LEKTIO

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Domestication of rock: Late Neolithic plaster ware from Tell Sabi Abyad, Syria and beyond

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> *It was so beautiful out in the country, it was summer – the wheat fields were golden, the oats were green, and down among the green meadows the hay was stacked.*

So, the story of "The Ugly Duckling" by H.C. Andersen begins.

Today, I want to tell you the story of the Ugly Vessel. Formerly known as white ware. *Like the duckling, it was misunderstood and set aside – ridiculed by its spectators, ignored by pottery specialists, cursed by field archaeologists, and dismissed as* varia *– a miscellaneous object of no clear value. Perhaps we could call it a misfit – a form no one quite knew what to do with, and few bothered to understand.*

2002 was the year I first encountered this white, coarse, and confusing material. I hope, more than two decades later, that my research has helped this so misunderstood vessel to find its proper place within archaeology. So, you, as the audience, can see that this vessel contains much beauty and colourful knowledge (Fig. 1).

Since Plaster ware is not widely known to the main audience, I need to take you back to the beginning and guide you through some of my past research steps. One of the most common misconceptions I have been fighting against in my whole research is: Ah, so it is a kind of ceramics? No, it is not. This material is made of plaster, not clay. Plaster originates from rock. A plaster pot undergoes an entirely different production sequence from a clay pot. Another difference is the use of pyrotechnology. Pottery is fired at the end of the production line. For plaster, this is in the beginning. Plaster is made by acquiring the rock material or gypsum soils. These materials are then heated at 700–900 degrees for

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Fig. 1. Plaster Ware pot with beaded rim, Tell Sabi Abyad.

limestone or 120–140 degrees for gypsum. The material is ground, water is added, and then a vessel is immediately shaped, or the plaster slurry matures, depending on the raw material, before shaping. The shaped vessel then must dry. Lime plaster takes a long time to set through carbonation (weeks, even years). Gypsum only takes a few hours or a day or two. Lime plaster instead gives a stronger and more durable material than gypsum.

The first known attempt to tame rock and make plaster occurred already in the Epipalaeolithic, more than 16,000 years ago on the Sinai Peninsula. Plaster and especially lime plaster slowly developed into a material used for plastering walls and floors, but also in mortuary contexts. Where and when did they start to make vessels out of plaster? Let's start with *where*. Plaster ware has been found from Cyprus in the West, to Iran in the East, from Anatolia in the North and to the Islands in the Persian Gulf in the South. In the west, lime plaster was often used, whereas in the eastern sites of the Balikh and Khabour Valleys in Syria, gypsum was the dominant material. This extensive variation in raw materials may be attributed to geological factors, as well as sociocultural customs and technological know-how. *When* is an interesting question that can only be answered with more regional studies. However, it is clear that at Tell Sabi Abyad (red arrow, Fig. 2), a site in the Balikh Valley in present-day North Syria, plaster ware vessels were used as early as 7000 cal. BCE. Perhaps even earlier.

Tell Sabi Abyad is a site with four mounds. In eighteen seasons of excavation, directed by Prof. Peter Akkermans (Leiden University), Neolithic settlements were uncovered at mounds I, II, and III, dating from

Plaster Ware sites in alphabetical order:

Abu Hureyra III, 2. Ain Ghazal, 3. Ais giorki 4. Ali Kosh, 5. Bouqras, 6. Byblos neol. ancien, 7. Çayönü, 8. Choga Sefid, 9. El-Kowm, 10. Gritille, 11. Hama, 12. Labwe II-III, 13. Munhata, 14. Nahal Hemar Cave, 15. Qdeir, 16. Ras Shamra VB, 17. Tell al-Sinn, 18. Tell Aswad, 19. Tell Boueid II, 20. Tell es-Sawwan, 21. Tell Halula, 22. Tell Hashbai, 23. Tell Jisr, 24. Tell Mafraq Slouq, 25, Tell Mounbateh, 26. Tell NebA'a Faour, 27. Tell Ramad II, **28. Tell Sabi Abyad**, 29. Tell Seker al-Aheimar, 30. Tell Shir, 31. Tell Sukas, 32. Telul Breilat, 33. Telul eth-Thalathat, 34. Umm Dabagiyah, 35. Umm Qseir, 36. Sha'ar Hagolan, 37. Saayideh, 38. Yarim Tepe I, 39. Wadi Shu'eib.

Sites outside the map with gypsum plaster, the islands in the Persian Gulf: Ghagha, Delma, and Marawah Islands.

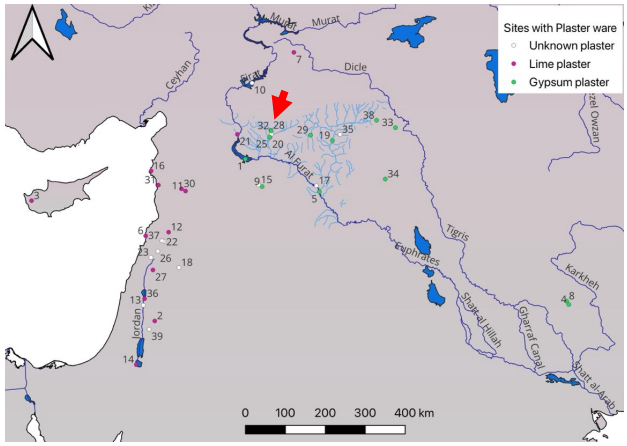


Fig. 2. Map Southwest Asia with sites with Plaster Ware (for full references see dissertation). Tell Sabi Abyad marked with a red arrow.

the late eighth millennium to the first half of the sixth millennium cal. BCE, that is, from late Pre-Pottery Neolithic B to the middle Halaf. At the main mound SAB I, excavations were carried out in five areas, referred to as Operations I–V (selected literature: Akkermans 1993; 1996; Akkermans et al. 2006; Akkermans et al. 2014; Akkermans et al. 2015). My research focus is on Operation III (Fig. 3). The darker blue marks the period when Plaster ware was commonly used. In the beginning, it was more common than pottery but less common than stone vessels. Plaster ware continued to be used side by side with pottery until it was phased out sometime during the Halaf period.

Not unknown but understudied

Due to the incomplete recognition of plaster material throughout excavations, plaster ware has not yet been fully understood. Its composition, being distinct from clay ceramics, has led pottery experts to deem it not significant for inclusion in their research. Consequently, it has often been classified as varia.

The lack of genuine information was also what caught my attention when I was working in the Small Finds administration at Tell Sabi Abyad in 2002. In my search for information, people were helpful in providing me with the information they had and encouraged me to search for

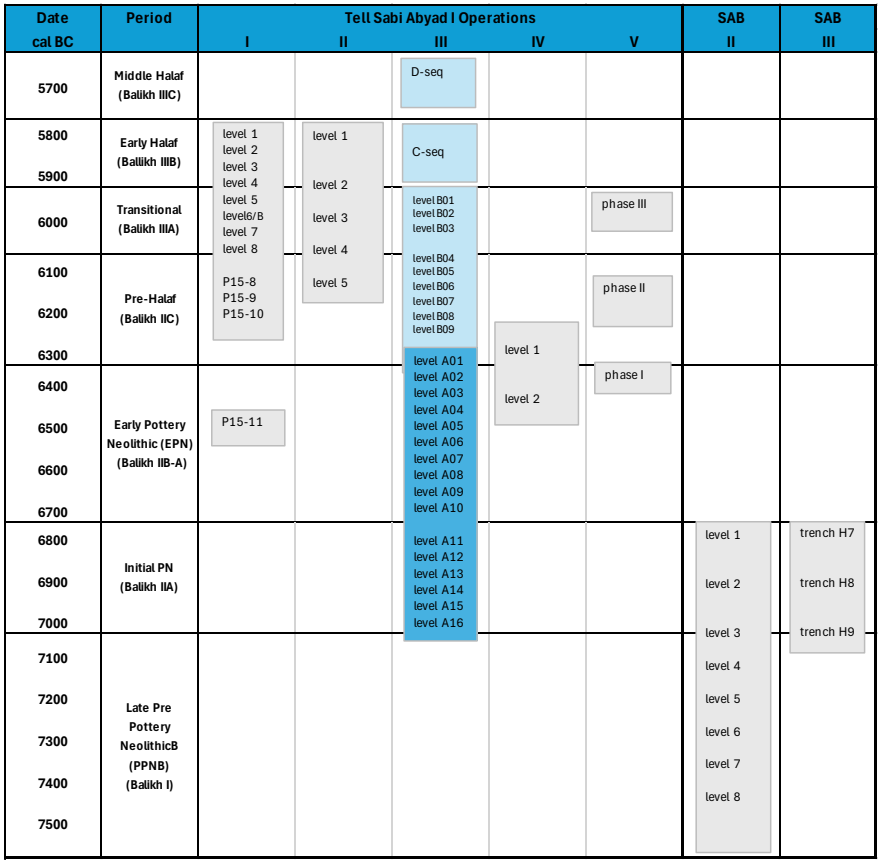


Fig. 3. Chronology of Tell Sabi Abyad. Operation III (blue) was the focus of the study.

more. Dr Marie Le Miere was enormously helpful in guiding me to some of the few early studies that focused on the material (Dunand 1949; Contenson & Courtois 1979; Maréchal 1982; Le Mière 1983). In 2002, my database consisted of only 2,700 sherds. I did not know that when the excavation ended ten years later, I would have studied thousands of sherds and weighed more than a ton of them. Had I known in 2002 what lay in front of me, my approach would have been different. To this day, this material constitutes the largest corpus of Plaster Ware in Southwest Asia. It is therefore with a heavy heart that I show you the following (Fig. 4) (See also the documentary from the Syrian Authority of Tourism and Protection of Antiquity made in 2017, https://youtu.be/kICwME6r7o-Q?si=BxDQsAW-_1KFg-XM).

Fig. 4. Research scattered in 2013/2014 during the looting of our storage facility outside Raqqa by ISIS. (Unknown Photographer, Syrian Directorate General of Antiquities & Museums).

Why it matters

In 2014, we were devastated by the news that the storage facility of Tell Sabi Abyad, situated outside Raqqa, had been looted. Boxes and bags were ripped open, leaving finds scattered on the ground. Years of research gone. This is also one of the main reasons why it is important that I publish my findings; otherwise, knowledge will disappear and be forgotten.

The curiosity that nearly killed the cat

When I started my research, I wanted to know everything about this Ugly White Vessel. The *Theory* behind it and the physical *Material*. I wanted to explore how *Typology* is more than just shapes, being a result of what the material allows, and how shape influences its use. By studying *Distribution*, I aimed to uncover the ongoing entanglement between co-objects and co-spaces and how it affects human interaction with objects in specific spaces.

One of the first struggles was understanding the terminology and the concept of the Agency of Naming. And how the terminology influences

our interpretations. Mine, my colleagues, but also the general audience. What do we really mean by *plaster*? Many publications only mentioned *plaster* but did not specify it further. It is quite crucial to know if a plaster is made of limestone or gypsum, as the *chaîne opératoire* is slightly different. Some reports even used the term plaster for mud floors. I also found out that gypsum can refer to both the mineral gypsum stone and the plaster, and that in some languages, such as German (gips), Swedish (gips), Finnish (kipsi), and Arabic (jiss), it is generically used for all types of plaster, regardless of the raw material.

What about this label: 'White Ware / *Vaisselle Blanche*'? An expression coined by Dunand in 1949 (Dunand 1949). Is that a comprehensible term? When I told colleagues at conferences that I studied white ware, I was sent articles about ceramics made from marly clay, kaolin, or even porcelain. It was clear my find category deserved a better description.

By calling it plaster, I am following the material tradition of Contenson and Courtois, who referred to it as *vases de chaux* – lime vessels (1979). To keep it simpler, I preferred "plaster ware" as it is hard to see the difference between lime and gypsum in the field. By using the term "Plaster ware" I combine the materiality of the plaster with the Functionality of the object (Nilhamn 2023).

Theory: the Fun stuff

For some people, theory is the boring part of research. I could not disagree more. Just compare it to sport.

- **Theory** is the Conceptual Framework. Or as we say in sports, the Strategy or Game Plan. It includes the WHY, the vision, the target, or the research aim. For me, understanding the agency of Plaster ware within Neolithic society is key.
- **Approach** is how I, as a researcher, proceed – approach the matter (case study, experiments, typology and distribution analysis). That is the Tactics – the HOW we play to meet the strategy (offensive or defensive).
- **Method** is the WHAT, the specific actions that must be done, or the execution tool. Petrography, XRF, building a typology, distribution mapping, or passes, shots, drills and so on.

I found my theoretical base in Symmetrical Archaeology. SA is, in fact, more of an approach of how theory guides performing archaeology. SA originates as a theoretical framework grounded in material semiotics, Actor-Network Theory (Latour 1994; 2005), and posthumanist philosophy (Witmore 2007; Olsen et al. 2012).

Symmetrical Archaeology supports my belief that both humans and material objects have agency and influence each other. They have equal ontological status (they co-produce meaning). Material is not passive; it acts, shapes, and relates. The concept of materiality, introduced by Gosden (1994), focuses on how the physical properties of materials, including sensory qualities such as density, mass, colour, and texture, shape human interaction with objects. Following Ingold (2007; 2013), this view extends to the **agency of materiality** itself: how materials, rather than finished objects, actively influence human behaviour. In my research, I explore the materiality of limestone and gypsum plaster, which may appear similar but possess different properties that affect their use. SA calls for multidisciplinary research. It is impossible to understand using only one method. During fieldwork, the material was gathered, counted, weighed, drawn, studied, felt, listened to and smelled. The material has been viewed both macroscopically and microscopically, using a polarising light microscope, as well as a Scanning Electron Microscope. X-ray Fluorescence was used for geochemical analysis of the elemental composition of the plaster.

Experimentation was used not only to replicate ancient techniques but to engage with plaster as an agentive material. From a Symmetrical perspective, I entangled myself as a researcher with the material. I experienced the joy of succeeding in making a pot and the despair and frustration when I did not.

Instead of building a typology based on only morphology (i.e. the shape), I wanted to investigate how the plaster influences the shapes. The raw material (lime vs. gypsum), production method, context, and interaction traces on the interior and exterior. And indeed, the material restrained the possibilities. The height was rarely higher than 20–40 cm. Most vessels are open bowls with diameters between 23 and 32 cm.

Plaster ware is in many ways very similar to the contemporary pottery[1], or should we say, early pottery looked like Plaster ware? Plaster

1 The Neolithic pottery has extensively been studied by Olivier Nieuwenhuyse 2007; 2018. Pottery and Plaster Ware were compared in a joint study 2011.

ware was initially considered the crude precursor to pottery. However, my research has shown that Plaster Ware was contemporaneous with pottery, albeit with different purposes due to the distinct physical qualities of the raw materials. One feature that stands out was the beaded rim, common on Plaster Ware but rarely found on pottery (Nilhamn 2024). Plaster ware lacked the ears and handles that we find on pottery; perhaps the beaded rim was intended to make it easier to carry the pot. Another reason is that a beaded rim helps when sealing off to protect the contents from light, rodents, insects or other humans. Not only did the sealing protect the commodity. Lime plaster as a material mitigates bacterial and fungal growth due to its high alkalinity and natural drying effect. Gypsum is hygroscopic, meaning it can both absorb and release moisture, which helps maintain a stable microclimate. In sealed containers, microbial activity is kept low due to limited humidity and oxygen.

Challenging Prejudices

It was long believed that a plaster vessel could not hold water. Strangely, many sherds showed signs of water contact on their interior side. That brought me to experiment. I found that plaster held water well, especially if treated with oil.

If we call a material white, we will never keep our eyes open for colour. During fieldwork, I discovered that our White ware was not as white as expected. When we changed the cleaning method from brushing to using an air blower and dipping in water, I noticed sherds with pigments; some had wavy lines or dots on the exterior, and others had discolouration on the interior. This brought me to experiment with the survival of pigment and to see how vulnerable these pigments are, indicating that we lost much knowledge by brushing (Nilhamn 2017).

As plaster ware is a rather heavy material, it is unlikely to be moved around much. I was especially curious about how it was distributed indoors and what the co-finds were. Together with Merel Brüning, who studied the architecture, and Akemi Kaneda, who studied the stratigraphy, we looked at the distribution of plaster within the site (Nilhamn, Brüning & Kaneda 2025).

One small backroom intrigued me especially. Here, 13 vessels were found with diameters between 25 and 50 cm – three with basketry impressions. The southern half of the room had a plastered floor. Not much space to move around, so most likely a space for storage.

We were also curious if the same plaster was used for portable objects as for architectural features, such as floors, walls and stationary bins. Our results showed that even if similar "ingredients" were used, according to XRF analyses based on elemental ratios, closer petrographic analysis using both a polarising light microscope and a Scanning Electron Microscope displayed differences in mixing, seen as variations in the distribution of minerals and voids. During my experimentation, I realised that, as with baking a cake, not only are the ingredients important for the results, but also how you mix them. The order in which you add gypsum to water, the water and air temperatures, the duration and intensity of mixing, and the drying time affect your results (Nilhamn & Kume 2024).

The petrography and geochemical analyses showed that at Tell Sabi Abyad, gypsum was the most common raw material for plaster. Which is interesting as the site itself is situated in a lime region, and gypsum is not directly at the site but requires a journey of approximately 40 km. This proves that geology alone doesn't determine choice. Nor does a material superiority. As you heard, lime plaster is more durable than gypsum. I believe it is a Trade-off between durability and speed, as well as fuel/labour costs. Further, it is a matter of cultural belonging, traditions and know-how.

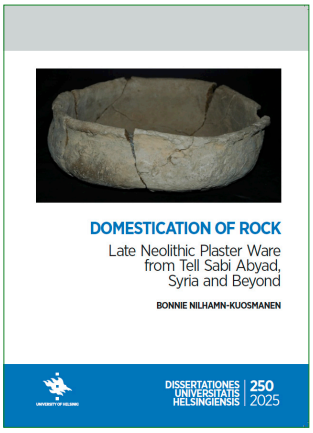
To conclude

A clear terminology is essential. I therefore advocate for the use of Plaster ware. Plaster relates to the material. Ware refers to both the manufacture and the function of being a vessel. I strongly oppose that Plaster ware was merely a primitive forerunner of pottery. Plaster ware has proven to be an excellent container for storing dry goods. Furthermore, it contained social value. It participated in both daily life and stored not only items but also memories and traditions. It was a stable domestic item. Too heavy to trade, it stayed home.

My title for my dissertation ends with the words … *and Beyond.*

There is still much to explore, but my wish is that this research shows the importance of paying attention to all kinds of materials, including those less commonly known. We should approach materials from both cultural and environmental perspectives. The agency of the material and its entanglement with other materials and humans. How it influences function, use and interpretations. The findings of my dissertation are a stepping stone in the ongoing research in Neolithic archaeology and material technology. Plaster ware is a valuable comparative material for studying early container technologies. It reminds us of the diversity of how ancient people interacted with and innovatively distributed their commodities and food, some for daily use, some stored away.

Plaster Ware is not a colourless, bland, ugly find category. Plaster ware is a beautiful, vibrant, entangled and crosshatched network of information. I feel privileged to have had the opportunity to explore its secrets and share them with you.



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Dr. Bonnie Nilhamn-Kuosmanen *defended her doctoral dissertation Domestication of Rock: Late Neolithic Plaster Ware from Tell Sabi Abyad, Syria and Beyond at the Faculty of Arts, University of Helsinki, on August 29, 2025. The opponent at the public defence was Professor Ian Kuijt from the University of Notre Dame, and the custos was Dr. Elisabeth Holmqvist from the University of Helsinki.*

Svenskt Referat

Ny forskning lyfter fram bortglömt neolitiskt material

I en ny avhandling vid Helsingfors universitet med titeln *Domestication of Rock – Late Neolithic Plaster Ware from Tell Sabi Abyad, Syria and Beyond*, visar Bonnie Nilhamn-Kuosmanen, att förhistoriska samhällen i Mellanöstern tillverkade kärl av gips och kalk, så kallad *Plaster Ware*, i en tid då keramik precis börjat få fäste (perioden 7100–5600 f.v.t.) Avhandlingen bygger på ett omfattande material från utgrävningar vid Tell Sabi Abyad i norra Syrien som var ett internationellt projekt lett av Prof. Dr. P. Akkermans vid Leiden Universitet (1986–2010). Över 23 000 skärvor av Plaster Ware har dokumenterats. Gips och kalk är två olika råmaterial. Gips bränns vid låg temperatur, är lätt att forma men blir skört; kalk kräver hög värme och mer arbete men ger ett hållbart bruk. Trots detta visar studien att gips föredrogs, vilket tyder på att snabbhet, tillgänglighet eller tradition vägde tyngre än hållbarhet och att valen var medvetna, även organisatoriskt. Kärlen användes länge parallellt med tidig keramik. Den aktuella situationen i Syrien försvårar fältarbete och plundring har förstört stora delar av fyndmaterialet. Därför är det viktigt att det här materialet nu har analyserats och publicerats. Det handlar om att bevara ett stycke kulturhistoria som annars riskerar att gå förlorat.

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