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## Carpenter Hoards in Minoan Crete, tools for woodworking? Technological and functional study of copper alloy tools from Malia.

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# MAIN RESULTS

- Two carpenters hoards in Malia (Quartier Mu) appear to be well attested woodworking toolkits both typologically and by tool association. Lithic tools are a complementary association (Karimali 2008) to metal toolkits for woodworking (Loescher 2021).
- Tool hoards alone are not a significant proof for a workshop (Evely 1988) they should rather be considered as toolkits (Procopiou 2013) stored pending future use. They can create a workspace "wherever [they are] laid" (Gorgues 2017)
- A first referential of archaeological and experimental traces.
- No woodworking related traces could be identified, but manufacture traces such as polishing marks and indirect percussion (teeth setting) were recognized.

# AN ONGOING RESEARCH PROJECT

A PhD Thesis started in 2021 on "Woodworking in Minoan Crete (3200-1100 B.C.): tool hoards, contexts and technology" with the aim to expand the investigation method to all 26 Cretan hoards previously identified as potentially related to woodworking.



# CARPENTER HOARDS IN MINOAN CRETE, TOOLS FOR WOODWORKING ? TECHNOLOGICAL AND FUNCTIONAL STUDY OF COPPER ALLOY TOOLS FROM MALIA

## INTRODUCTION

How may we study woodworking when the material is not preserved in the archaeological record ? During the Bronze Age in Crete (3200-1100 B.C.) there are hoarding practices of metal tools within the settlements (Blackwell 2018). 13 of them have been referred to as "carpenter's hoards" (Branigan 1969 ; Deshayes 1960 ; Evely 1993 ; Poursat 1985). From a first synthetic study (Loescher 2020) we identified a larger panel of 26 "tool kits" (Procopiou 2013) potentially related to woodworking. These attributions, which are based on typology and associations within the assemblages, remain however uncertain. The difficulties are due to the versatility of the tools and the use of the same techniques (sawing, cutting) in wood, stone and bone working. This research therefore questions the functional attribution of metal tool deposits in Minoan Crete through a use-wear and an experimental approach.

## METHODS

### Use-wear analysis

Application to metal artifacts is a recent field in archaeological research (Dolfini, Crellin 2016 ; Kienlin, Ottaway 1998) Referential of traces used (Gutiérrez, Munoz Moro 2020 : table 1). Material : Optical Microscope Dino-Lite (x20 and x50).

### Experimentation

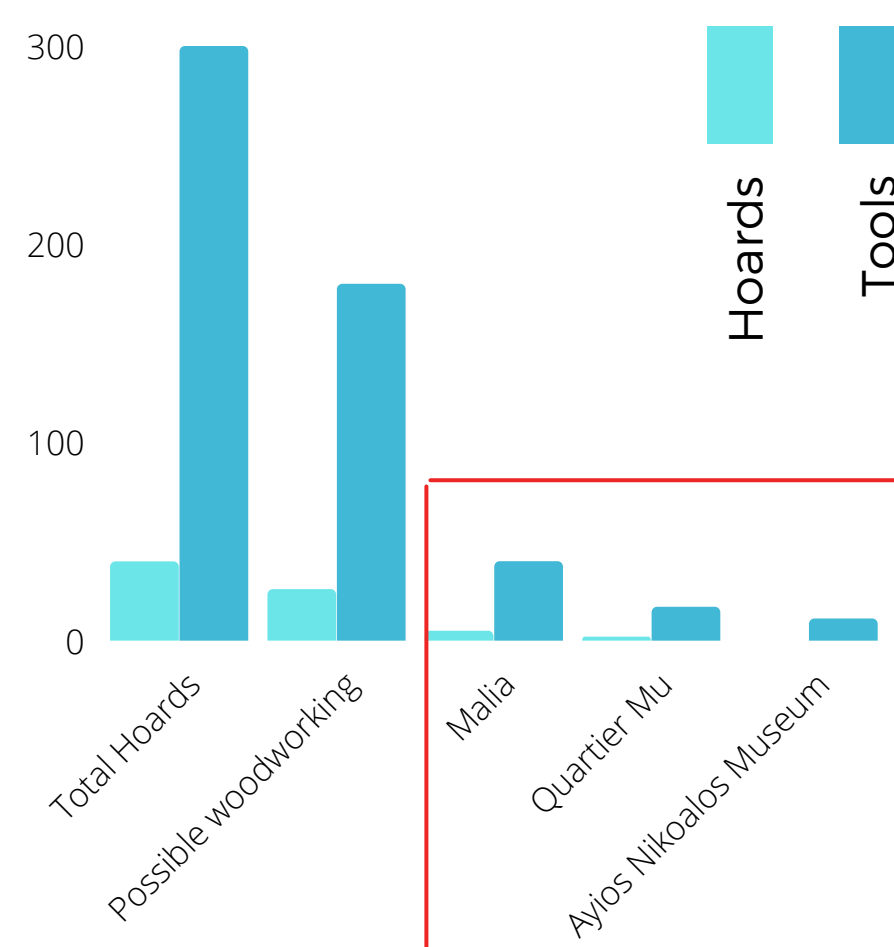
6 saws whose versatility is known from their archaeological context (Poursat 1996). Recent developments of archaeological experiments around tools in the aegean world (Maragoudaki, Kavouras 2012 ; Maragoudaki 2019 ; Löwe Fri 2011) Collaborations with :

- François Allier (Fonderie de l'Oppidum) for the reproduction
- LTDS (Tribology and Systems Dynamics Laboratory UMR 5513) for analysis

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## SAMPLE STUDIED



### Malia, Quartier Mu (Hoards A 19 et B IV4) :

- 2 "administrative" buildings
- MM II (~1700 B.C.), destruction layer
- fallen from upstairs
- only tools ; typologically related to woodworking (modern parallels)
- association of lithic and metal tools

## CONTEXTS

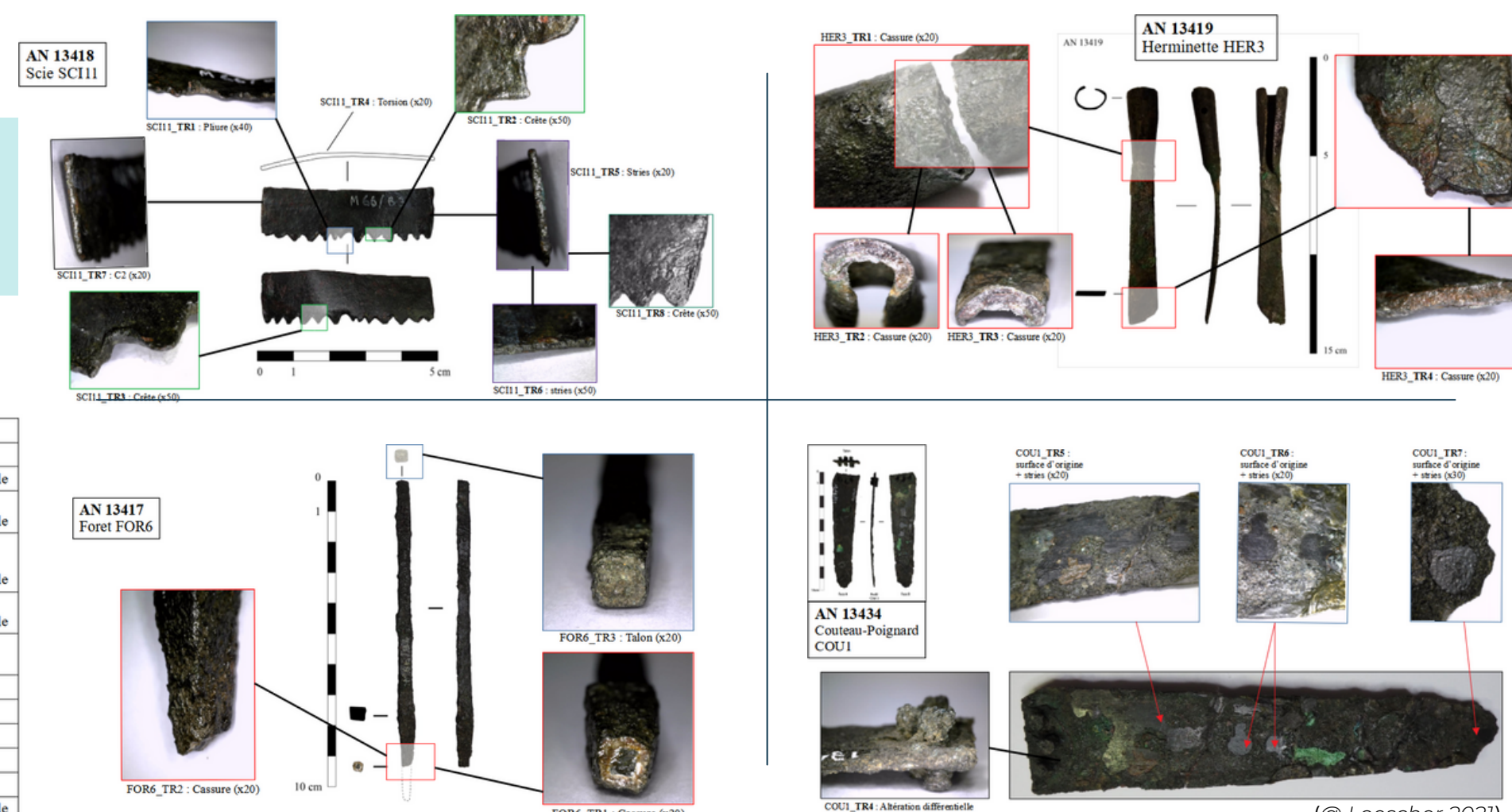
**Hoard A**  
Building A, corridor I 9  
metal tools : drill ; knife-razor ; saw ; axe-adze  
lithic tools : 2 axes

**Hoard B**  
Building B, room IV 4  
metal tools : double axe ; saw ; adze ; punch (or drill) ; chisel  
lithic tools : 3 obsidian blades ; 2 whetstones ; hammer

## USE-WEAR ANALYSIS ARCHAEOLOGICAL TOOLS

11 archaeological tools analyzed [Ayios Nikolaos Museum of Archaeology] 8 from Hoards A et B + 7 little saws (Optical Microscope Dino-Lite : x20 and x50)

Type de trace	Outil et ID. Trace	Interprétation
Cassure	FOR6_TR1-2	Fabrication
	HER3_TR1-2-3-4	Altération post-dépositionnelle
Torsion	SCE11_TR4	Utilisation/manipement
	13439_TR5	Fabrication
Plisure latérale	SCE11_TR1	Utilisation/manipement
	SCE11_TR2-3-8	Altération post-dépositionnelle
	13439_TR4	Fabrication
Stries	SCE11_TR4-5	Fabrication
	COU1_TR5-6-7	Polissage
Altération différentielle	COU1_TR2-3	Emmanchement
	COU1_TR3-4	Scier des rivets
Bord défectueux	13439_TR2	Utilisation
Résidus	13439_TR1-2	Altération post-dépositionnelle



## EXPERIMENTATION

### 6 versatile small saws reproduced and tested

Saw model from Quartier Mu, Hoard A et B (Evely 1993 : type 1)

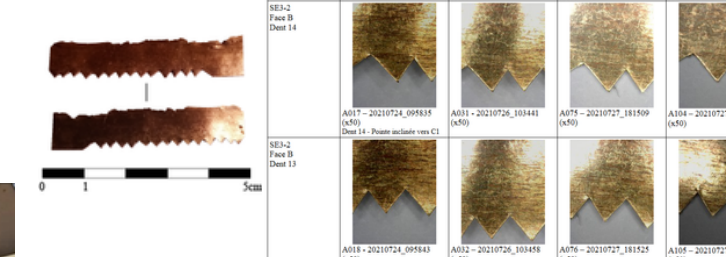
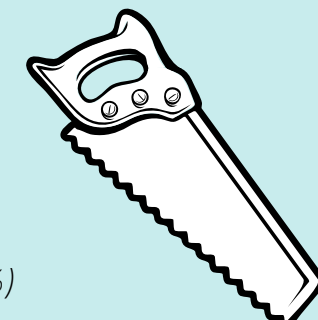
3 different materials :

- wood (olive tree)
- bone (bovid)
- soft stone (steatite)

2 variables :

- bronze alloy (tin 3% and 8 %)
- worked material

3 sessions of 30 min work, observations carried after each session



Type de trace	Outil et ID. Trace	Interprétation
Résidus	SE3-1_TR1	Utilisation
	SE3-2_TR1 ; SE3-2_TR4	Dépôt de su travail du bois
	SE3-3_TR1 ; SE3-3_TR2	Utilisation
	SE3-3_TR2	Dépôt de moëlle et de chair
Emoussé	SE3-2_TR1 ; SE3-3_TR1 ; SE3-3_TR2	Utilisation
	SE3-3_TR2	Dépôt de poudre de stéatite
Entaille et plisure latérale	SE3-2_TR2 ; SE3-2_TR2	Utilisation
	SE3-2_TR2	Mise en forme des dents à la cisaille
Stries	SE3-2_TR1	Fabrication
	SE3-3_TR2	Marquage
	SE3-3_TR2	Utilisation
	SE3-3_TR2	raibone exacte inconnue

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