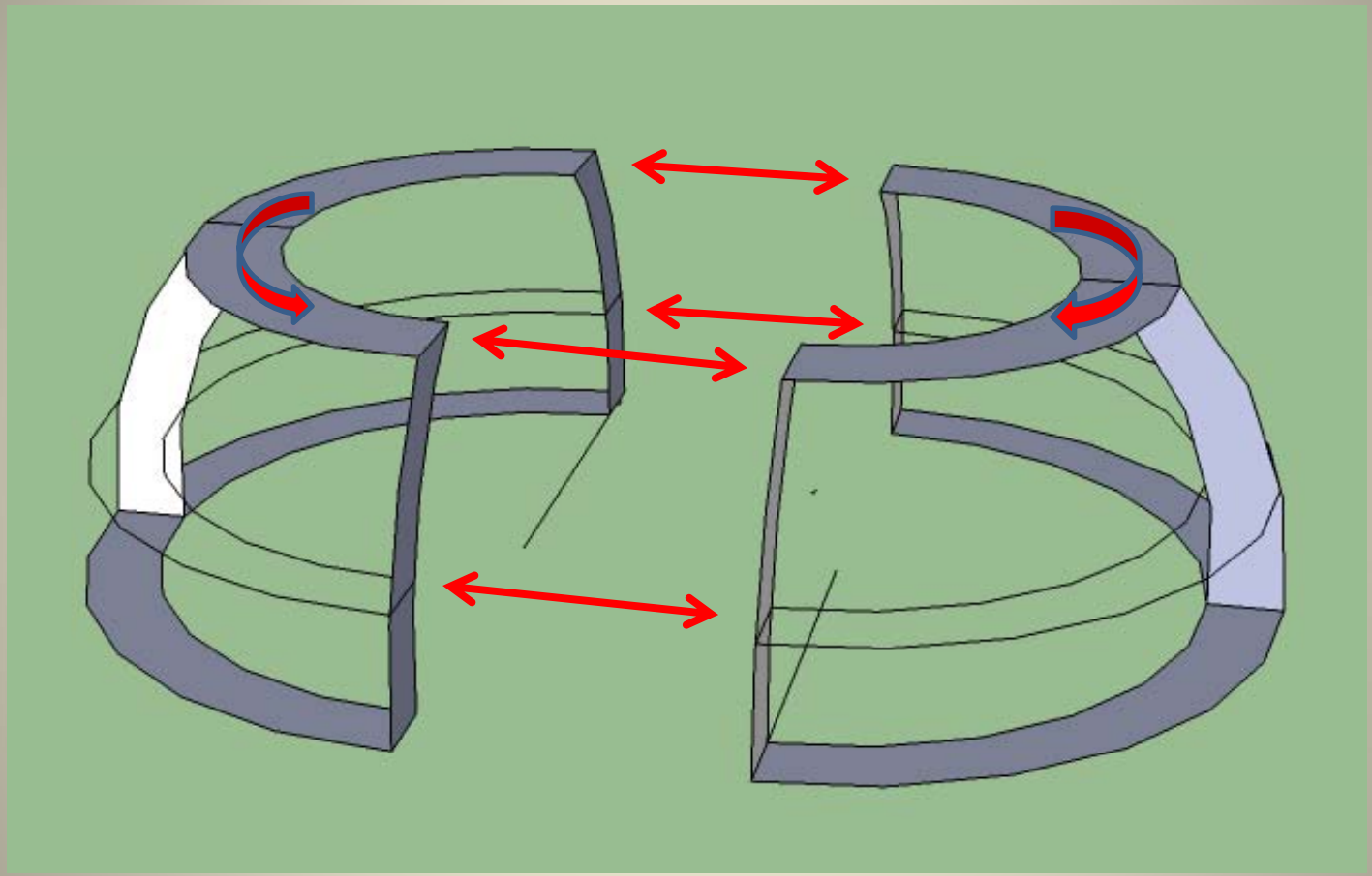
- roofing structure:
Were the temples roofed over?
Did they use timber or stone?
Why the strong portal between “half-domes”?



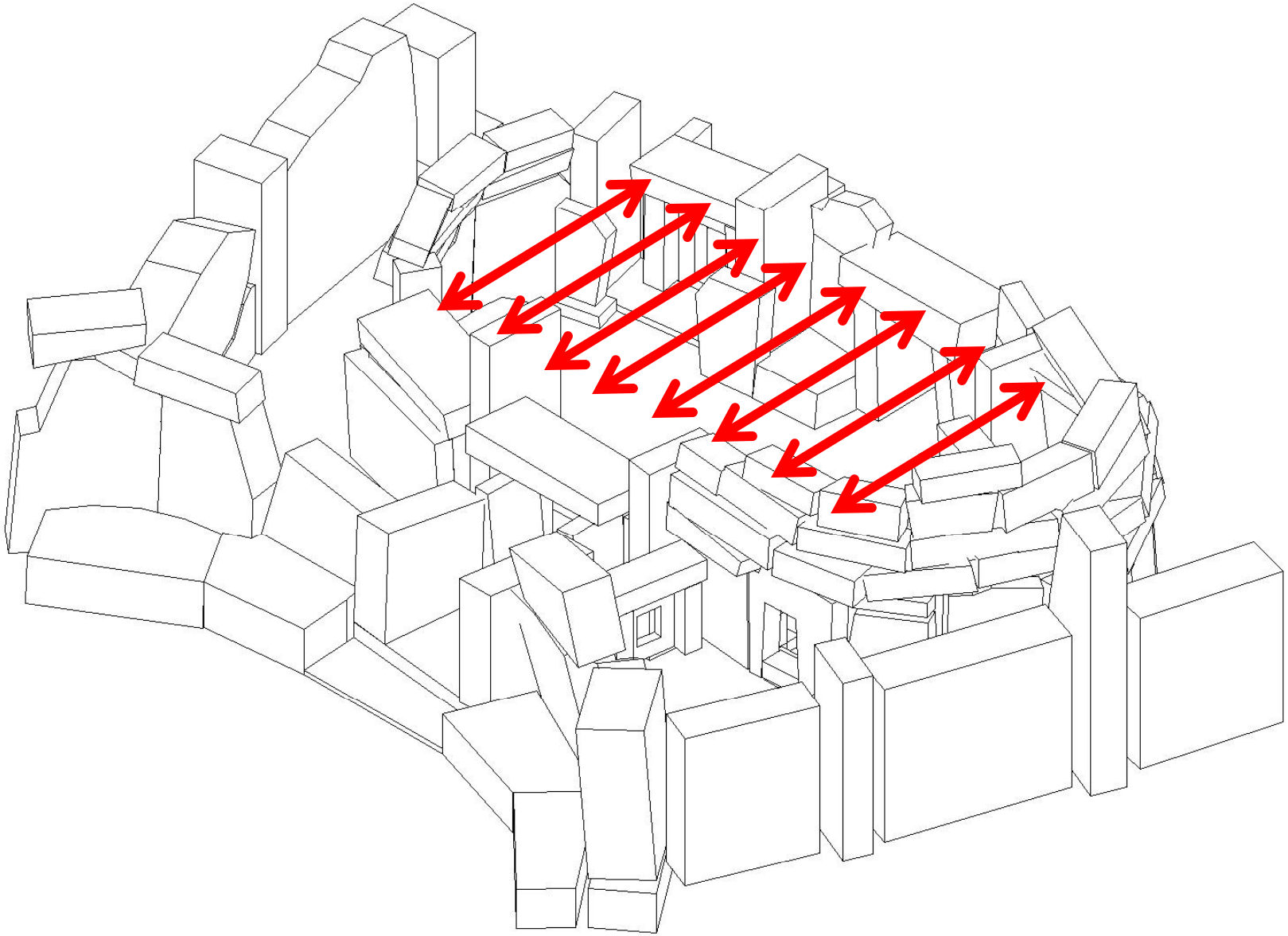
mechanics of masonry shell/ truncated dome – (mycenean tholos)
meridonal load path and circumferential ring action

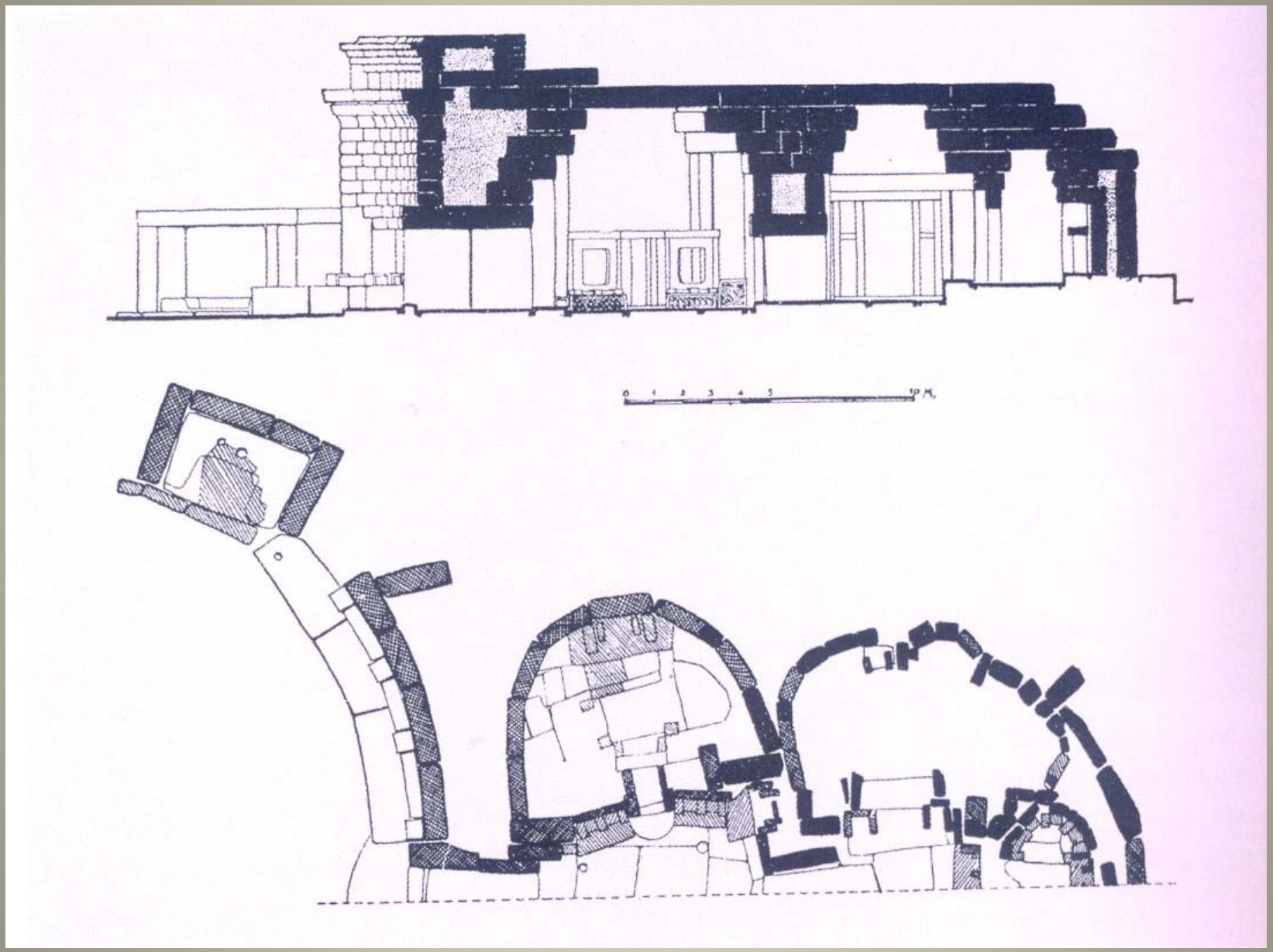


lack of ring action in half dome – with truncated top, vertical arch action not possible - unstable



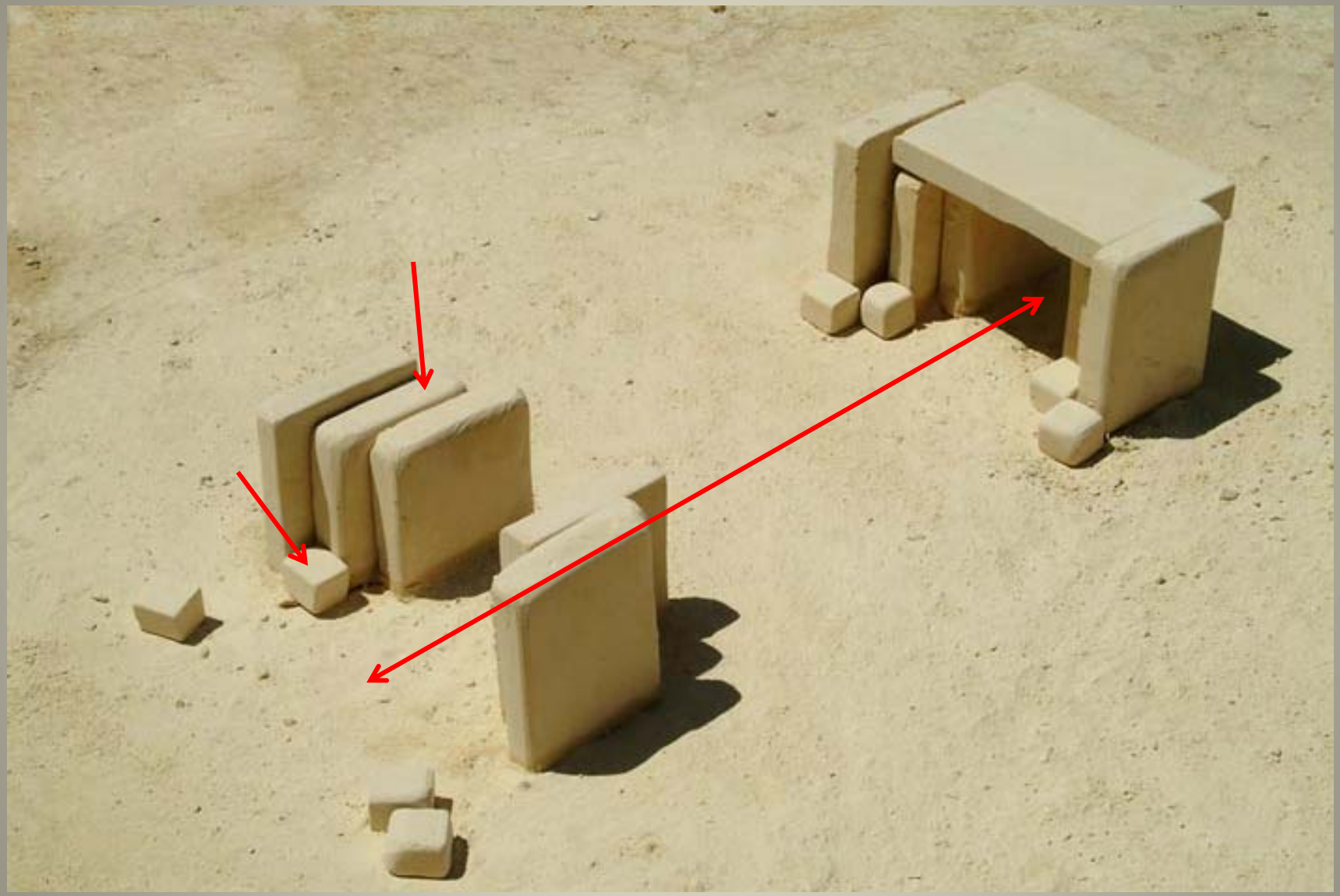
stability recovered by coupling two truncated hemispheres via strong element – trilithon portal, “porthole” opening.

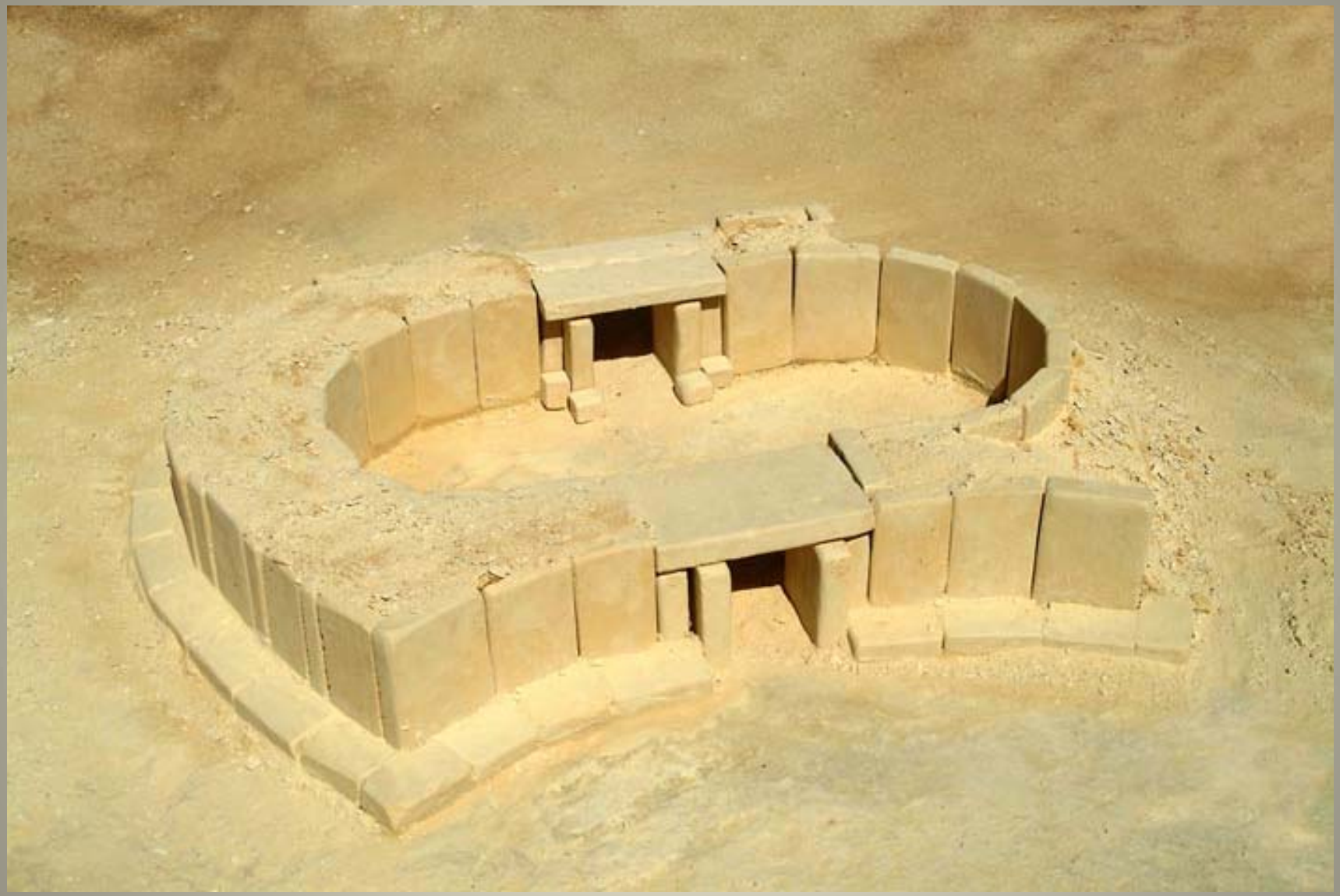


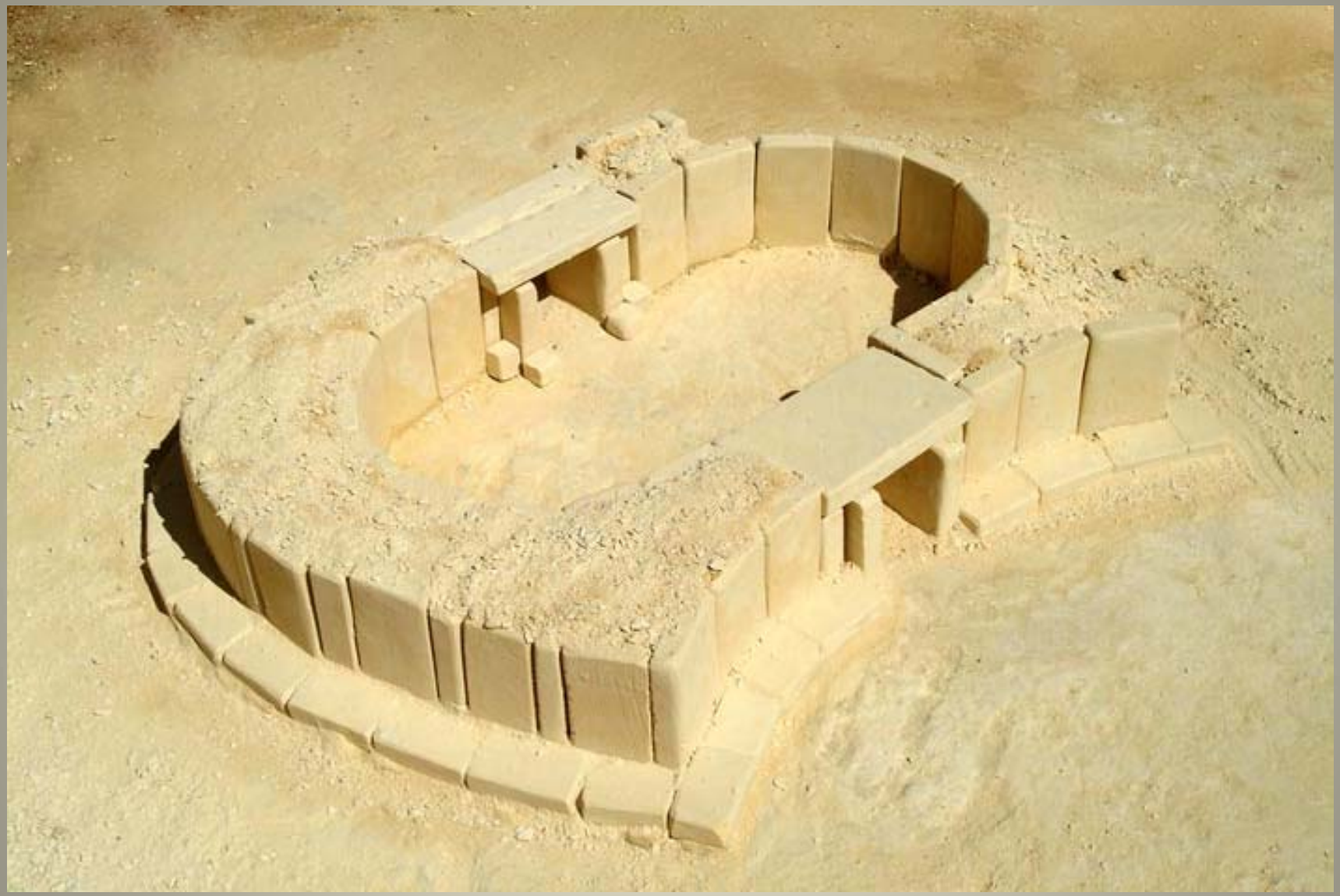


Reconstruction by Ceschi, 1939

HOW TO BUILD A TEMPLE in easy steps!

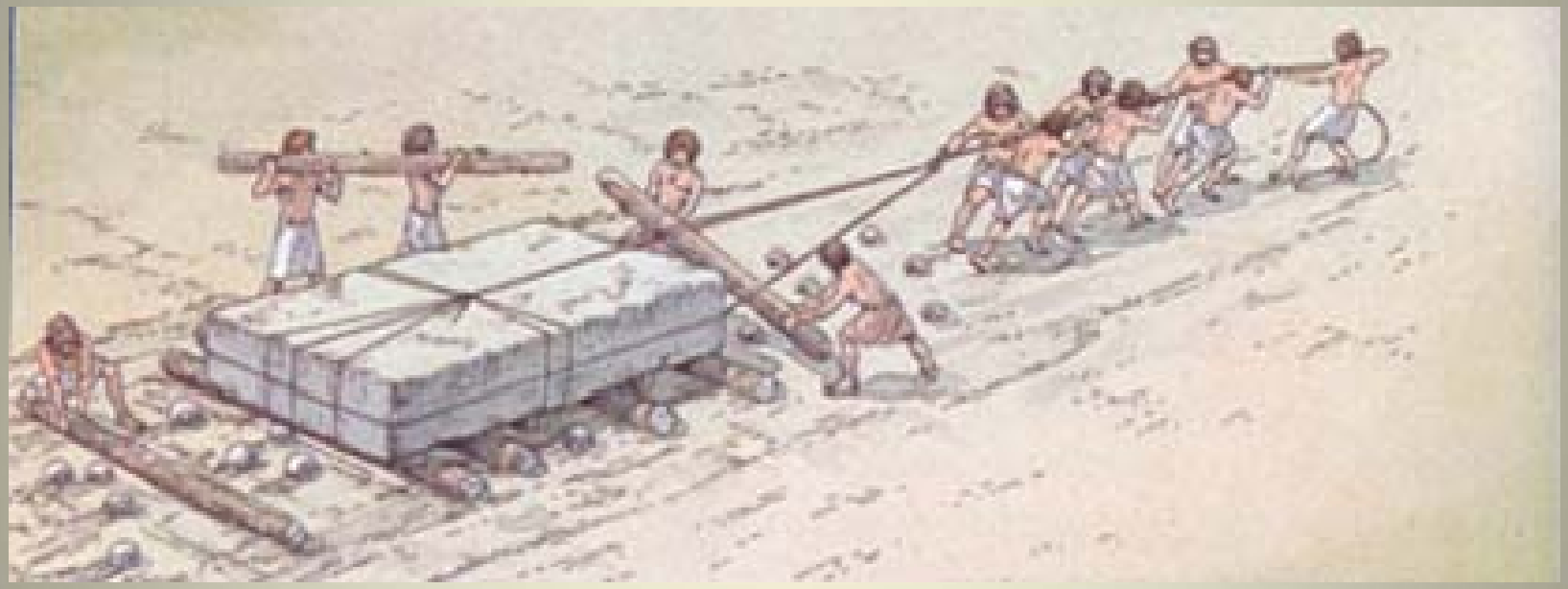






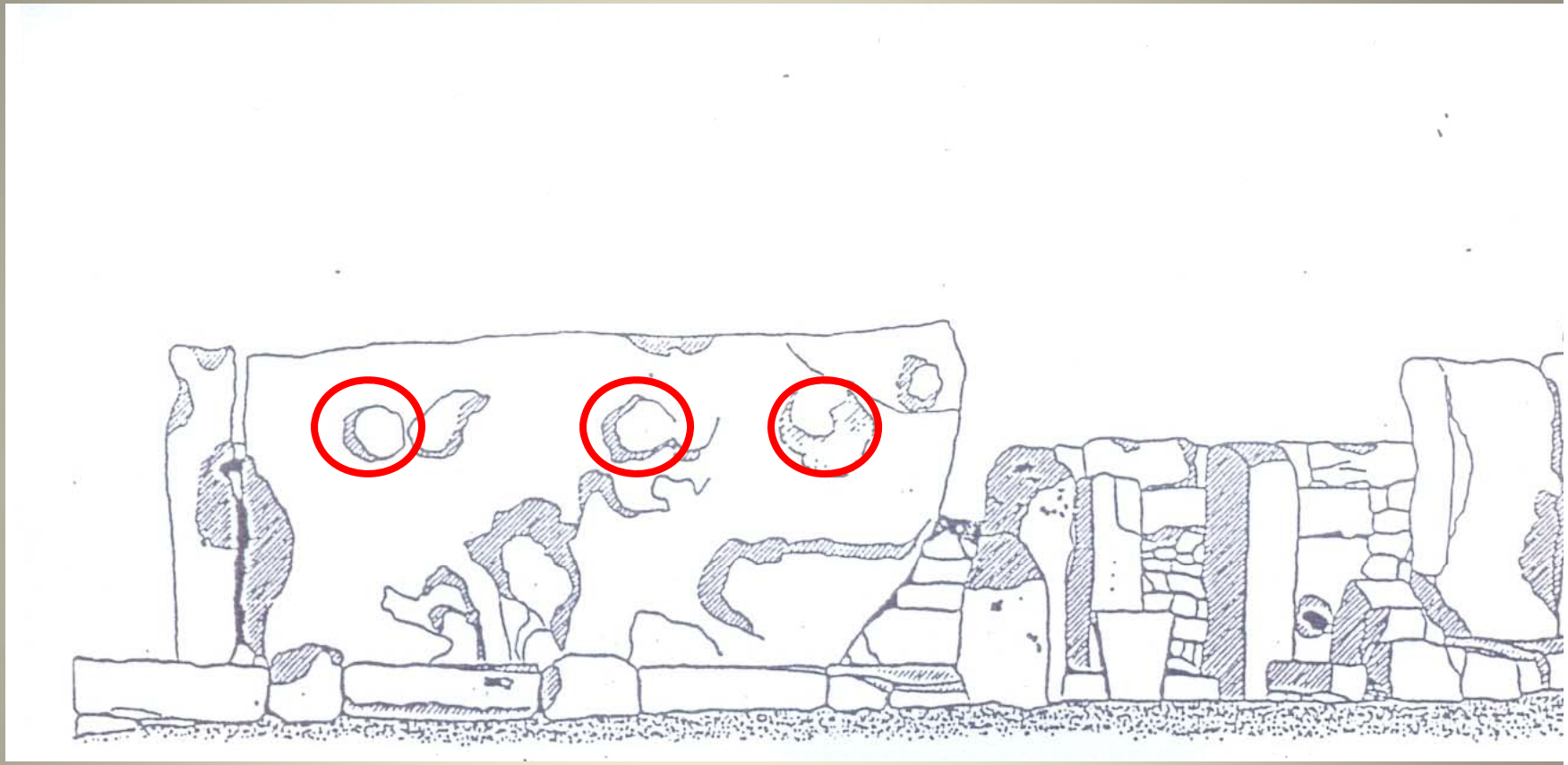
CONSTRUCTION PROCESS
Quarrying:
Where did they get their stone from?

CONSTRUCTION PROCESS
transporting stone:
How did the prehistoric builders carry the enormous megaliths to the site?



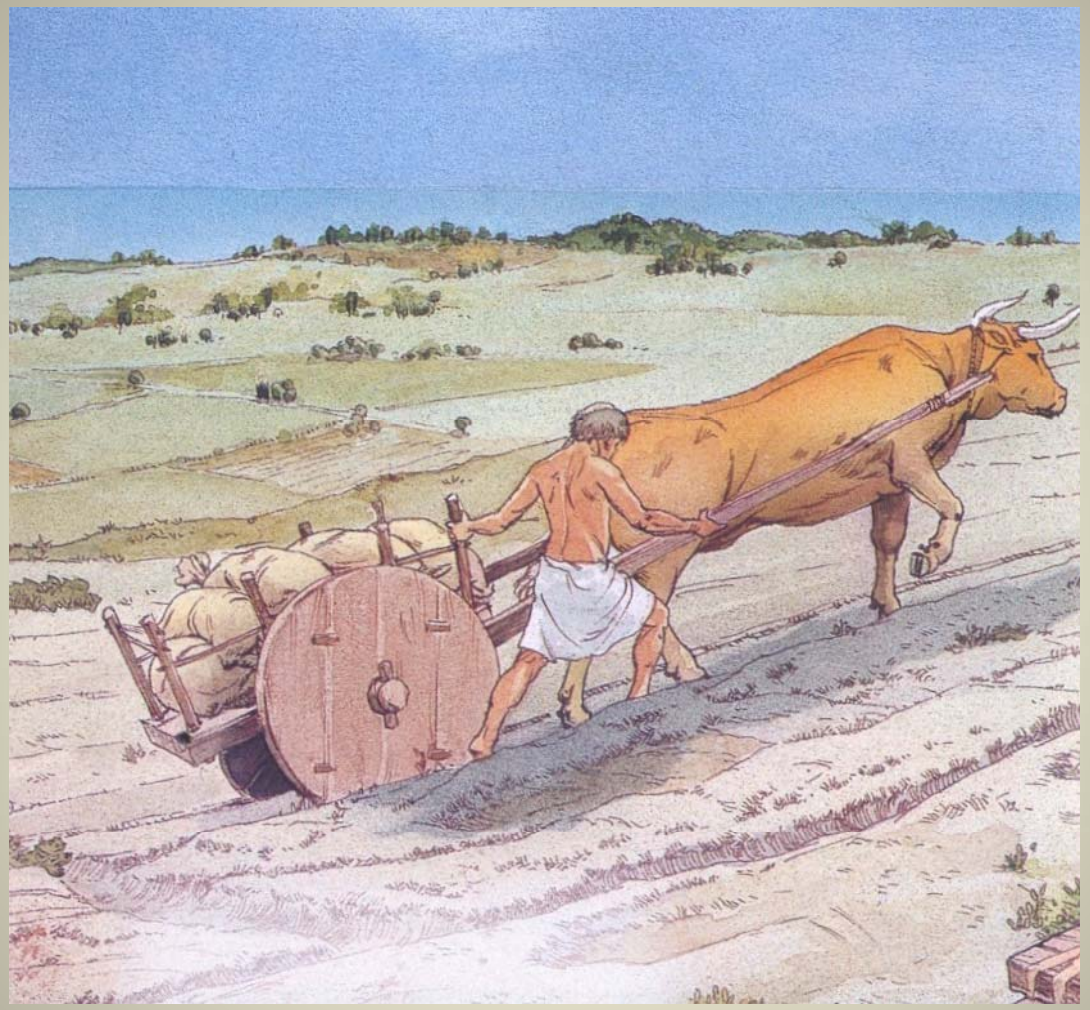
timber rollers?

ca. 6.5 tonne megalith (1450lbs)



roller ball depressions?

roller balls

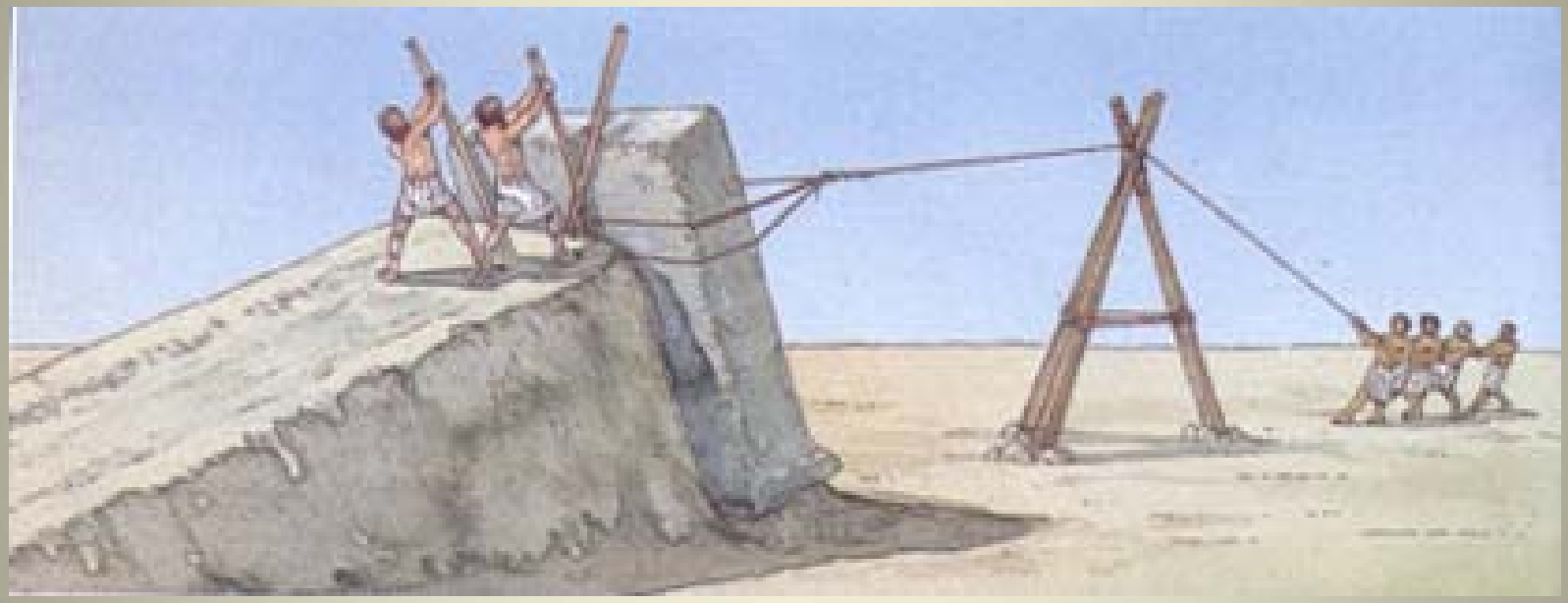


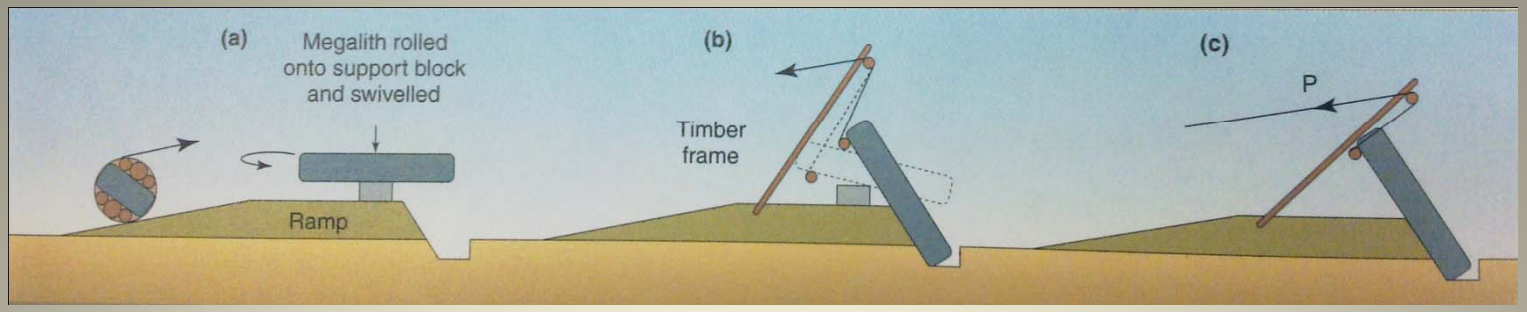
cart/ sled?

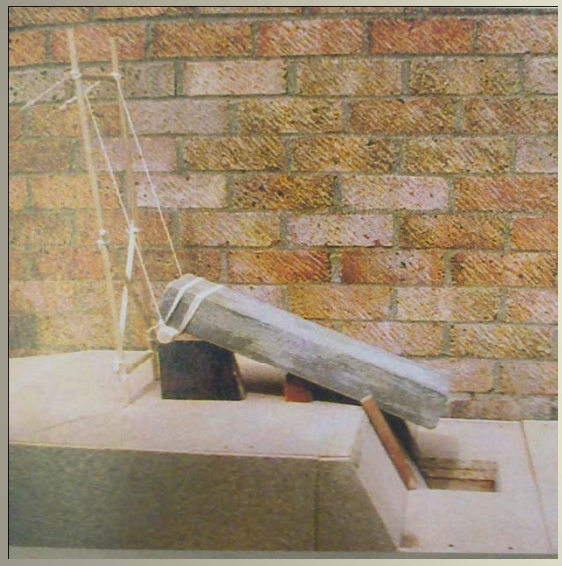
prehistoric cart-ruts

rolling a megalith up a hill/ramp – R.H.G.Parry

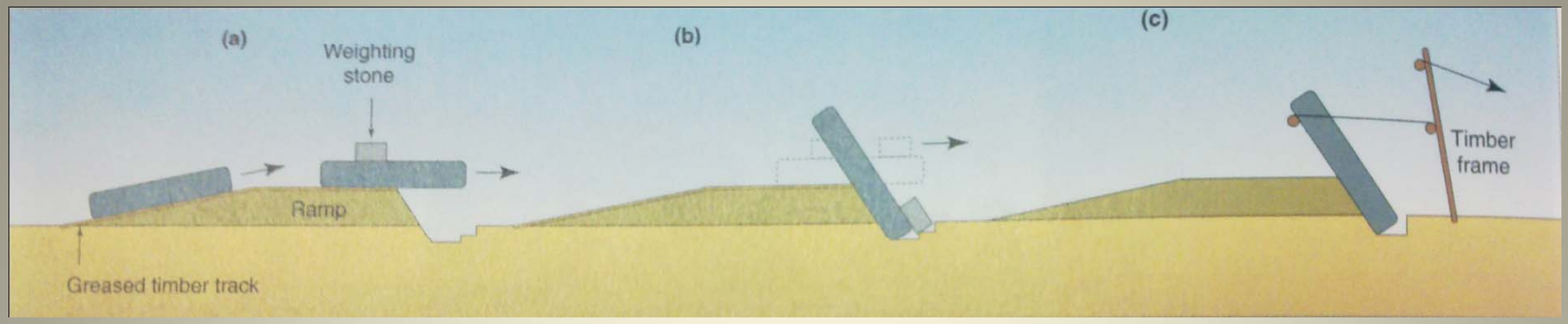
CONSTRUCTION PROCESS
lifting stones up:
Earth ramps?
Ropes and levers?

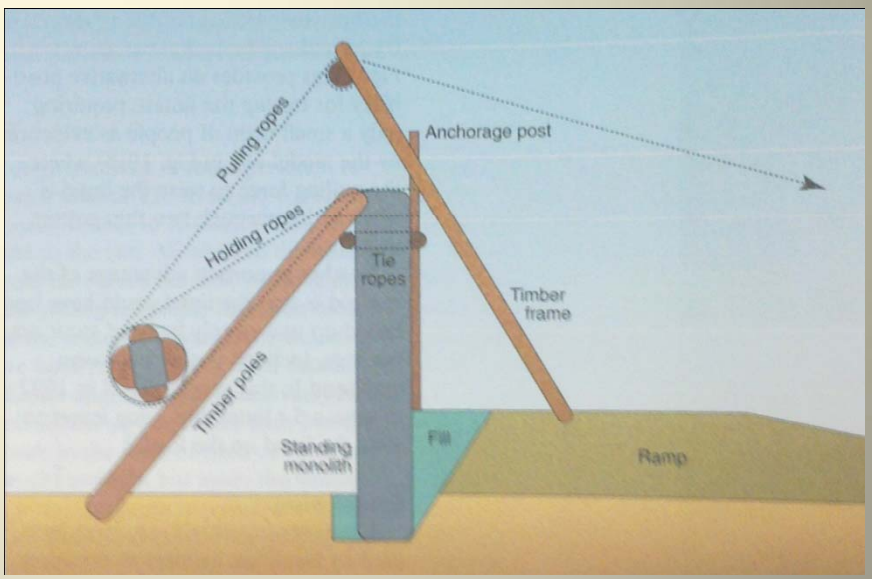






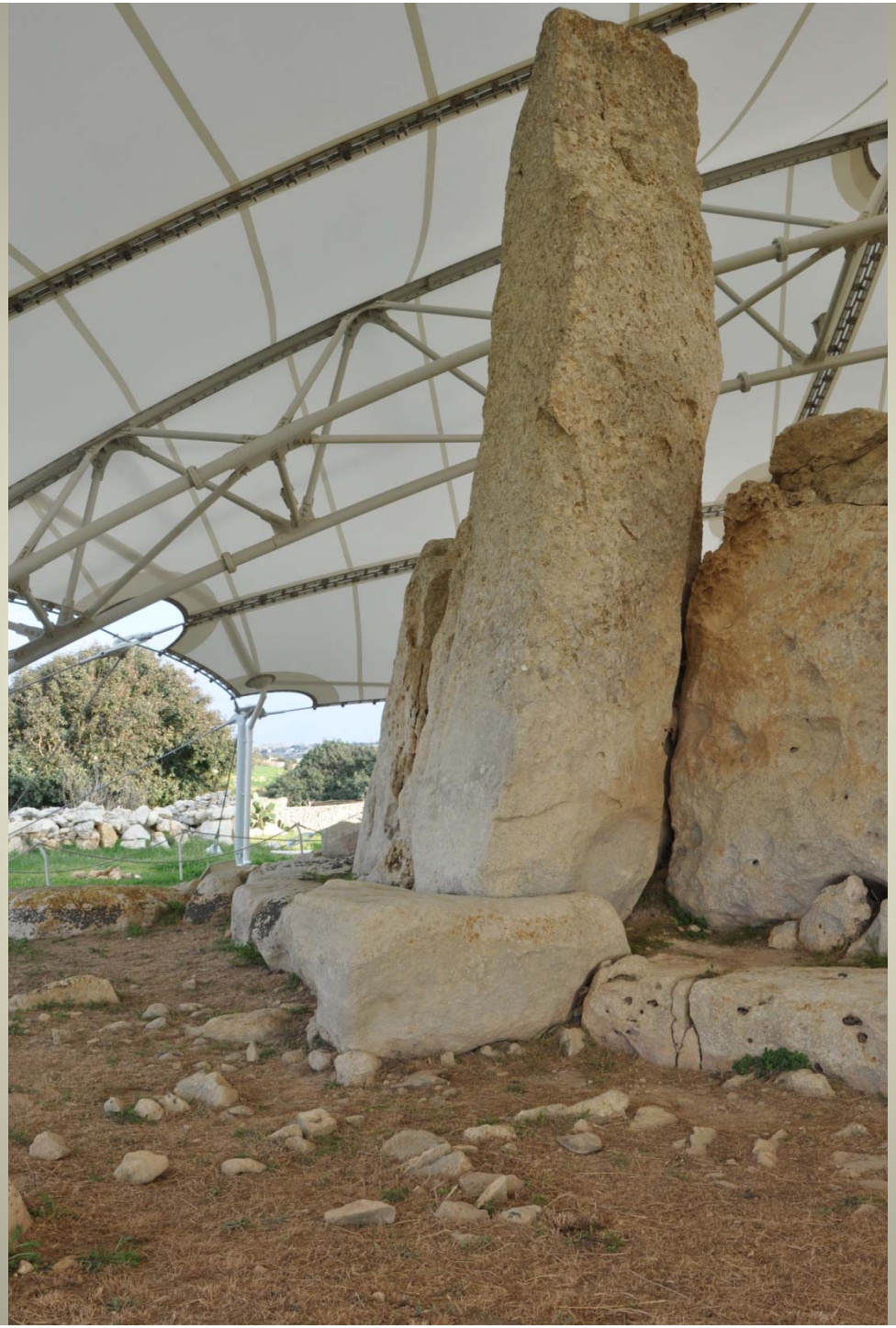
Studies by R.H.G.Parry



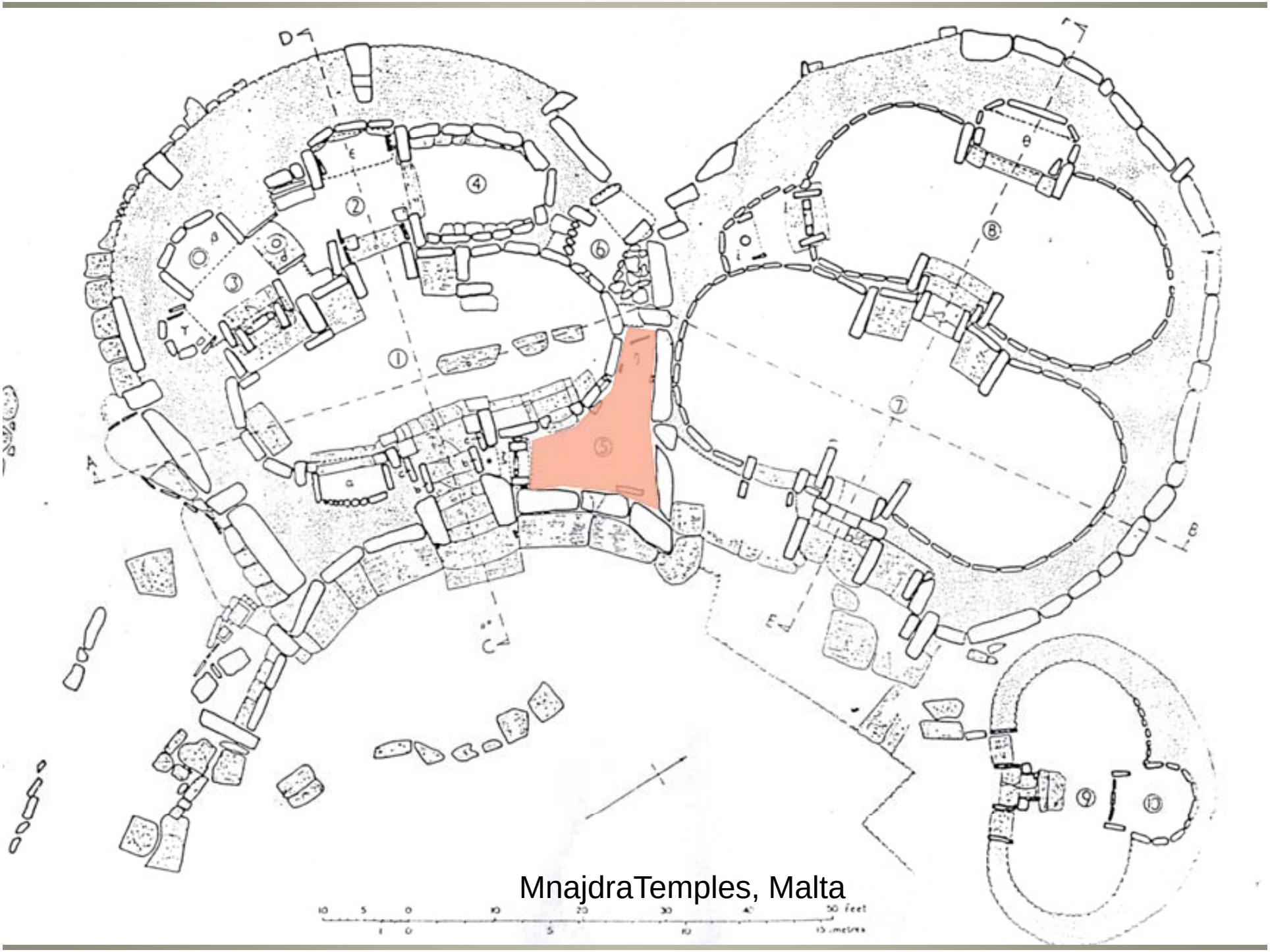


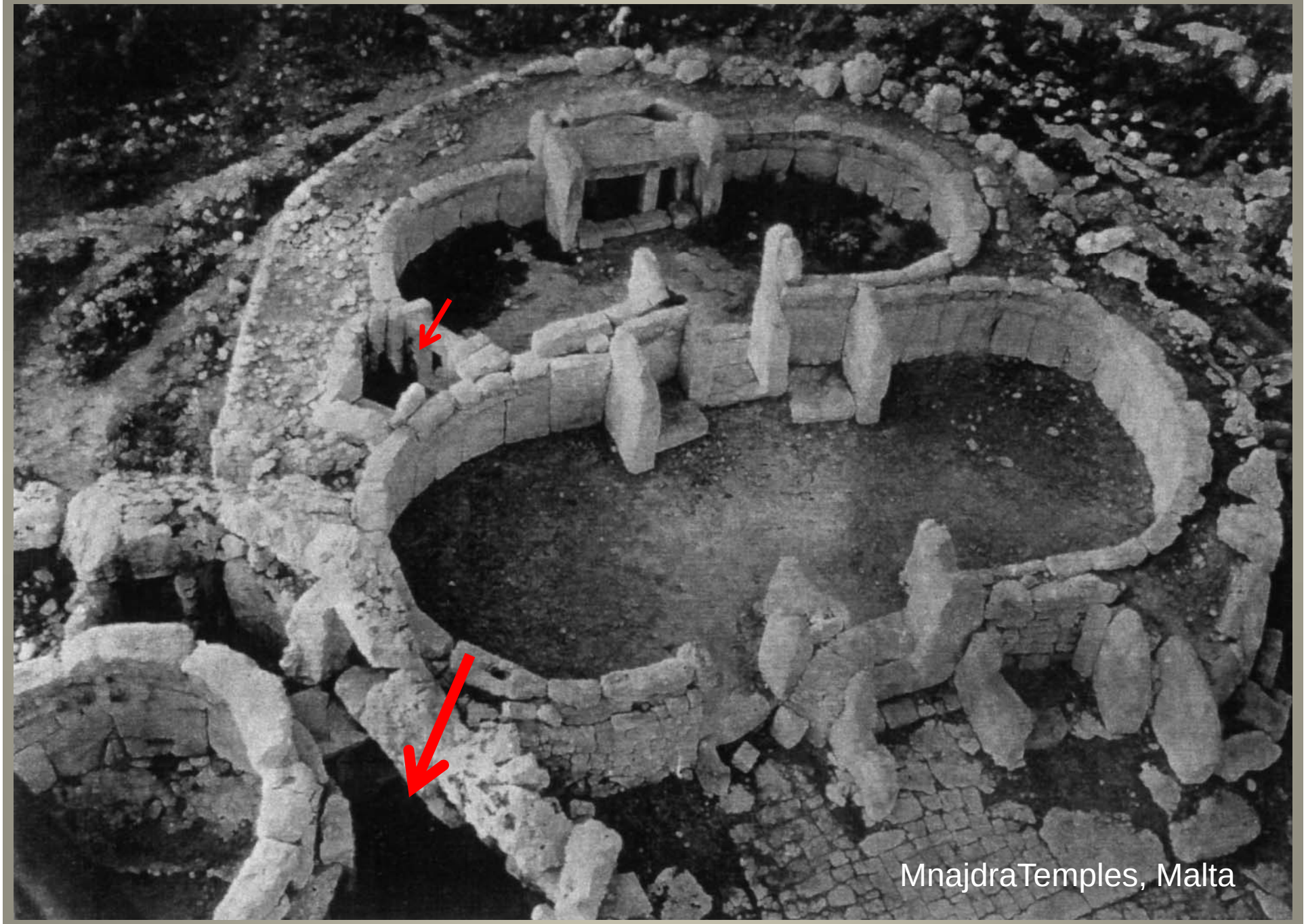
Studies by R.H.G.Parry

pivot points or locking device?



CONSTRUCTION PROCESS
alterations/extensions:
How did the builders make changes and extensions?


MnajdraTemples, Malta


MnajdraTemples, Malta


D
E
A
C
B
①
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
10 5 0 10 20 30 40 50 feet
5 0 5 10 15 metres

References

Tampone, G., Nerli, P.P., Zetti, I, Elementi e Caratteri Costruttivi delle Architetture Megalitiche del Mediterraneo Occidentale, Proc. of XIII Congress, International Union of Prehistoric and Protohistoric Sciences, 1996.

Vance, J.G., Description of an ancient Temple near Crendi, Malta, Letter to N.Carlisle, 1840, in Archeologia, Vol. 29

Cavanagh, W.G. and Laxton, R.R., The Structural Mechanics of the Mycenaean Tholos Tomb, The Annual of the British School at Athens, 1981.

Ashby, T., Bradley,R.N., Peet,T.E. and Tagliaferro, N., Excavations in 1908-11 in Various Megalithic Buildings in Malta and Gozo, *Papers of the British School at Rome, IV* 1913

Ceschi, C., L'Architettura dei Templi Megalitici di Malta, Rome: Palombi, 1939

Evans, J.D., The Prehistoric Antiquities of the Maltese Islands: a Survey, London: Athlone Press, 1971

Tampone, G., Vannucci, S., Cassar, J., Nuove ipotesi sull'architettura del tempio megalitico di Ggantija a Gozo, Bollettino Ingegneri, 3, 1987

Tampone, G. Avanzamenti delle ricerche sulle architetture preistoriche megalitiche Maltesi, Bollettino Ingegneri, 7-8, 1990

Bonanno, A., Tecniche costruttive dei templi megalitici Maltesi, 1988

Piovanelli, G. Alcune considerazzioni sulla possible coperture dei templi Maltesi, 1988

Xuereb, K, The Structural System of a Maltese Megalithic Temple, (With Particular Reference to Mnajdra), B.E.& A. Dissertation, University of Malta, 1999.

Zammit, T., The Prehistoric Temples of Hagar Qim and Mnajdra, Malta: Interprint, 1994

Torpiano, A., Preliminary Report on the Damage Reported at the Prehistoric Temples at Mnajdra, 1994

Torpiano, A., Report on the Collapse at the Hagar Qim Prehistoric Site, 1998

Torpiano, A., "The collapse and proposed restoration of a prehistoric megalithic structure", International Conference on Structural Studies, Repairs, and Maintenance of Historical Buildings, 1995, Crete.

Torpiano, A, "The Construction of the Prehistoric Megalithic Temples of Malta", Malta Before History, Miranda Publishers, 2004