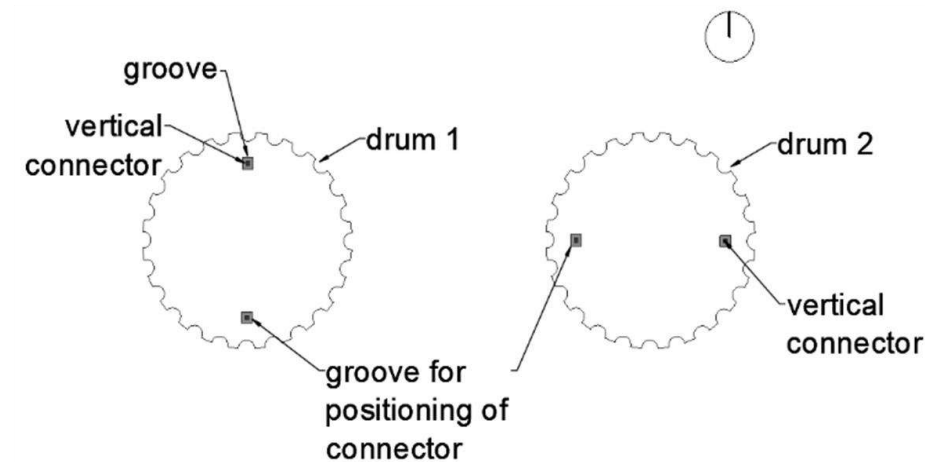
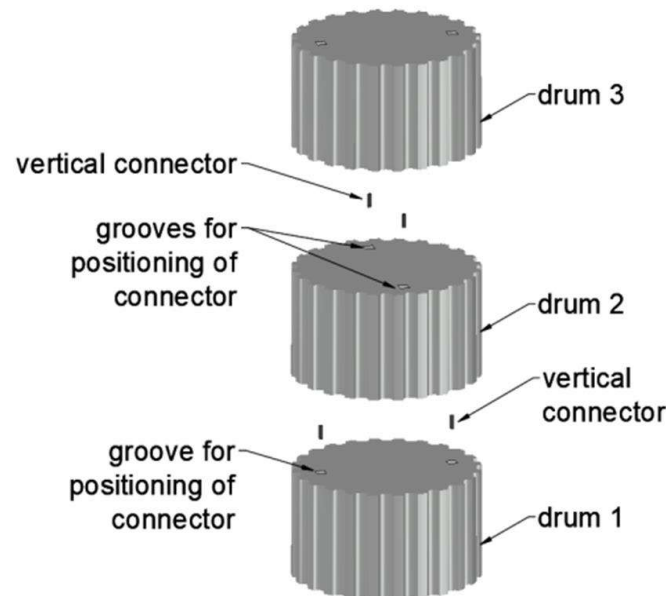


# Introduction to the Workshop

The current workshop is part of an extensive research project, aiming to investigate the effect of interfaces, reinforced using vertical connectors (gomfoi) on the seismic behaviour of ancient monuments. The research focuses on the seismic behaviour of columns and colonnades, where shear connectors cross the interfaces between consecutive drums.

- Title of the research project: ***Reinforced Interfaces between structural members in Ancient MONuments***
- Proposal of the research project: March 2021
- Initial Approval of the research project: May 2022
- Research project starting date: October 2022
- Initial Idea: *Gomfoi* are mainly known to connect horizontal members but in some cases they are used for the connection of the drums of the columns, in the Hellenistic and Roman Era.

In most cases, the reinforced columns have a slenderness ratio greater than 1.0. Recent restoration works at the Olympieion, Athens, have revealed the arrangement of vertical connectors shown in the Figure.



## Main Aims of the Research Project

- (a) Documentation of vertical connectors, based on Literature and on in situ documentation of vertical connectors and related pathology,
- (b) Detailed literature review of the available experimental and analytical works,
- (c) Selection of a typical monument,
- (d) Shaking Table Tests of columns and colonnades,
- (e) Modelling of connection, calibration, parameter analyses,
- (f) Modelling of subassemblies, calibration, parameter analyses
- (g) Dissemination and presentation of the results of the project

## Literature Survey

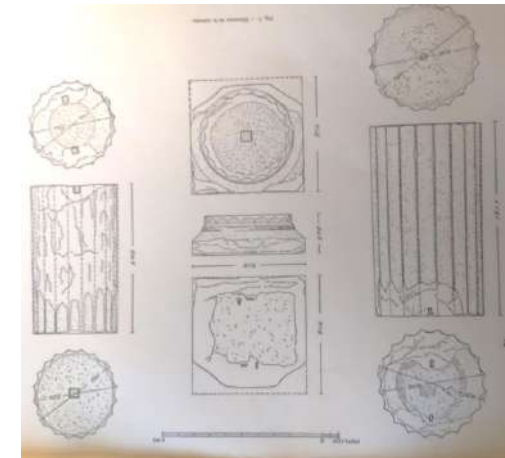


The remains of the three buildings in Samothrace.  
<https://www.samothrace.emory.edu/unidentified-late-hellenistic-buildings-1-3/>.



Collapsed wall and columns of west portik in Laodikeia.  
 Kumsar et al., 2015

The Temple of the Twelve Gods (Dodecatheon), and the positions of the grooves. Jean and Will, 1955.



Picture from the Agora, in Sagalassos, Turkey.  
 Ingo Mehling, CC BY-SA 3.0, from:  
<https://commons.wikimedia.org/w/index.php?curid=20238776>



A vertical connector with lead between the fifth and the sixth drums, in the east column (Two choregic columns on the South flank of the Acropolis).  
 Zambas et al., 2011.

## In-situ Investigations



*The Temple of Olympian Zeus, Athens*



*Drums of the Temple of Twelve Gods, in Delos*



*Stoa Kotyos, in Epidavros*

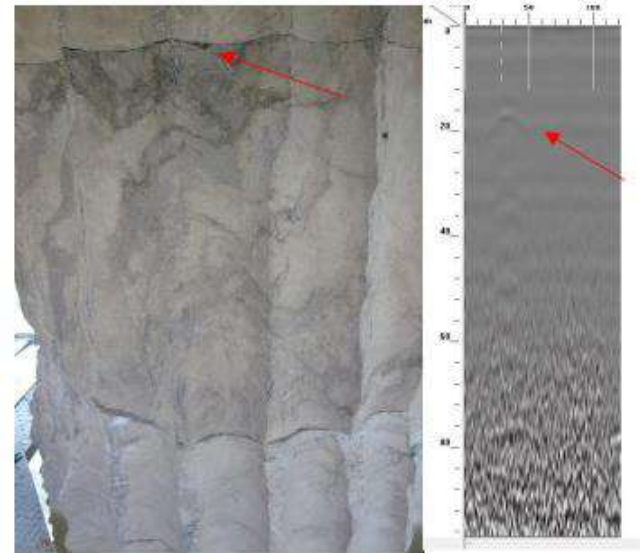


*The Temple of Athena Alea, in Tegea*

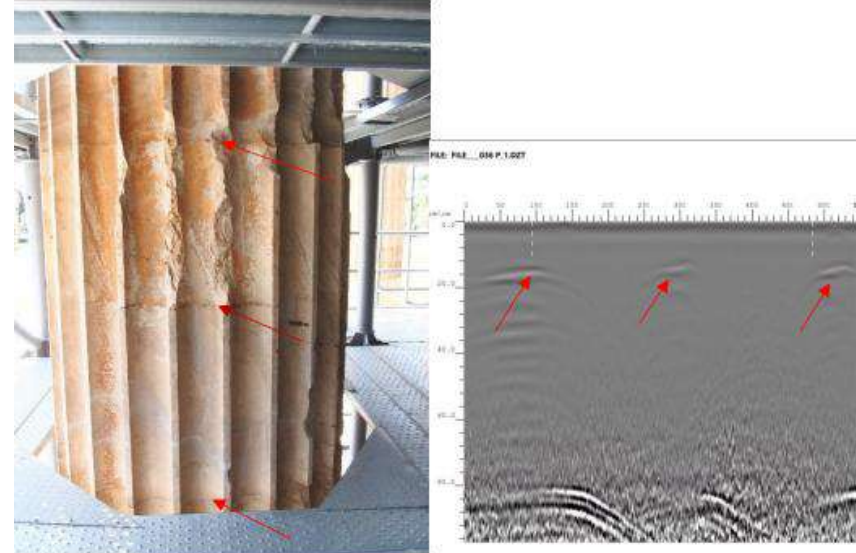


*Gymnasium, archeological site of Olympia*

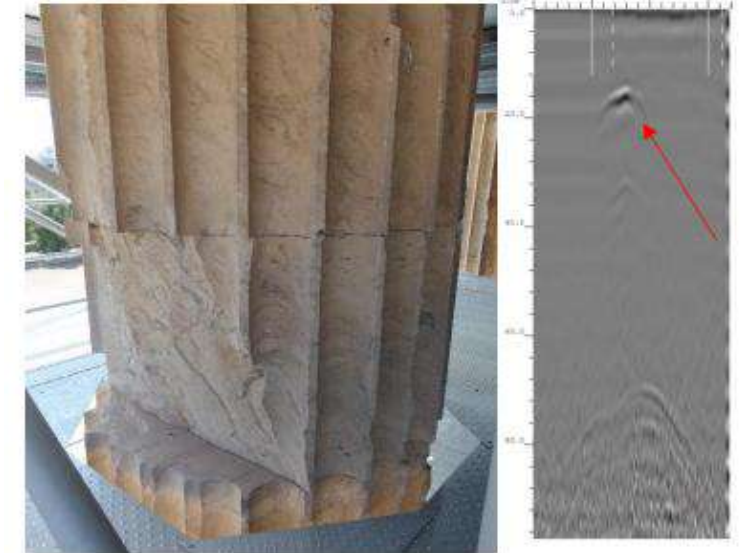
## In-situ Investigations- Application of the Radar Technique



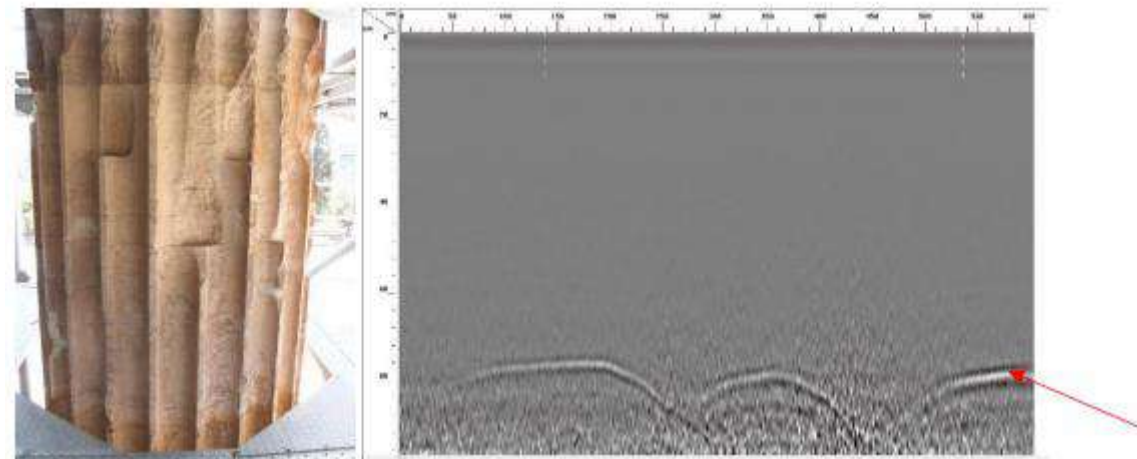
Column B18. Flut "α"



Column A3. Flut "η". Traces of lead between successive drums



Column A1. Flut "η". No traces of lead between the drums



Column A3. Flut "α". No traces of lead



Column A1. Flut "α". No traces of lead between the drums

# In-situ Investigations – Selection of the Monument – Gymnasium, Ancient Messene



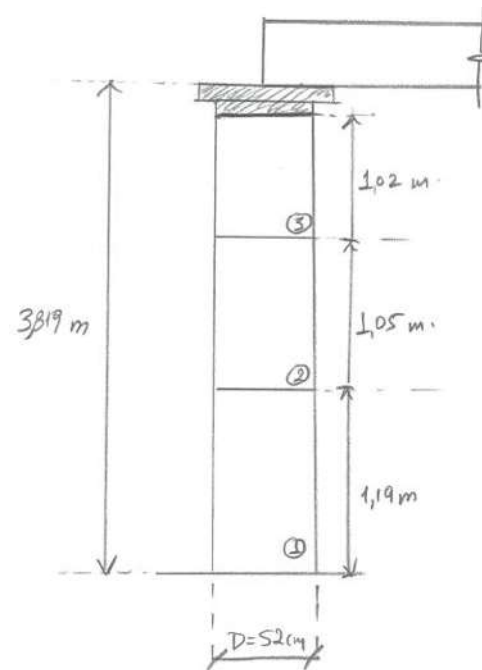
→ The construction of the corner and the epistyles



Drums with grooves and connectors →



A column, as restored



Drum with grooves and channel for the lead pouring →

