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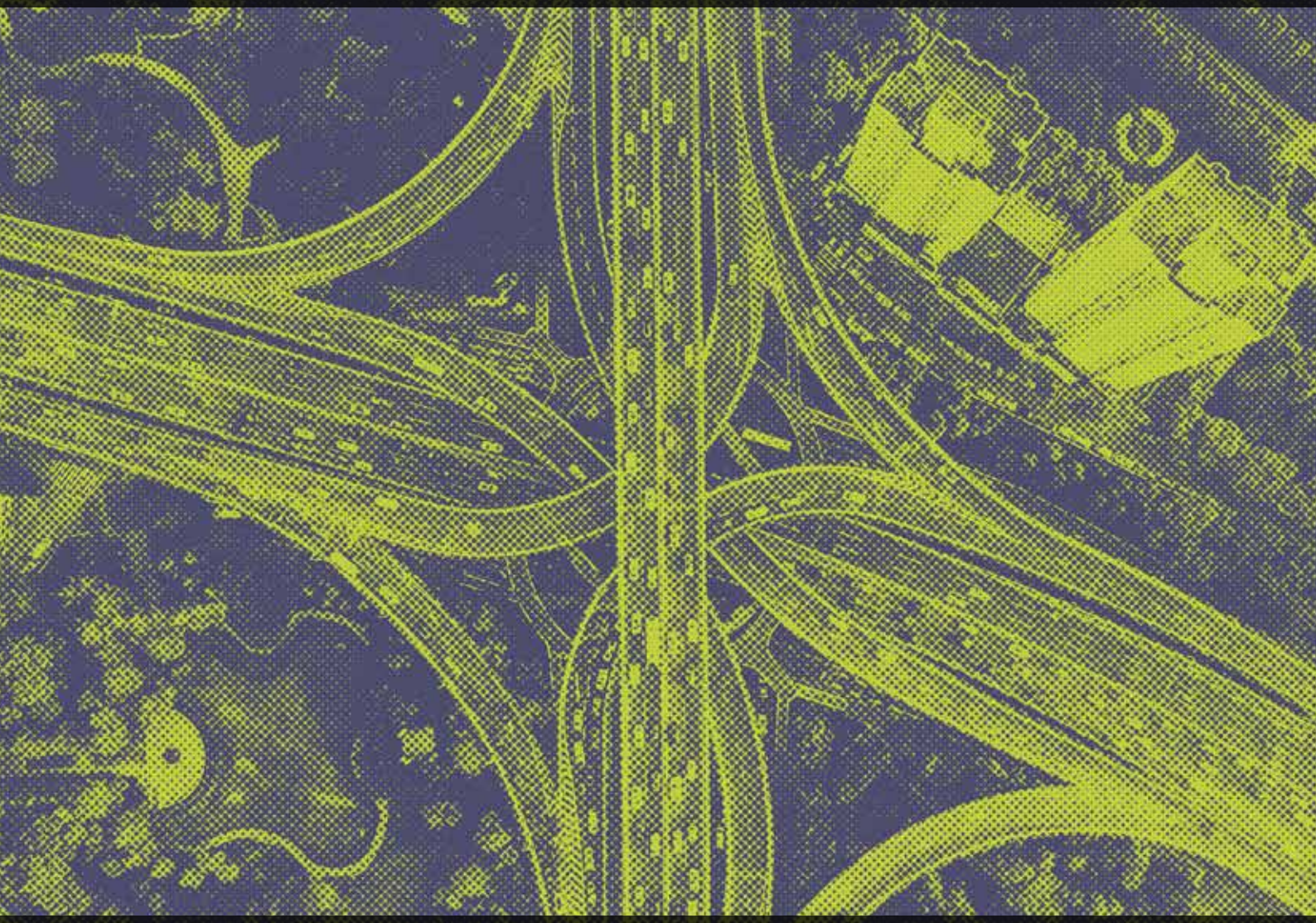

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THE HUMAN WORLD

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EDITORIAL STATEMENT

HOW MATERIALS SHAPED THE HUMAN WORLD

Marie Kolbenstetter, Maikel Kuijpers and Ola Lygre

The human past has been shaped by materials, and our future will be too. Without a thorough understanding of the material powers that make us, we are not well equipped to create a more sustainable future. An archaeological perspective is crucial to this understanding as we explore the long-term with a special focus on human-material relationships, offering society a perspective on human-material dependencies, and how they arise and change. Archaeologists have no problem recognising the importance of materials in the past. Entire epochs are named after them: Stone Age, Bronze Age, Iron Age. But something changes, supposedly when 'history' begins. There is no Concrete Age that follows the Iron Age, despite the fact the Roman Empire could not have been built without concrete.

This special volume of Inter-Section challenges this dematerialised view of history. The presented papers explore how materials have, and continue to, shape and guide the human experience, as they have been our companions since time immemorial. Materials are the building blocks of our society, but we have hardly begun to acknowledge the extent to which this statement rings true. What happens when we do? How will we see ourselves when we take a less anthropocentric look at humanity, and give a little more due to the materials that make us? They shape our surroundings in the form of objects, tools, and buildings, but they also shape us. Humans are fundamentally embedded in, and emerge from, a material environment. In other words, there are material dimensions to how we think and behave. This means that through writing material histories we are writing human history.

There are many different theoretical perspectives that focus on human-material relationships. From Marx to material engagement theory, from entanglement to thing theory, from craft theory to material agency. For clarity's sake, we lump all approaches under the heading of "New Materialisms" (Witmore 2014, 203), despite the fact that some scholars prefer their own terms, such as "neo-materialist" (LeCain 2017) or 'material agency' (Boivin 2004). With 'New Materialism' we refer to a group of new theoretical approaches developed during the last few decades. The overarching theme of these approaches is that the role of the materials in material-human relationships is reconsidered, with many of these frameworks arguing that that material has agency of its own, (in)dependent of human action on the material.

This special issue was born out of a 2021 course titled *How materials shaped the Human World* at the Faculty of Archaeology of Leiden University. This course was designed as a collaboration with the Royal Academy of Arts (Koninklijke Academie van Beeldende Kunsten – KABK), to familiarise both archaeology and design students with the new perspectives on human-material relationships offered by the theories of the 'New Materialisms'. The course centered on a few key materials, such as concrete, clay and wood, which are featured in this special issue.

Concrete - *opus caementicium* - was a crucial material for the Romans, who used it to shape and connect their empire. In the modern age, it has allowed us to shape our world in unparalleled ways, becoming one of the main materials of the modern human habitat. And why should we not speak of the Clay Age rather than the Stone Age? As mundane and unpretentious as clay may be, this material has been foundational to prehistoric societies in the shape of pots and mud bricks. Moldable and forgiving, clay is a universally favoured material, and one of the most frequent archaeological finds. Finally, while evidence is often absent or poorly preserved, wood has played a central role from the early human past to the present. Wood is characterised by its diversity, as different types of wood offer a distinct set of traits, allowing it to fulfil many different roles, from planks to books to spears. In the form of mass-timber it is even making a come-back as a sustainable building material.

The contributions to this special issue can be conceived as thought experiments, aiming to explore how theories of new materialisms are inherently embedded in how archaeologists approach assemblages. As such, contributors were encouraged to reevaluate archaeological, historical or material phenomena by putting materials - not people - front and centre of the narrative. The resulting articles highlight the agency of the materials in shaping the social and cultural dynamics that surround them, as well as the networks that include them. This reframing of archaeology as a study of *things and materials*, rather than a study of the human past, allows us to extend archaeological thinking to recent and contemporary contexts. Further, it encourages us to rethink our relationship with the materials which shape our existence, as evidenced in the afterword by designer Nina Škerjanc.

In the first contribution to this volume, Michael McCabe III takes a phenomenological approach to the production process of *ceramica argentata*, an Etruscan ceramic type, which combines the qualities and affordances of clay and metal. Through material engagement theory, he explores the effects of the various affordances of these materials on the maker's mind at the different stages of the operational sequence. By recentering the materiality of the *ceramica argentata*, at every step of the production sequence, he provides a different perspective on this well-studied object category, and reveals the sensescapes produced by the handling of the material.

In the second contribution to this special issue, Mikaela Radford integrates new materialism perspectives into the more processual operational sequence approach, taking the 18th century wooden Maori canoe, or *waka*, as a case study. By documenting the same operational sequence from both anthropocentric and material-centric perspectives, she manages to integrate Maori worldview into the processing of wood as a resource, highlighting the interrelationship between the affordances of wood and traditional indigenous knowledge.

In the third contribution to this special issue, Sven van Maris explores the material agency of concrete by examining 200,000 Albanian bunkers. By focusing on the material aspect of these bunkers, rather than the political context that led to their creation, Sven van Maris highlights the agency of concrete in activating and maintaining the social memory of the Hoxa dictatorship. This contribution exemplifies the use of archaeological new materialist thinking to recent historical and current phenomena, exposing the long-lasting effects of concrete's material agency.

In the fourth contribution, Imme van der Leij takes on a similar approach in her discussion of the sociocultural role of concrete's permanence in the case of the Shayad/Azadi Tower in Tehran. Through examining the affordance of concrete in the design strategies of the monument, and in the lived experiences it produces, Imme van der Leij produces a holistic narrative of the materiality of concrete and its durable impact on state-building in Iran.

In the final article of this special issue, designer Nina Škerjanc discusses how both new materialism and new technologies informs and shapes modern design. Offering a reflection from a designer perspective on working with clay in modern times, Nina Škerjanc's contribution documents the various impacts of industrialization on the cognitive processes of the maker, and on the clay's material agency. In her afterword, she highlights the value of a designer's perspective to the study of (past) crafts. The inherent relationship between maker and material is emphasised, which sits at the heart of new materialism perspectives.

Our aim with this special issue is to show the extent to which people are entangled with materials. Realising how caught up we are with materials helps us to better understand who we are, and what we have in common with all humans, and other living beings on planet Earth.

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THE PHENOMENOLOGY OF MIND AND MATERIAL:

CERAMICA ARGENTATA PRODUCTION IN ETRURIA

Michael Dennis McCabe III

ABSTRACT:
Ceramica argentata stands out in Etruscan ceramic production, particularly for its dialectical blending of two worlds into a finished product, metallurgy and ceramic production. Modern research on the topic primarily focuses on explaining the production sites and the step-by-step process of the production method. Recent developments in new materialist thought offer a new perspective on past analyses of *ceramica argentata*; the focus of this article is to demonstrate the applicability of material engagement theory (MET) on *ceramica argentata* to shed new light on the relationship between maker and material. This article combines past research on physicality, production and production sites with MET and the notion of prehension to break down previous delineations between mind and material, and frame new conversations around *ceramica argentata*. In doing so, this contribution aims to foster further conversations regarding agency and how it is produced, highlighting the role of sense-scapes and the mind as having no *a priori* location.

KEYWORDS:
Materialism, Prehension, Cognition, Ceramic production, Etruscology

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INTRODUCTION

The development of *ceramica argentata* stands out particularly in ceramic production within the Etruscan sphere of influence. *Ceramica argentata* is a process which involved the dipping of ceramics into molten tin or rarely other precious metals, and drying them to form a slip that resembled a valuable silver finish. This development had a significant impact on how the viewer perceived the finished product, the senses involved, and the transformation on behalf of the craftsman (Haynes 2000, 325). Understanding Malafouris' material engagement theory and how it applies to the case study of Etruscan ceramic production and, more specifically, the development of *ceramica argentata* offers to shed new light on this material development. What changes result from applying a metallic slip? How does the perception of the material change fundamentally when the slip is applied? What can be gained from applying material engagement theory's phenomenological perspective, and how does its application vary from traditional Heideggerian phenomenology in this particular case? Material engagement theory and its impact on research on phenomenological studies are instrumental here in developing a new understanding of the impact and relationship between material and maker.

The resulting article will approach previous questions by first providing a brief synopsis of the theory used and how it offers a new perspective; then attempt to document the materiality of *ceramica argentata* (what is to be understood from this change and what physically happens to the material prior to and post slip application); then offer an overview of the production method itself; and finally discuss material engagement theory's usefulness in our understanding of *ceramica argentata*. This article aims to analyse what can be gained with such an approach, as opposed to taking the materiality at face value (a typological approach) or using the older Heideggerian phenomenological perspective.

[1] Material Engagement theory and many of the New Materialist strains find themselves in relation to *4E* cognition sometimes known as enactivism. The *4Es* in their most basic form regard the mind as: Embodied, Embedded, Enacted and Extended see Thompson (2007) for a detailed description of enactivism.

MATERIAL ENGAGEMENT THEORY: THINGING, PREHENSION, THROUGHNESS

Heidegger stands as one of the foundation figures for post phenomenology and as a result, one of its largest targets. His philosophy of technology has been criticized for being essentialist or in short, holding a "one size fits all" model of interpretation (Ihde 2010, 114). Other criticisms have ranged from the former, to "failing to connect with specific technologies" (Verbeek 2005, 95). Regardless, Heidegger's early work such as *Being and Time* and the concept of *Dasein* inevitably lead to post phenomenological thought with its radical concept of "Being in the world" both of which play critical roles in the development of New Materialist thought (see Heidegger 1996).

Malafouris, in his *Mind and Material* engagement, explains how material engagement theory takes a step forward with its phenomenological position, pressing the notion of the act of creation in the production method itself. The mental exchanges throughout this process are laid forth as a phenomenological experience, rather than the artist and material *being in* the world as separate entities. In the case of *ceramica argentata* this new application comes to fruition through a dialectical method, merging two unique crafts to create a synthesis that blends two completely different worlds—the application of metallurgy to ceramic production changes all of the senses involved with its construction. For instance, sight, smell, and touch all react in a completely new way to the utilisation of the slip in comparison with the step preceding it, the shaping of the ceramic vessel.

To ground material engagement theory within this analysis, its historical roots must be addressed. The pioneering contribution of Olsen, Shanks, Webmoor & Witmore (2012) in *Archaeology: The discipline of things* has led to a series of new theoretical models surrounding material culture, aptly named new materialist thought. Similarly, to many of the mew materialist strains, material engagement theory had not developed within a vacuum but instead resulted from a culmination of frustrations regarding the cartesian heritage of cognitive archaeology (Thomas 2004, 27). The development of material engagement theory by Lambros Malafouris (2013) focuses on creating an approach focused on the ontological unity of mind, world and body. What this means in archaeological practice, is the intentional study of the relationship between material culture and cognition through space and time, and what the consequences of material engagement are regarding the shaping of mind (Barona 2021, 143). Material engagement theory comes amidst the backdrop of similar theoretical discussions, such as the social brain hypothesis (SBH), 4E cognition, and theory of mind (ToM) models, which aid in its genesis, notably in an attempt at a rebuttal against said Cartesian biases. Archaeologists have used SBH and ToM to interpret the relationship between social cognitive and technological evolution, especially regarding the Paleolithic (Gamble et al. 2011; Gamble 2013; Gowlett et al. 2012). What both theories leave out, however, is the relationship between maker and material, material agency and the evolutionary efficacy of material engagement. The fundamental step forward with the development of material engagement theory is the perspective that while SBH offers to invoke matter more constructively by highlighting the underlying forces of change, material engagement theory suggests that these forces of change must be within the act of engagement itself, not before or following. The growing interest in *4E* cognition is one of many perspectives attempting to push back against this cognitive view of the location of mind and the material world[1].

How is material engagement theory represented, and what makes it different in its approach to cognitive archaeology? First and foremost, the theory is shaped by the principle of the mind having no *a priori* location; this is fundamental in understanding the following process. There has been a significant effort to create boundaries and delineation between the mental and the physical in past analyses. However, as Malafouris argues, this frame of thought fails in most real-life situations where thinking and interacting with the physical are inseparable in a material ecology (Malafouris 2019, 2). This pushes the concept of materials playing a significant role in human cognitive evolution; humans think through construction and material interaction, thereby leaving memory traces (Malafouris 2008a, 363). These memory traces, for example, are one aspect of a built knowledge or rather learned knowledge in the larger ecosystem of the mind. MET is a theory seeking to understand intelligence, not merely as a reflected form originating within the physical brain, but as an intuitive process where intelligence is enacted through the physical (Iliopoulos 2019, 2). This contradicts earlier barriers between the mental and the physical, in that it argues for our bodies not to be considered as external markers of human mental architecture as Malafouris puts it, but rather as active participants in the process of the mind (Malafouris 2019, 3). If we take the mind as having no *a priori* location, it allows us an abstract stance in regard to what the mind really is. In that process we are given the ability to create a mindscape involving not only what resides within the human brain, but incorporating the senses in real-time, the build-up of memory through action, the surrounding environment and the material itself (Gosden and Malafouris, 2015).

MET varies slightly from the standard Heideggerian phenomenology, the phenomenological method developed by Husserl and later expanded by Heidegger in the early 20th century. MET does this in stepping away from the notion of being-in-the-world toward the process of becoming with and through the world.

> *'The concept of thinging denotes the kind of thinking we do primarily with and through things. For the material engagement approach, withness and throughness take precedence over aboutness… thinging should be seen itself as an act of consciousness' (Malafouris 2019, 7).*

This is a transformative notion, the idea that experience is a mode of cognitive becoming. Rather than thinking that a flow of energies from materials to humans' forms agency, we have to detach ourselves from the notion that it exists independently and establish the perspective of agency through the action of creation. Understanding this form of agency is essential, as it allows us to step back from thinking of production in perfect phases of ex-

ecution, rather it considers the production in its totality. The production then is a fluid process that takes form due to the cause and effect of the factors at play. In this case, this ontological gathering of mind-stuff, sensory experience, the ceramic or metallic material, or neural patterns is what Malafouris explains to be *thinging* (Malafouris et al. 2014, 1-4). The shift of focus from *think-ing* to *thing-ing* represents a twofold process: *think-ing* usually accounts for the understanding of something in its absence, whereas *thing-ing* can be understood as the process of thinking that occurs *with* and *through* materials. In essence, the purpose of Material Engagement Theory is to shift focus away from the experience of thinking *about* materials to an approach where *withness* and *throughness* take precedence in action.

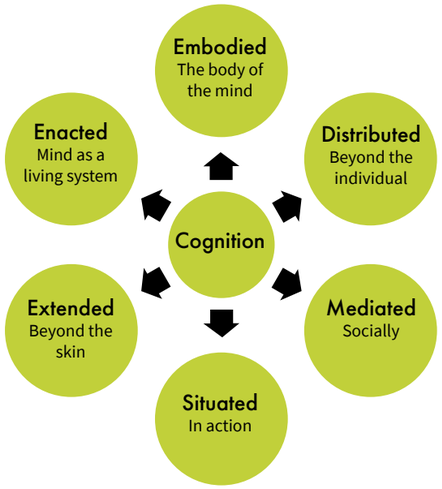

Figure 1. Chart detailing Material Engagement Theory's approach to cognition (adapted from Renfrew and Bahn 2016, 430 fig. 10.67).

The notion of *prehension* is critical to applying can material engagement theory in the case of *ceramica argentata* production (see Whitehead 1978). *Prehension* can be fundamentally defined as relatedness. This relatedness is exhibited as a worldly system of *relata*, reshaping the spatiotemporal configurations of entities and transforming perception and ideation into relations composing the world; blending time, memory and feeling, it is indicative of the perceivers enveloping the perceived either consciously or unconsciously into oneself (Griffin 2001, 79; Litman 1947, 236). The natural lean of MET toward this theoretical background, allows the understanding of a material consciousness, not just in the potter's brain or body as separate ontological units, rather as the ongoing exchange between biological and non-biological materials, energies and surroundings (Whitehead 1978, 208; Malafouris 2019, 11). The use of *prehension* here complements can material engagement theory in forming a fundamental base and offers additional scope in understanding the exchange that occurs between the various aspects of the mind, incorporating it offers to further integrate material and its affordances into the mind.

CERAMICA ARGENTATA PRODUCTION

As is the case with much of Etruscan ceramic studies, *ceramica argentata* has been subject to thorough scientific scholarship or, in a more traditional manner of a typological report (see Dionisio 2014 2021; Ramage 1970; Rasmussen 1979). While these reports and scientific studies have added much to the study, especially regarding conservation, the analysis of *ceramica argentata* generally lacks in conceptual approaches. In this way, applying new theoretical models to overlooked areas of Etruscan ceramics will add depth to our understanding of how these various developments shaped Etruscan society.

The ceramic production process and, more specifically, the production of ceramics with a metallic slip can be limited to three main production areas: Volsinii territory (workshops in Orvieto and Bolsena), Faliscan Territory (Falerii, Corchiano, and Vignanello), and Volterra (Michetti 2005, 112). The workshops flourished from the end of the fourth and third century BCE and consisted of various vascular forms related to wine serving and banqueting. While the objects are seemingly related to large container vessels, they have been primarily observed in funerary contexts (Turfa 2017, 988).

Ceramica argentata production is closely connected to the black varnished ceramic as far as the imitation of metallic prototypes is concerned. *Ceramica argentata* as an archaeological class also finds itself deeply rooted in the iconographic schemes of Magna Graecian ancestry and mythological portrayals (Ambrosi 2010, 60). The visual representation of the Amazonomachy attests to this (see Fig. 4), with connections being made between *ceramica argentata* production of the Volsinian production and the metallic prototypes of Taranto in the mid 5th- 4th century BCE (Fischer-Hansen 1993, 59; Michetti 2003, 34, 112).

There was an extended period of replicating ceramics using metal prototypes in Etruria leading up to the fourth century BCE. Early Bucchero ware was a fundamental stepping stone in this process, attempting to replicate the desired appearance of metallic objects with its dark finish (Ramage 1970, 11; Perkins 2015, 4). There is a long-standing desire by Etruscan aristocrats to acquire advanced metallurgical constructions and the role that toreutics plays on Etruscan craft construction is significant. Examples of advanced metalworking can be seen stretching back centuries in constructions such as Etruscan armaments (Cowan 2014, 747).

Therefore, we can see that a thorough understanding of metallurgy developed in Etruria for some time, with increased interest in replicating it through shape or form in ceramic production. *Ceramica argentata* serves as a cheaper method at replicating Etruscan toreutics, a tradition that has its origins deep in the ancient past, well into the creation of Bucchero ware a staple of Etruscan material culture with its roots in the 8th century BCE (Dionisco 2014, 1; Perkins, 4). The development of *ceramica argentata* arose from the incorporation and deep understanding over generations of metallurgical production.

The producer understood the finished ceramic product, its qualities, and operated concerning temperature, appearance, time to cool, and means to carefully 'dip' the ceramic vessel into the molten tin. All of which follow the material engagement needed to produce ceramic vessels, which comes from a complex working relationship with the material to produce a finished product (Ramage 1970, 11).

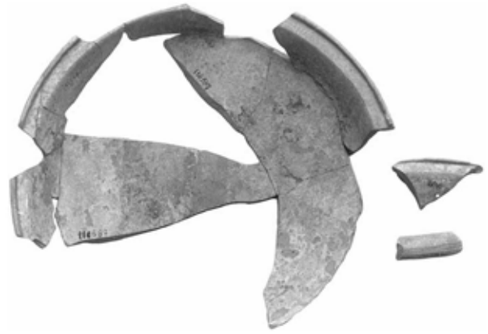

Figure 2. Fragmentary plate in ceramica argentata (adapted from Barbieri 2003, 213).

Figure 3. Fragmentary Krater in ceramica argentata (adapted from Barbieri 2003, 209).

THE MATERIALITY OF CERAMICA ARGENTATA

Understanding the physicality of *ceramica argentata* will help situate the application of can material engagement theory while applying the theory to the production method. Shifting toward the material make-up of *ceramica argentata*, the example given by Barbieri represented in Figures 2 and 3 illustrates this well. Figures 2 and 3 show homogeneous clays, which are well-purified, and have an orange interior shade when finished. The coating, which seldom lasts into the modern period, can be identified via its light green shade. Through microscope analysis, abrasions that suggest the process of cleaning and maintaining the finish can be seen. The remaining shade from the original coating does not appear homogenous, likely due to its deterioration; grey and white spots can be seen scattered throughout, which Barbieri has linked to the possibility of fungi (Barbieri 2003, 208). The examples provided highlight a crucial element, the division of the production into three separate 'stages' of development: first, the construction of the vessel form; second, the application of moulds or reliefs following the vessel's construction (as illustrated with the decorative handles in Figure 2); and lastly, the 'silver' finish that is applied (Barbieri 2003, 207-210). While we may be presently inclined to view distinct and different premeditated production stages, it is fundamental that we not focus on the individual acts as stages, but rather the totality of working with the material and construction of the product.

During the production of the vessel form (representative of the first 'phase'), a potter's wheel would have been requiring the potter to interact with the material through the senses of sight and touch to feel the movement of the vessel as it began to take shape. These senses of sight and touch play a fundamental role in the build-up of sedimented gestures and motor habits forming practical knowledge. The second phase, which can be seen as a decorative transition, required the application of various tools to allow the craftsman to feel their way through the material and the allowances given to the potter, via the clay. This decorative phase serves as a primary example of the *throughness* that occurs in this process. The plasticity of the clay, while still open to change, significantly impacts the future of its construction and application of various elements (decorative and slip); the potter must carefully feel their way through the material and its allowances. This then affects the following stages, the plasticity of the material must be equally as represented in the mind, effectively creating a sense-scape, a state of consciousness in the moment of its creation and through a continuous flow of energies wholly intertwined with the action. This state of consciousness can be seen to be representative of the concept of *metaplasticity*[2]. This, too, continued into the final step, applying the slip. The metallic slip involves the process of melting down tin (or sometimes other precious metals) and dipping the ceramic vessel into the molten material, then allowing it to cool once removed. This step completely changes the

[2] The notion of *metaplasticity* refers to the concept of 'human becoming' as put forth by Malafouris. Metaplasticity refers to the relationship (or series of *relata*) that encompass the physical and non-physical aspects of a mindscape.

sensorial experience of the material, creating a new plasticity of metal in addition to the clay's natural plasticity.

MATERIAL ENGAGEMENT THEORY AND ITS RELEVANCE TO CERAMICA ARGENTATA

With the culmination of *ceramica argentata*, we see a new step in the phenomenological experience of ceramic production. The multiplicity of factors lending themselves to the process of throwing clay and forming it into a vessel take on new meaning when synthesized into a process that merges metalworking and ceramic production. However, it is fundamental that this conversation remains independent from the modernist perspective of what matter and mind consist of; in other words, reshaping the conversation from entities to events. For the craftsman, viewing the events in snapshots of time, as we now typically recognize them to be, would not have been the case as the work with the material unfolded (Malafouris 2008b). Additionally, the material takes a primary (mind having no *a priori* location) rather than passive (mind having *a priori* location) role in the construction of a finished product, which happens as a result of interaction, this interaction is explained below.

What then, can material engagement theory offer in its approach to the archaeological significance of *ceramica argentata* and how can it be applied in a practical manner? If we, for example, think of the processes of ceramic production and visualize the events unfolding: the experience of working the clay, pushing and pulling the elements together, the spinning of the wheel, the pressure involved from the fingertips, how moist the clay is, from here we can gather pieces of an event unfolding, a flow of energy between potter and material (Malafouris 2019, 9). Here we can recognize the cognitive experiences that occur between material and mind, the affordances given by the material, and the reaction and production that is reformulated back into the clay to produce a particular form; there is no definitive demarcation that occurs between the mind-stuff and the inanimate material-stuff (Thompson 2007, 13). The development of the product occurs via the act of creation, as argued by Malafouris. However, if we remove MET and its applications, what would be the traditional approach? The traditional approach would lead us to believe that a model of mental causation would be applicable. A predetermined act of creation within the physical brain is followed by an enactment which leads to a finished product. The traditional Cartesian models leave no room for flexibility, the only productive creativity that is taken into account is that which resides within the physical mind as opposed to Malafouris' mode of becoming which pulls from the concepts of enactivism and active externalism (see Valera et. al. 1992; Di Paolo et al. 2014). This is where the clear demarcation between the mind having *a priori* location and not factoring in the engagement with the material or agency, fails to explain developments in the process of creation; the analysis for cognition must be responsive to the subject under study (Hutchins 2010, 426).

Agency is then the result of a flow of energies, a material engagement, whereby energies are transformed into agencies as a result of the creative tension that coalesces with form and flow. This is where the potter's skill comes into the equation, 'it is the precision in discovering the right balance of agency for each specific stage of the process of form-making… a new form brings about a re-working of the potter's imagination and ways of seeing and a new understanding of the agentive capacities and vitality of the clay' (Malafouris 2019, 11).

The visual examples help us understand the processes occurring in the production of *ceramica argentata*. The above-mentioned process of this exchange of energies occurring through material engagement illustrates the affordances given to the craftsman by the material (Gibson 1977, 68). This can be seen here with the post-application of frieze work to the outside of the shaped product. Working through the material, the potter would have faced countless pressures and changes in imagination as they worked with the clay. This is demonstrative of agency not existing as a permanent feature of the maker or the material – rather, it emerges through this creative tension. Rather than human intentionality forming the object through fixed directional capabilities and thoughts stemming from the brain, it results from the material being enveloped into the mental, during the act of creation, employing Whitehead's notion of *prehension* (Hartshorne 1978, 256). We have a problem in our understanding of agency, if agency is to be accepted as not within material or the physical brain and rather understood in action: the question of agency then shifts from 'what' to 'when' (Barona 2020, 143). It is only after that a separate but similarly unique example of material engagement occurs in the frieze application. However, this application depends entirely on the process that occurs before it, suggesting the cognitive imagination between material and mind. If there was too much pressure, not enough moisture, or any other mistake during production, the following application of a frieze would not have happened. Therefore, the relevance of a thoroughly planned out human methodological impact as a sole representation of how this production came to fruition loses all meaning in creating the craft (Wynn and Coolidge, 2014). Thus, the frieze work depended on the potter's level of imaginative thinking and reaction (skill) to the material resulting in a highly complex phenomenological experience of material engagement (Barbieri 2003; Michetti 2005).

The example of an amphora constructed in *ceramica argentata* ware (figure 4), initially formed on a potter's wheel, is an example of intimate engagement with the material throughout the above-mentioned process. The second part consists of the sculpting of the frieze element, which requires working through the clay to get to the desired depiction. Finally, the molten tin bath to form the slip would have needed to have been applied using precisely the correct temperature, time, and cooling. A very similar process occurs here as in the prior figures. Do all three stages (the shaping of the amphora, the creation of the amazonomachy frieze, and the ability to submerge it within the molten metal) represent different actualizations of material engagement? No, because how specialized the task work is when considering the prolonged period of working with and through the materials

Figure 4. Ceramica argentata production: complete amphora with a visual representation of frieze work, (www.getty.edu).

to provide a finished product. While it may be easy to separate this work into three distinct cognitive processes, it is tantamount that we view this as a complete and malleable process of the mind and take a serious phenomenological approach concerning the producer and the product. The process is constantly in flux, with all future actions dependent on the moment in which the producer is currently in and their response to the affordances given by the material, which in turn is a generation of agency not as a 'what' but as a 'when'. A prolonged material engagement between the plasticity of mind and material, cements the build-up of knowledge and motor behaviour as resulting from the material itself changing and building upon a cognition of becoming (Stout et. al., 2011, 1335; Wynn and Coolidge 2014, 50).

Material engagement theory and its relevance to *ceramica argentata* becomes all the more interesting if one applies the theoretical framework to the Etruscan ceramic production's *longue durée*. If we understand the potential of applying MET as an evolutionary paradigm, questioning the neo-darwinian models in the development of human cognition, the larger scale of Etruscan ceramics can be taken into consideration[3]. It is known that organisms modify their own environments and as a result play an active role in the dictation of their own evolution, these changes result in the creation of two fundamental building-blocks for the understanding of cognitive evolution; what Hutchins describes as 'cognitive ecologies' and landscapes of affordances (Hutchins 2010, 705; Rietveld and Kiverstein 2014, 326). What is significant here is the understanding that future generations are impacted by the material affordances of prior generations at any given moment within their craft vis-à-vis the cognitive mode of becoming that occurs in the act of creation (MET) (Hutchins 1996, 428). If we take a theme that resonates throughout the Etruscan *longue durée*, such as toreutics as mentioned prior in this analysis, new conceptualisations of Etruscan development can be brought to light. Such questions, begin with restructuring our understanding of mind and from there cognitive evolution; reshaping the position of *ceramica argentata* production to one that may be an apex to cognitive development fixated on toreutics offers ample opportunities for analysis of material engagement and the extended mind. These questions go far beyond the limitations of this analysis; however, they do offer depth and a radical shift toward our understanding of the deep past and the consequences that come as a result of our engagement.

CONCLUSIONS

What new perspectives does can material engagement theory offer in terms of cercamica argentata production? The production of *ceramica argentata* is a prime illustration of the concept of *thinging*. Through *thinging*, the depths and bounds of creative imagination run deep and are the result of a reworking of the ways of seeing and capacities of the material, which manifests itself in agency as a 'when'. A phenomenological approach and incorporation of Whitehead's notion of *prehension* allows for the introduction of multisensorial thinking and abstract conceptions of time and learned behaviour. Through material engagement theory, we can shift the thinking of production from a perfect set of phases that result in a perfect finished product, into an experience wholly defined by what happens in the moment of production.

This fluid process, always subject to change and development, is a relationship between material the senses and mind, and finally, a link between times and physical barriers that amount in its totality to a lived experience of material engagement. This process can be demonstrated well past the boundaries of mind and matter, even into other dimensions of craft production and learned knowledge. The application of MET provokes larger questions regarding the systems of *relata*, affordances, memory, time and the entanglement of mind and the world. Pinpointing themes of development and applying new theoretical moulds offers to reshape the creative histories of a peoples from one limited to the directional capacities of an individual to one where the mind is deeply embedded in the material. Themes and trends may be called into question not strictly as cultural influences separate from

[3] For more in-depth critiques regarding the Neo-Darwinian models of evolution based upon genetics see Jablonka et al, 2014; Laland et al., 2014, 2015.

the mind, but as key cognitive developments. MET, 4*E* cognition and much of enactivist thought should play a foundational role in our understanding of archaeological material. MET holds a perspective specifically created to incorporate the archaeological realm into cognitive evolutionary theories and as such, holds much potential in its expansive reach in terms of what may be reinterpreted and how new data may be analysed. The material engagement approach is perhaps the best answer to understanding the phenomenology of material and mind, how they interact and blend together in a space where a clear demarcation between mind and material cannot exist.

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WOOD AND WAKA:

MATERIAL AGENCY IN THE CRAFTING OF EIGHTEENTH CENTURY NORTH ISLAND MĀORI WAKA TAUA HULLS

MIKAELA M.F. RADFORD

ABSTRACT:
By adopting a perspective inclusive of material agency, this article explores the ways in which the affordances of wood influenced its use in the crafting of North Island Māori waka taua hulls in the eighteenth century. In a practical sense, the wood itself was much more involved in the crafting of these vessels than has previously been considered in archaeological analyses, which have typically focused on the symbolic meanings of materials as opposed to the effects of their physical properties. A chaîne opératoire framework is used to outline the major steps the Māori of the North Island followed to craft waka taua hulls, incorporating the agency of wood expressed as affordances in order to complement and expand upon the previously human-centric scope of this methodology. The inclusion of material agency within the methodology makes it possible to map the ways in which both the material and the Māori carvers shaped the production of the material culture.

KEYWORDS:
New Zealand, chaîne opératoire, affordances, new materialism, watercraft.

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INTRODUCTION

Wood inhabits a significant position in the Māori world and has always been an important resource for the Māori of the North Island of New Zealand, comprising a large part of their material culture in the form of canoes, meeting houses, tools and *taonga* (treasures) (Veys 2010, 87). A readily available resource on the North Island in the 1700s and centuries prior, trees existed as an abundant natural resource for Māori communities, providing a foundation on which to build strong traditions of wood working. The eighteenth century saw Māori woodcarving flourish on the North Island despite some early contact with Europeans (Graham 2014, 4). *Waka taua* (war canoes) were the largest and most elaborately decorated canoe type of the eighteenth century, bearing prow and stern pieces carved with lacelike patterns representing the tribes and their ancestry (Best 2005, 24, 46; Mead 1961, 11; Tregear 1904, 119). These vessels were and still are crafted by the Māori of the North Island as symbols of the power and strength of their communities (Graham 2014, 4; Tichborne 2020). As functional objects *waka taua* were used to navigate coastal and inland waterways for competition and warfare (Barclay-Kerr 2006, 2). The vessels had dugout hulls that were sharply crescentic in transverse section and were made either as a single piece or by lashing together up to three interlocking sections (Haddon and Hornell 1975, 201). Fully assembled, *Waka taua* could measure between 9-30 m in length and had carved top-strakes lashed to the gunwales to increase their freeboard (Best 2005, 24, 46; Veys 2010, 95).

The techniques and tools that the Māori used to produce material culture, such as waka taua, from wood took into account their own capabilities and cultural practices as well as the natural characteristics of the material. The ways in which people and natural materials are mutually related can be explored when the agency of both craftspeople and materials is considered, and because material culture plays an active role in constituting social realities, it is apposite to focus some research on the role of the materials themselves (Harris and Cipolla 2017, 148; Jones and Boivin 2010, 336, 350). By incorporating the agency of wood, expressed as affordances, alongside that of Māori carvers within a *chaîne opératoire* for the carving of *waka taua* hulls, this article explores the material aspects of the practices involved. This methodology makes it possible to put theory into practice and map the ways in which both the material and the Māori carvers shaped the production of the material culture.

MATERIAL AGENCY AND AFFORDANCES

In the spheres of modern Western thought, agency has been variously defined by the display of intentionality, language capabilities, reflexivity and creativity (Callon and Law 1995, 491; Jones and Cloke 2008, 82). New, Western considerations of agency have removed these qualifiers and are attempting to do away with dialectical distinctions, such as subject and object, that have previously been engrained in many realms of archaeological thought (Harris and Cipolla 2017, 147; Jones and Boivin 2010, 347). Differentiating subject and object implies that the former acts and the latter is acted upon, with no reciprocal effects. Material agency has entered the stage as a concept that allows researchers to explore the ways in which humans and materials equivalently affect change. Of particular interest are the roles that materials play in the foundation of practices involved in the production of material culture (Jones and Boivin 2010, 351). Material agency recognises materials as agents in practices of craft. Therefore, craftsperson and material are viewed on the same footing, essentially as collaborators. From this conceptual basis there is the potential for archaeological research to reveal just as much about the history of materials as of human experience and practices (Witmore 2014, 211).

The concept of affordances similarly seeks to unravel subject-object dualities (Barati and Karana 2019, 113) and does so by acknowledging and exploring the impact of matter. Affordances are all the features of an environment that provide an animal with possibilities for action (Gibson 1986, 127; Hodder 2012, 48; Rietveld and Kiverstein 2014, 327; Voestermans 2021, 2). Affordances are closely tied to human practices and skills because the opportunities presented to any animal are dependent on the capacities of their species (Rietveld and Kiverstein 2014, 325; Voestermans 2021, 2). The agency of naturally occurring materials, such as wood, is expressed through their affordances, manifesting in the actions they inspire and enable. Human material culture is consequently the result of tension between materials, cultural practices and skill (Lipińska 2021). It exists as the outcome of an interplay of human and material agents.

Understanding the qualities that are inherent to a material aids in understanding the physical realities of past interactions between craftspeople and material. North Island Māori traditions include longstanding relationships, both physical and spiritual, with wood that culminated in a rich material culture, including their waka taua. Taking a perspective of material agency when studying Māori traditions of woodworking helps to shed light on how and why practices came about by delving not only into the human but also the material past.

WOOD FOR WAKA IN THE MĀORI WORLD

The presence of large tree species on the North Island of New Zealand allowed for the production of wide dugout canoe hulls that did not require an outrigger to be stable in the water (Hiroa 1949, 202; Veys 2010, 27). For waka taua, the Māori of the North Island typically used *kauri* (*Agathis australis*) or *tōtara* (*Podocarpus totara*) trees, favouring *kauri* (Evans 2000, 19; Veys 2010, 98). Mature *kauri* reach average heights of 30-50 m, while *tōtara* can reach 30 m and both species grow straight trunks comparatively free of knots (Bergin 2003, 6; Bergin and Steward 2004, 5; Ecroyd 1982, 17; Evans 2000, 19). The necessity of transporting a large piece of wood intended for carving from the felling site to secondary work sites and, eventually, to water, was an essential factor in the organisation of labour surrounding the crafting of waka taua. Nonetheless, the location of a tree, however far from shore, was not a deterrent if it was deemed an ideal specimen (Best 2005, 68). The time, effort and cooperation required then depended on the dimensions of the tree as well as the vision of the *tohunga* (expert) for the final vessel (Mead 1961, 11).

In Māori tradition, the act of carving was itself a ritual and therefore *tapu* (sacred), requiring the correct protocols to be performed in order to protect both the *tapu* of the carved object and the mana (power) of the carver (Mead 1961, 11; Neich 2001, 153; Veys 2010, 58). The trees used for carving and their trunks were also *tapu* and needed to be approached and treated in accordance with protocol. The immense amount of effort involved and the potential for costly accidents meant that a strong need for things to be done correctly surrounded all work, extending into spiritual considerations. Large *tōtara* and *kauri* trees were representatives of the god of the forest, *Tāne*, who formed a link between earth and sky (Neich 2021, 146). *Tōtara*, the children of *Tāne*, were respected as living individuals, so appropriate rituals were performed by priests to appease *Tāne* before one could be cut down for use in crafting and to protect those working in *Tāne*'s domain (Evans 2000, 18-19; Neich 2001, 146).
In accordance with protocol, wood carvers, almost exclusively men in Māori society, would never blow upon their work to remove the shavings but would brush or tip them off instead (Mead 1961, 11; Neich 2001, 153). As a general rule the act of carving was performed away from the activities of daily life (Brown 2003, 32). Carvers kept their work and tools at a distance from the presence of elements free from *tapu*, such as cooked food and women (Neich 2001, 153) although the tangential involvement of both was essential for the completion of a project (Best 2005, 74-75). All steps performed in the production of any carved object took into account the cultural and craft knowledge surrounding the activities as well as the affordances of the wood at hand, such as its weight, density and grain.

A CHAÎNE OPÉRATOIRE FOR NORTH ISLAND MĀORI WAKA TAUA HULLS

A *chaîne opératoire* describes as a series of steps the actions performed in the process of crafting an object, and involves considerations of the raw materials, tools, knowledge, ideas and agents involved (Gosselain 2018, 2). However, since *chaîne opératoire* originated as an analytical tool in Western scientific thought the role of agent has typically been restricted to humans. Consideration of material agency, expressed as affordances, within the *chaîne opératoire* for a Māori *waka taua* hull adds material variables to each step. A *chaîne opératoire* for North Island *waka taua* hulls involving the methods and

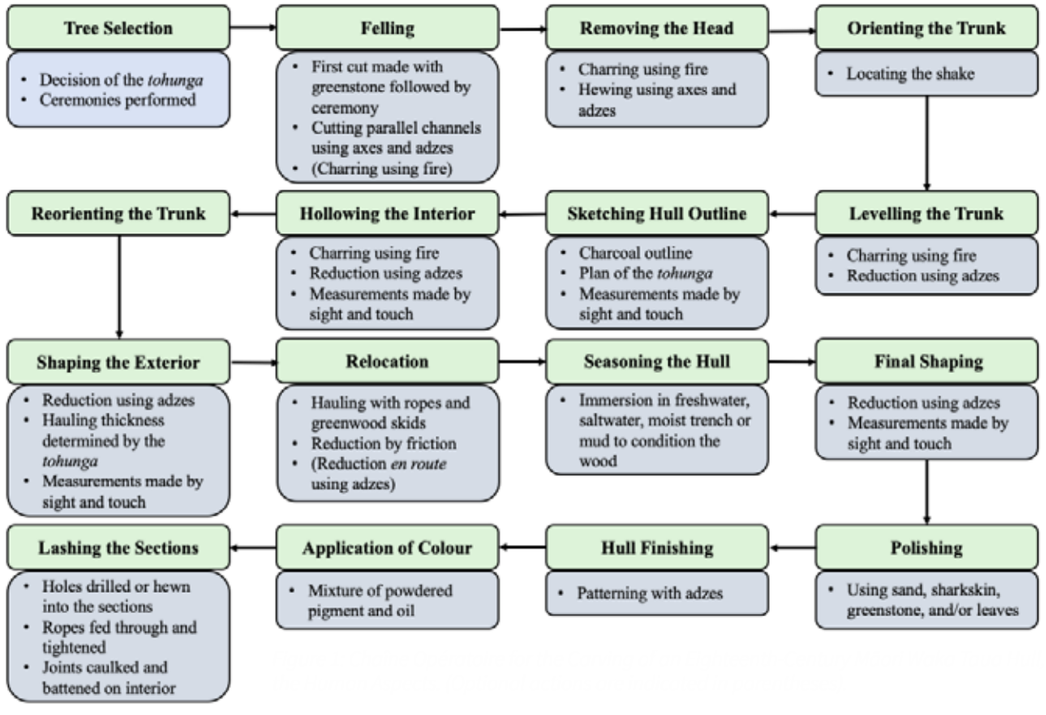

Figure 1. Chaîne Opératoire for the Carving of an Eighteenth-Century Māori Waka Taua Hull, the Human Aspects. (Optional actions are indicated in parentheses).

tools of the eighteenth century is represented in Figure 1, following the typical format that presents primarily the human centred aspects of crafting. To complement and expand upon this, Figure 2 presents a *chaîne opératoire* wherein the material centred aspects of each step are enumerated in order to map the effects of wood on the process.

The crafting process for carving a *waka taua* hull began with tree selection. The *tohunga* would examine prospective trees for signs of imperfection and would look for a connection to the tree by contemplating both the physical and spiritual worlds, drawing on craft knowledge, an understanding of affordances, and ritual knowledge (Evans 2000, 19; Tichborne 2020). Positive physical signs for a trunk included thick bark, indicating that the tree was mature and had a strong, close grain, and trees growing close to the valley floor were likely to have been well nourished and therefore possess strong grain (Evans 2000, 20).

A *tohunga* could see all possibilities in a piece of wood before beginning his work (Neich 2001, 156), but its qualities still presented challenges, each piece providing both opportunities and boundaries. Māori carvers always worked within the bounds of their original material, such as crafting multiple interlocking hull pieces when one trunk could not produce a canoe of the desired length (Neich 2001, 149). When crafting with wood, individual pieces can only be shaped by reduction or by warping and separate pieces must be fastened together in the production of larger objects, as seen with *waka taua* hulls made from multiple sections (Haddon and Hornell 1975, 201).

Felling a tree using stone adzes required immense effort and many days of work (Evans 2000, 20). The size, density and weight of the chosen wood affected the practical physics of felling and shaping a trunk, thereby affecting the technology and skills the Māori developed and diversified to most efficiently do so (Lee 2019, 22). From the 16th century onward, stone woodcutting and carving tools were made predominately of greenstone (nephrite), which had to be sourced from the South Island (Brown 2003, 33; Brown 2009, 32). This hardstone was ideal for handling dense woods, such as *kauri* and *tōtara* (Brown 2003, 33). One technique of felling involved the repetition of carving out two parallel horizontal channels all the way around the tree, and then the removal of the material in between (Evans 2000, 20). Alternately, fires lit in a circle around the base of the tree could be used at this early stage to speed the process of removing material (Evans 2000, 20; Tregear 1904, 117). Wood's ability to behave as a fuel in the process of combustion afforded the use of fire as an additional tool of reduction. Once a tree had been felled, controlled fires were again used in alternation with adzes to char then chip away at the head of the tree so that it could be removed from the trunk (Best 2005, 68). Without moving the tree from the felling site, it was examined to locate the shake, a naturally occurring crack that runs lengthwise through a trunk. The trunk was then manoeuvred and oriented to position the shake at a right angle to the desired vertical dimension of the boat (Best 2005, 69). The shake, however, had the potential to restrict this dimension if close to the centre point of the tree. Then, to level the trunk to the desired height of the gunwale, the wood on top was repeatedly charred to a rough depth of 3-5 cm at a time and the weakened material was removed each time using stone adzes (Evans 2000, 21). Once levelled, the *tohunga*'s vision for the hull, conceived for that specific tree, was transferred to the trunk as a sketch. However, the majority of the work, was completed without outlines or measuring tools (Evans 2000, 22).

The hollowing out and shaping processes could then begin, being completed once again using fire in combination with adzes (Best 2005, 69). Next the trunk was turned over and the exterior was shaped and reduced to its optimal relocation thickness (Evans 2000, 22). Completing these initial steps of hollowing and shaping at the felling site lessened the weight that would need to be manoeuvred to a secondary shaping site closer to water. However, long distances and rough terrain required a sturdy hull so as not to suffer damaged (Evans 2000, 22). The rough hull was then hauled using rope attached to the bow, stern and sides, and skids of green wood were used in the process of moving the hull along a safe route determined by the *tohunga* (Best 2005, 70; Evans 2000, 22). The abrasion of hull material during hauling was accounted for in the initial reduction phases, but if it did not occur at a sufficient pace some additional hull material could be removed *en route* to lessen the weight further (Best 2005, 70). The rough hull could then be seasoned for several months either in a moist trench, freshwater, seawater or mud, otherwise the hull would undergo this process after final shaping (Evans 2000, 19, 27).

The final shaping and construction of the vessel would be completed under a shelter near to the water where it would make its maiden voyage (Del Mar 1924, 125; Evans 2000, 26; Veys 2010, 98). Greenstone adzes were used to finish the exterior with a fine scalloped or fish scale pattern to improve hydrodynamics of the hull (Evans 2000, 21, 27; Veys 2010, 98). During the final shaping of the interior, experienced carvers would ensure that it was completely symmetrical, doing this without the aid of any plans or measuring tools (Evans 2000, 27). After all shaping was completed the hull sections would be fitted together and the vessel would be painted and equipped with its carved top-strakes and bow and stern decorations (Evans 2000, 19, 29).

The process of reducing a tree trunk in order to produce an object like a *waka taua* hull was not only the application and manifestation of a mental model (Goto 2012, 59). The techniques that the *tohunga* and other carvers developed did not existed solely in the mind, but developed out of a continual interaction of mind, body and material (Goto 2012, 59). During each step of the *chaîne opératoire* (Fig. 1 and Fig. 2), the characteristics of the material affected, in subtle or drastic ways, the actions carried of the carvers who continuously interacted with the wood critically and reflexively. While *kauri* and *tōtara* trees pos-

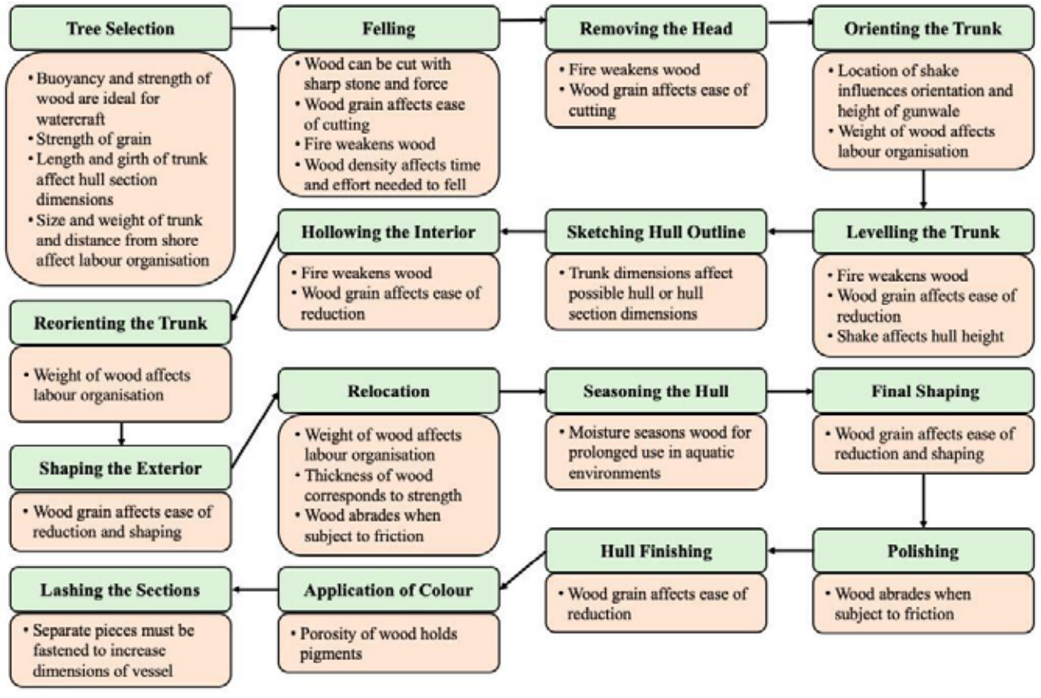

Figure 2. Chaîne Opératoire for the Carving of an Eighteenth-Century Māori Waka Taua Hull, the Material Aspects.

sessed natural qualities that were ideal for making *waka taua* hulls such as buoyancy, strength and malleability, their natural dimensions and features while alive, such as height, girth and shake affected and ultimately constrained the dimensions of individual hull sections. It can be seen in the way measurements and cuts were made by sight and touch that the decisions of the carvers were driven by the affordances of the wood as well as by individual knowledge and in the moment interactions with the material (Lee 2019, 19-20).

CONCLUSIONS

Material agency as a theory contributes to material culture studies by placing people and materials on the same footing in order to move beyond considering solely what material objects mean to include what effects materials themselves have on the production of material culture. The methodology of *chaîne opératoire* offers a way of operationalising this theory by providing a framework within which to map expressions of material agency, adding affordances as material variables to the various steps of production. For this article, this methodology provided a material perspective of the production of eighteenth-century *waka taua* hulls. Māori carvers engaged in the production process would have taken into consideration through all steps the characteristics of the material they were interacting with, as well as their cultural practices and knowledge, which were developed out of countless interactions with wood. The final product as well as the enduring practices were affected by both the carvers and the wood, and therefore were the result of both human and material agency.

The impact of material agency on the crafting of *waka taua* can be further explored by examining in greater detail the ways in which the material influenced the social organisation surrounding manufacture, including the networks of resource acquisition and community participation. In addition, further research may seek to utilise the incorporation of material agency within the *chaîne opératoire* methodology to explore the relationship between Māori carvers and their material in the context of decorative carving, such as for the bow and stern pieces and the top-strakes of waka taua. The same may be done in analysis of present-day crafting practices, as *waka taua* continue to be built as fundamental identity markers for North Island Māori communities.

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ONLY CONCRETE REMAINS

MATERIAL PERMANENCE AND AMBIGUOUS EXPERIENCE OF THE SHAHYAD MONUMENT, TEHRAN

Imme Hannah van der Leij

ABSTRACT:
Concrete, inherent to modernist architecture, possesses agency. Its ambivalent properties have diverse material effects on the spectator. Drawing on Ingold's 'anthropology of materials', the framework of the social life of materials allows to interpret sociocultural implications of material manifestation. Within the underdeveloped domain of autocratic modernist architecture, this discussion of the case of the Shayad/ Azadi Tower in Tehran, Iran aims to illustrate how the material properties of concrete produce ambiguous experiences which are reflected in the design-strategies of the monument. The materiality of the Shahyad monument emits experiences of modernity and ancientness at the same time, which aligns with the design-strategy and ideology of the Pahlavi regime. Evoking imperial continuity, the Shah rooted his modern vision of Iran's future national identity in the permanence of Persian civilization. Yet, the highly malleable properties and agency of concrete have made the monument an active locus of power which continues to shape Iranian society after the Islamic Revolution of 1979.

KEYWORDS:
modernist architecture; autocratic regime; the social life of materials; agency; national identity

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Figure 1. Le Corbusier's buildings in Chandigarh, India. Photograph taken by Roberto Conte.

INTRODUCTION

Concrete is the material of the modern. 'Talking about concrete means talking about modernity' (Forty 2013, 14). It is *the* material which constitutes the origin and development of modern architecture. Now, concrete is accepted as the most widely used construction material worldwide (Meyer 2005, 1). Therefore, its presence and impact on public space is significant. Signalling modernity, concrete in architecture is used to separate the ancient from the modern (Wickstead and Barber 2015, 1). This gave rise to the ideological meaning of modernist architecture in the 20th century wherein concrete structures represent 'architectural utopias of social emancipation' (Minuchin 2013, 240). In contrast, besides aiming to elicit a sense of awe, concrete is also able to render an 'uncanny' feeling of 'not being at home' (Croft 2004, 8). Experience of estrangement through architecture is especially a modern - and thus a concrete - condition, according to Vidler (1992). Therefore, concrete modern architecture embodies this 'paradox of modernity' - seeking utopia vis-à-vis feeling estrangement - for concrete material possesses agency and has ambivalent properties which produce ambiguous experiences.

Drawing on the framework of the social life of materials, this study interprets sociocultural implications of moments when a substance manifests itself in a particular form (Drazin 2015, 13). The ideology of concrete modernist architecture as a utopian strategy for a progressive (democratic) society, based on its connotation of a free society and individuals, has been subject to extensive academic research (Levine 2018, 43; Mehan 2017a, 210). Le Corbusier's urban planning of modernist cities, in which concrete is applied for its emancipatory potential, can be viewed in this light (Figure 1) (Minuchin 2013, 239). In contrast to the role of modernist architecture in democratic societies, knowledge about its functioning in autocratic states is underdeveloped. Yet, this is perhaps even more relevant based on the idea that architectural forms can shape the political structure of a society (Mehan 2017a, 211). Hence, choice of material and the resulting structures matter considerably indeed. By focusing on the role of material properties, this essay discusses to what extent material experiences of concrete are significant when studying the design-strategies of autocratic modern architecture. Here, the Shayad/Azadi Tower in Tehran, Iran (hereafter: Shahyad monument) (Figure 2), a prime example of concrete modernist architecture in an autocratic context, will be used to illustrate how the concrete structure produces ambiguous experiences which are affected by concrete's material properties.

MATERIAL AGENCIES

Moving away from a semiotic approach of the object's 'symbolic meaning', Gell proposes that objects have an agency which mediates between art and social processes. His 'anthropology of art' studies social relationships caused by the agency of objects, which signals the move towards a 'material perspective' (Gell 1998, 6-7). As such, social 'agents' have the ability to initiate causal sequences of action and act on 'patients'. Many combinations of relationships between agents and patients are possible. Even so, Gell (1998, 39) ultimately argues that the agency of an object on a 'recipient' (spectator) is placed there by an 'artist' (maker). In the context of art and architecture especially, Gell (1998, 47) states that a patron executes his agency through the work of art he has caused to come into existence. Therefore, considering monumental architecture as the expression of power (Mehan 2016, 317), specific experiences of a structure could reflect or result from the intention of the patron. Gell (1998, 12, 18) however, remains somewhat descriptive of the various interactions that are possible between humans and 'things'. His theory could be used to analyse the relationships that are possible between artist's intentions, their creations, and their audience (Humphry 2005, 43). Nonetheless, Gell does advance understanding of *how* these interactions occur.

This could be the result of Gell's focus on *things* as his loci of agency, rather than the material. As Ingold (2013, 7) critiques, the study of material culture has mostly focused on finished objects and their role in the life histories of those who use them. Ingold (2013, 7, 12) argues the role of sensory awareness in processes of making and knowledge *through* materials is lost. In order to study the role of agency in shaping design-processes and material experience, the concept of material properties is chosen. This is defined as 'the ascription of the quality of having material effects' by the material substance of which a thing comprises (Drazin 2015a, xxvi). Consequently, the focus of this essay moves away from analysing specific moments of interaction between objects and individuals (Gell) towards an 'anthropology of materials', which interprets sociocultural implications at moments when a material substance takes on a specific form (Drazin 2015b, 13). In the case of the Shahyad monument, this moment of material manifestation takes place when concrete becomes architecture. The study of social relations in the vicinity of architecture from the material perspective of concrete, as an 'anthropology of materials', is a valuable contribution of this essay (Ingold 2013, 10).

MATERIAL MANIFESTATION AND EXPERIENCE

So, what happens at moments of material manifestation? Drazin (2015b, 23) argues that these manifestations constitute the exercise of authority and mobilization of

Figure 2. Frontal view of the Shayad monument in Tehran, Iran. Photo courtesy from Wikipedia.org

those actors who view themselves as being in control. Tompson (2004, 295) adds that those in control have the power to ensure their objects are durable, whereas those of others are transient. Hence, materials underlie, enable, and naturalize established hierarchies and social orders (Drazin 2015b, 27). Consequently, this conceptual avenue allows for the combination of material, social and political perspectives.

Material manifestations impact public space. Findley (2005, i-xi) clarifies those processes and material qualities in public space are a locus and indicator of power relationships. Architecture is integral to reasserting cultural and political agency and is used as a spatial strategy by those in power to control and manipulate the physical world. Moving beyond the role of the architect as an agent in architectural creation, Findley (2005, xii) asserts that the political, economic, and socio-cultural power structures inherently connected to architecture result from its dependency of patronage. Therefore, approaching monumental architecture as a locus of power integrates Gell's notion of patronage with Ingold's view on material properties and effects.

As concrete constitutes the most widely used construction material worldwide, the application of concrete in architecture is also versatile. By altering its constituent parts, its material properties and affordances change (Croft 2004, 8). This results in different architectural forms, due to which the look, feel and experience of concrete is diverse. Design-strategies of the architect and the patron could integrate this phenomenon, when aiming to exert a certain agency through the application of the material. Choosing the material concrete shapes the design-process. In what way ambiguous experiences of concrete's material properties in modernist architecture are present in the design strategies of an autocratic client, will thus be discussed hereafter.

AUTOCRATIC MODERNISM AND NATIONAL IDENTITY

The creation of monumental architecture involves the material, the architect, and the patron. Here, Iranian Shahyad monument serves as an example to investigate the material experiences of concrete modernist architecture. The monument was built by architect Hossein Amanat and inaugurated in 1971 for the celebration of the 2500-year anniversary of the Persian Empire. Grigor clarifies (2003, 215) that Shahyad was a material manifestation of the political ideology of Shah Mohammad-Reza Pahlavi (reign 1941-1979) to create a modern Iran as a continuum of the *Great Civilization* of the Sassanian past into a bright future of the nation-state. Hence, Shahyad reflects the autocratic tendency to crystallize identity through the

fixation of memories in objects and institutions (Grigor 2003, 209). The monument, however, was appropriated by other socio-political meanings when it was claimed as the ultimate symbol of the Islamic Revolution in 1978-79 by the Islamic clergy, after which an Islamic Republic was established (Grigor 2003, 207). From this moment onwards, the original name Shahyad Aryamehr (denoting the Shah's name), was changed to Azadi Tower (Freedom Tower). Accordingly, Grigor (2003, 224) argues that a monument's social and cultural meaning depend on those in power, as those generate the culture of signage of society at that specific time. Thus, monuments are constantly appropriating new cultural memory, due to which the human-centred understanding of a monument is constantly evolving.

In contrast, from a material point of view, Grigor (2003, 223-224) states that Shahyad endured the shifts of power in Iran and became a central locus in the popular uprising, precisely because of the formal and architectural qualities of the monument. Shahyad's only pre-Revolutionary meaning that remains is its *disciplinary memory* of inherent architectural qualities, such as its monumental size and shape, its modernity, and its material presence. Disciplinary memory is defined as the process of architectural design and the practice of the architectural profession, which is therefore based on cognition and experience (Grigor 2003, 208). This alludes to Ingold's (2013, 7) notion of knowledge *through* materials. As such, knowledge of materials through experience is vital in the process of architectural design and the disciplinary memory of a building results from its material physicality. In other words, Grigor (2003, 207) asserts the physical persistence and durability of monuments is indicative of their disciplinary memory. In terms of disciplinary memory, Shahyad is constructed of reinforced, poured-in-place concrete, in order to address the challenging shape and the seismically active location. After this, the structure was clad in white marble, of which every stone cladding is unique due to the complexity of the Tower's structure with arches and curves (www.archdaily.com) (Figure 3). Even though the skin of the monument is not made of concrete, the shape of the cladding was dictated by concrete material. Material can also be understood as a structural form. The structure's shape gives direct

Figure 3. Inferior view of the Shayad monument in Tehran, Iran.

meaning to the material of which it is constructed, according to Poerschke (2013, 151). The constructive essence of concrete is strength and malleability, which enables Shahyad's dynamic shape to be 'stable on the ground and bursting into the sky' (Grigor 2003, 214). Thus, the material properties give physical presence to the ideology of the Pahlavi regime: the nation's movement towards the future. The material experience of concrete's properties culminates with the design-strategies and the meaning the autocratic patron intended for the monument. Grigor (2003, 214) states that 'the sudden halt of that dynamic movement upward was designed to imply achievements still necessary to reaching that future.' Therefore, the shape shows that the nation is heading towards a new modern destiny, under leadership of the Shah. In material terms, the concrete creates a solid base, which enables the building to present a powerful, simple, and centralized experience (Figure 2; 4). The concrete allows for the creation of pure and bold lines, revolving around a monarch who would lead the nation to a modern and bright future (Figure 2; 3). This sense of centrality, directionality and power of the Pahlavi government is what was sought to be represented in the monument.

In addition, Shahyad's modernism, colour and concrete material implies a sense of openness and honesty (Grigor 2003, 215-216). These utopian modernist experiences of concrete are thus present in the design-strategies and objectives of the monument's architecture. Significantly, the Shahyad square and monument as its focal point constituted the centre of Tehran's urban renewal during the Pahlavi regime. Grigor (2003, 97-98) used the term 'Tabula Rasa' to describe the dominant strategy of political and social modernization, comparable to the Haussmannisation of Paris, which created a '*utopian blank slate upon which a new Iran could be conceived "over again"*' (Mehan 2017a, 215). The central positioning of the monument in a modernized Tehran and the structure's composition revolving around a central point strengthen each other. This could mark the glory of absolute power, according to Mehan (2016, 317). Taken together, the materiality of Shahyad marks a new urban identity (Mehan 2017a, 218). In the formation of this new (urban) national identity, modern concrete materiality is central.

Shahyad's modernist style is nonetheless also influenced by the shapes and structures of Antiquity it derived its inspiration from. Grigor (2003, 212) describes the monument as a modernist abstraction of ancient Persian architecture, such as the renowned *iwan* of the Sassanian palace of Ctesiphon (Figure 5) which inspired the central arch of Shahyad. The monolithic and solid design of Shahyad is a reference to the monumental sizes of ancient Persian architecture. Thus, the material physicality not only allows for experiences of modernity but is also reminiscent of ancient Persian structures. As a result, the strong and monumental shape of the concrete inspires ancientness and timelessness, according to Grigor (2003, 216).

Forty (2013, 10) argues this results from concrete's ability to blur categorical distinctions such as modern/ancient, as well as liquid/solid, smooth/rough, natural/artificial and base/spirit. Similarly, the cladding of the monument is engraved marble (Figure 6). When a spectator

approaches the structure, the experience of a monolithic concrete building is replaced with the experience of 'vernacular' engraving, creating a more 'tangible' experience.

Figure 4. Aerial view of Azadi Square.

Figure 5. The ruins of Taq Kasra (Madain, Iraq). Photo courtesy from Wikipedia.org

In short, the monument allows for experiences of modernity and ancientness at the same time, due to which Shahyad embodies the uncommon representation of both the modern-and the un-modern in concrete (Forty 2013, 34). Unifying the past and the present, the monolithic Shahyad monument represents the locus of the creation of Iran's national 'identity'. Its architecture embodies language of form, shape, colour and concrete materiality which enables ambiguous experiences. All this serves to remember, narrate, glorify and legitimize the nation state. Hence, the initial purpose of the monument was to freeze the Shah himself in time and space, as an 'architectural manifesto of Shah's monarchy, his vision, ideology and ultimate aim' (Grigor 2003, 216). The Shah aimed to ascribe political status to the Shahyad monument through association with historical memory and collective imagination of the Sassanid Empire's glorious past. Mehan (2017a, 319) cites that once this memory fades, the monument may be appropriated by new meanings and new ideological imperatives. As such, only Shahyad's physical concrete presence has endured (Grigor 2003, 216).

CONCRETE FUTURES

In this article, I have argued that Shahyad presents ambiguous experiences, due to its various material properties. Significantly, instead of contrasting these different experiences of the concrete monument, the modern and the ancient align in the design-strategy and ideology of the Pahlavi regime. The Shah legitimized his rule through referencing historic precedents in his architecture in order to evoke notions of continuity. The Shahyad monument served as a spatial-temporal threshold between the glorified Persian empire and the Pahlavi capital (Grigor 2003, 215). Through this concrete monument, the vision of Iran's national future was aligned with the permanence of Persian civilization.

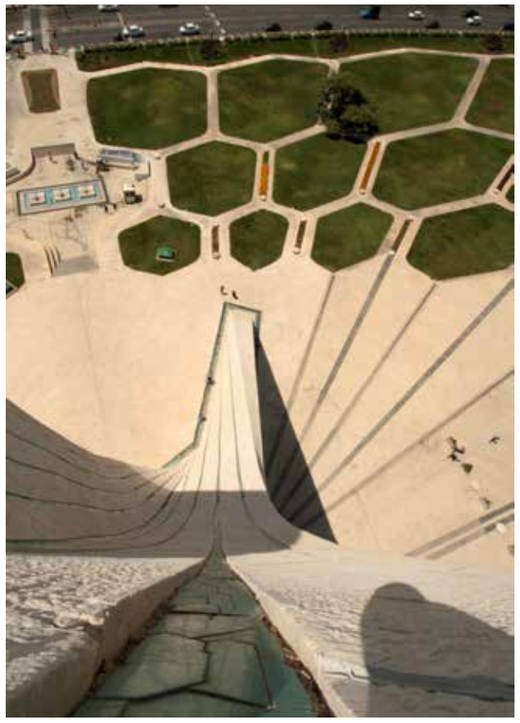

Figure 6. View of Shayad monument from the Azadi Tower.

Ultimately, the highly malleable properties and agency of concrete allow the architect of autocratic modernist architecture to engineer its plasticity in order to articulate a form of material politics. The impact on human experience of the monument itself and the variable image it represents, bringing together the ancient and the modern, is part of the monument's design strategy (Minuchin 2013, 241). Therefore, the ability of concrete to elicit many different experiences affects the strategies and outcomes of autocratic modernist architectural projects. Yet, despite the changing sociocultural context surrounding the material presence of Shahydad, its endurance has not been influenced. Significantly, the monument itself, through its concrete permanence, has become a locus of meaning-making which continues to shape the development of Iranian society. In essence, all fades but concrete remains.

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CONCRETE'S MATERIAL AGENCY

AND THE 200.000 ALBANIAN BUNKERS

Sven van Maris

ABSTRACT:
Thousands of concrete bunkers, built during the communist dictatorship of Enver Hoxha, are scattered all over Albania. Previously, they have mostly been examined on the basis of their symbolic meanings, but not on their materiality. This essay investigates this materiality by exploring the concept of material agency and examining concrete, the bunkers' defining material. During the 'bunkerisation' of Albania, concrete's agency was somewhat limited. The communist dictatorship could use the material at their will. It was after the dictatorship however, that concrete's agency became apparent. As a result of concrete's properties the bunkers are now involuntary monuments to the past.

KEYWORDS:
Concrete, Material Agency, Bunkers, Communist Albania, Monuments

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INTRODUCTION

Albania, the small and mountainous country in Eastern Europe, is littered with concrete bunkers (e.g. Figure 1) built during the communist dictatorship of Enver Hoxha that lasted until 1985. Documents show that 173,371 bunkers were constructed in 1983, out of a planned 221,143 (Veizaj et al. 2020, 1011). The bunkers have mostly been examined for what they as physical objects symbolise. Galaty et al. (1999) investigated how the bunkers have been deployed by Albania's communist dictatorship to impose its ideology on the Albanian people. They argue that they were constructed to stand for social solidarity and defence, but have since the end of the dictatorship stood for an overthrown and openly mocked political regime (Galaty et al. 1999, 209). This theme comes back in the many journalistic travel pieces that are written about the bunkers every year: the bunkers are 'concrete testament to the paranoia of Enver Hoxha' (Eilers 2016), and '[b]urrowed between an isolated past and a reinvented future' (Crevar 2017).

Less focus has been on the materiality of the many concrete bunkers. The bunkers have not been studied principally on the basis of what they are as physical, material objects. This lack of considering the material intrinsically ties into New-Materialisms' challenge of the anthropogenic view of materials, a view in which human ideas about material take precedence over the material itself (LeCain 2017, 16). Boivin states that materiality and its ability to impose constraints and enable possibilities have been overlooked (Boivin 2008, 168). A neglect of

Figure 1. Bunker in the city of Korçë, photo courtesy of Wikipedia.org

materiality is also prevalent in archaeology, argues Olsen in his aptly titled *In Defence Of Things* (2013). According to Olsen, archaeologists recurrently interpret material culture and landscapes as 'metaphorical "stand-ins" that always represent something else' (Olsen 2013, 3), moreover, 'the "social," the "cultural," the "political," and so forth [are] all implicitly conceived of as extramaterial entities' (Olsen 2013, 3).

An idea that helps emphasise the importance of materiality is the concept of material agency. It is the idea that material has agency and impacts humans emotionally, sensually, socially and even physiologically. This agency is given by its physicality, meaning qualities like its colour, weight, and strength (Boivin 2008, 129-130). The fact that material has agency does not entail that we should see this deterministically. Humans are able to shape material and likewise, material shapes humans, making it a two-way relationship. With the acknowledgement of material agency, justice is done to the things themselves.

In this essay I explore the concept of material agency in relation to the Albanian bunkers. The defining material of the Albanian bunker is concrete: it gives it its look, its strength, and its shape. While the materiality of bunkers could also lie in their geological setting as it is rock that shelters the bunker (Garrett and Klinke 2019, 1071-1073), this is not true for the Albanian bunkers. These bunkers were placed everywhere, in urban as well as rural environments, near the coast as well as inland. The geological setting thus varies greatly, making it not geology that defines the Albanian bunker, but concrete. By using material agency and focussing on concrete, it is possible to inquire into the materiality of the Albanian bunkers. To what extent did concrete's material agency shape the programme of 'bunkerisation' by the Hoxha regime and the bunkers' existence afterwards?

CONCRETE AND THE BUNKERISATION PROJECT

Concrete is a combination of cement, aggregates (such as sand and pebbles) and water. Concrete starts as a liquid, which later solidifies. This flexibility means that it can achieve any shape in its liquid form. This is where concrete's appeal lies (Bartolini 2015, 196). The most important component, cement, is made up of a finely ground mixture of lime, clay and metallic oxides, fired in a kiln at a high temperature (Smil 2014, 19). Cement that was satisfactory to produce reliable concrete was available after 1824. From then on, it was possible to make concrete that is strong under compression; however, the material is weak in tension. To combat this flaw, the concrete can be reinforced with iron. Concrete and iron bind solidly and the iron is protected from rust by the hydraulic cement. In the last decades of the nineteenth century, reinforced concrete steadily developed, its popularity growing. By the twentieth century, reinforced concrete was well in place and became the basis of huge urban expansions (Smil 2014, 28-37).

There is a strong connection between communism and reinforced concrete, and one could state that the use of concrete by Albania's communist dictatorship is part of a tradition. On the 7th of December, 1954, Nikita Khrushchev, first secretary of the Communist Party Central Committee of the Soviet Union, gave a speech about concrete and its use in construction. The speech was the starting point for the famous Soviet apartment blocks made of reinforced concrete panels. Khrushchev declared that concrete was to be used for everything possible; if something could be made with concrete, it should be made with concrete. For the sake of efficiency, prefabrication should take precedence over *in situ* production. Furthermore, the importance of standardised designs was emphasized (Forty 2012, 149-159).

Figure 2. Medium bunker, photo courtesy of Wikipedia.org

The Albanian bunkers fit into this tradition. The Albanian bunkers were built during the rule of Enver Hoxha, which began in 1944 and lasted until Hoxha's death in 1985. The context in which they were built was one in which Albania became more and more isolated. Albania's alignment with the USSR, formed in the years after the Second World War, broke down in 1961. An alliance with China followed, but in the late 1970s this partnership fell apart, too (Payne 2014, 161-162). The bunkers were the result of a plan by the communist leadership in 1971 to solidify the country's defence. Significant to this plan was the idea that the entire population was to be prepared militarily. The resulting project was implemented in 1975, and consisted of placing bunkers throughout the country to protect soldiers and the civilian population in case of an attack by foreign armies. This lasted until the mid 1980s (Veizaj et al. 2020, 1010) and was known as the 'bunkerisation project' (Payne 2014, 161).

The Albanian bunkers have been tentatively categorised into three groups, based on size: small (Figure 1), medium (Figure 2 and Figure 3) and large bunkers (Veizaj et al. 2020, 1011). The small bunkers have a diameter of 3 m and the medium bunkers a diameter of 8 m (Stefa and Mydyti 2009, 74-75). The large bunkers vary in size. Up to 1983, roughly 160,000 small, hemispherical bunkers were built. They were prefabricated and then transported to their intended location. Meant for soldiers and civilians, these bunkers were everywhere: in urban and non-urban areas, in the mountains, and on shores. The medium bunkers, on the other hand, were only placed in strategic positions. They were to be used by the military and designed to withstand attacks from tanks. They were typically mushroom-shaped, but other shapes were possible too. The different elements of the bunkers were prefabricated and then assembled on site. Almost 10,000 were made until 1983. The larger bunkers were designed to be used as military control centers or storage of military equipment. These were tunnel bunkers composed of both prefabricated elements and parts that were made on location. Roughly 2,000 were made (Veizaj et al. 2020, 1011). It is possible to zoom in on the production process of the mushroom-shaped medium bunker, which was put together by combining up to seven different reinforced concrete parts. Very fine concrete was used for

the parts, which set in large metal moulds. The setting in the mould could take weeks; the cap element had to set in a mould for up to 18 days. After all the parts finished setting in the mould, they were ready to be transported (Glass 2017, 147-148).

If we consider the concept of material agency and Albania's bunkerisation, it would seem that concrete's agency was secondary to the agency of the dictatorship. Just like the Soviet Union, Albania's communist dictatorship was able to successfully manipulate and use concrete, with the help of methods like prefabrication and standardisation. The communist regime could take great advantage of the properties of reinforced concrete: its strength under compression and tension and its ability to be poured into any desired shape. Yet concrete had some agency too. It had influence on determining the time parts needed to set, and concrete's weight put constraints on logistics. Without concrete's properties it would not be possible to conceive very large projects such as the Soviet Union's apartment blocks and Albania's bunkers. The project of building the many bunkers was facilitated by the material. However, it was Albania's dictatorship and its ideas that were decisive in the end. In the next section, concrete's material agency is really demonstrated.

Figure 3. Interior view of a medium bunker, photo courtesy of Wikipedia.org

INVOLUNTARY MONUMENTS OF A COMMUNIST DICTATORSHIP

The thousands of bunkers were never used for their intended purpose during the communist dictatorship. No attack ever came and the population never had to resort to the bunkers. With the death of Enver Hoxha, the bunkerisation project of Albania was terminated. The country was filled with bunkers that served no apparent purpose, with the exception of reminding the Albanians of the dictatorship. What was to be done with them? Architect and researcher Jason Payne puts forward four possible strategies: nullification, adaptation, indifference, and ambivalence (Payne 2014, 165-166). By considering concrete's material agency, it is possible to determine which option has the most merits.

The first strategy, nullification, involves the elimination of all bunkers from the landscape (Payne 2014, 165). This would remove the reminders of the communist past. In this scenario every bunker would have to be located, disassembled, and destroyed or recycled. This way, every physical reminder of a bleak period in the country's history is gone. This strategy has enormous downsides however. Here concrete's material agency is crucial. First of all, because of concrete's weight, the costs and difficulties of logistics would be enormous. Yet the most important factor, because we are dealing with reinforced concrete here, are the costs of separating the concrete from the metal. These costs are very high on account of their solid bond (Smil 2014, 56). So, because of concrete's agency, locating, transporting and recycling every bunker is just too expensive. Nullification is not possible.

The next strategy, adaptation, would see the bunkers adapted and reused (Payne 2014, 165). There are also problems that stem from the concrete's materiality in this approach. To begin with, because of concrete's properties, particularly its colour and texture, the options for reuse are limited. The bunkers cannot be made into comfortable dwellings and cannot be modeled easily. The many bunkers found in urban spaces cannot be turned into benches or other street furniture. However, even more important is the state of many of the bunkers. The 160,000 small bunkers of Albania were never needed and there was no reason to maintain them after the dictatorship. This leaves the assumption that many bunkers are not suitable for reuse because of the state the concrete is in, as concrete is very susceptible to deterioration, exposed as well as buried. This causes concrete to look ugly and lose strength, causing unsafe conditions. If concrete is not adequately maintained or repaired, the replacement costs are enormous. This is especially the case with concrete that is of poor quality (Smil 2014, 56). Concrete's agency makes the strategy of adaptation unviable.

As the result of concrete's properties, two final, workable strategies are left: indifference and ambivalence. Indifference is a sort of passive preservation and leaves the bunkers alone. Ambivalence is like indifference, but without the passivity. If the bunkers were just left alone, there is the risk that Albanians forget what the bunkers are, argues Payne. The strategy of ambivalence aims to promote the continuity of the bunkers and to investigate what the bunkers mean (Payne 2014, 165-167). Indifference is about forgetting as time passes by, ambivalence is about trying to remember. Concrete's properties cause the strategies of nullification or adaptation to be impractical. So, due to concrete's agency, the bunkers are there as reminders of the communist dictatorship, for the time being at least. The Albanian bunkers are involuntary monuments. Choices in the future will determine if the Albanian people are willing to forget the bunkers and what they stand for, or if they will try to remember.

CONCLUSIONS

Research on the many bunkers built in Albania during the communist dictatorship has predominantly focused on what they, as physical objects, symbolise. This essay addressed the bunkers' materiality by considering the concept of material agency. This concept refers to how material influences humans and has agency of its own. Humans and material come together in a two-way relationship: material shapes humans, just as humans shape material. The bunkers of Albania illustrate this neatly. The bunkerisation of Albania was initially a project thought of, and executed by, humans. In this process the agency of concrete, the bunkers' principal material, was secondary to the agency of the communist regime. The ideas of Enver Hoxha were leading, but facilitated by concrete and its properties.

However, it was concrete that ultimately influenced the afterlife of the bunkers. Albania is now stuck with numerous bunkers, whether the Albanian people like it or not, and part of this is to blame on the materiality of concrete. Material agency is a suitable concept to demonstrate that humans do not just impose their will on the material world, but that material considerably influences humans too. Archaeology has been somewhat dominated by research that interprets material things as representations of something else, insofar things like politics and culture almost seem to exist independently of the material. By employing the concept of material agency in relation to the Albanian bunkers, it is demonstrated that politics and the material are (of course) closely related. It is a gentle reminder to archaeologists that materiality matters.

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AFTERWORD

POTTERY IN THE DIGITAL AGE

Nina Škerjanc

THE CRAFTSPERSON AND THE TANGIBLE MATTER

When hearing about the terms “craftsmanship” and “digital fabrication” one might think that they are complete opposites, something that excludes one another. But even if the manual and digital working process differ, as a designer I would suggest that digital matter and tangible matter, in this case, clay, are similar. The experience of forming a digital model in a 3D virtual space is comparable to forming clay with your hands. Both matters are pliable, adjustable, additive, and subtractive. In this foreword, I will try to reflect on my practical experiences with clay and further explore the relationship between pottery and digital fabrication.

As simple as clay seems to be at first glance, one can experience the complexity of it when trying to form it to one’s will. The knowledge needed to transform a lump of clay into something as simple as a ceramic bowl requires the skills of a craftsman. Craftsmanship is generally associated with manual dexterity, skilled artistry, and the art of making, but can also express cultural identity and traditions (Rodriguez Carrion 2013, 376). A craftsman skilfully uses their experiences, tools, and knowledge to work with the material and create objects.

As a designer, I had little experience in forming clay and my skills would probably be considered nothing more than adequate when compared to skilled craftsmanship. Nonetheless, I was curious about working with clay and getting to know its material properties, so I started to experiment with different kinds of hand-building techniques, as well as extruding[1] and slip casting. By working with the material, I got a deeper understanding of not only clay itself but also the craftsperson’s mindset and workflow. Clay is a very pliable material that can be formed in its liquid state with slip casting or modelled by hands and tools when it’s firm. Because of its properties, clay can be formed with additive and subtractive techniques. These allow the process of working with clay to be very flexible, unlike for example working with wood where “mistakes” are harder to fix. This security of being able to adjust the shape of the clay very easily (even when making mistakes) encouraged me to experiment and improvise in my work process much more than when working with some other materials.

THE MATERIAL AS AN AGENT

Within the process of making traditional pottery lies an intimate relationship between the intent of the craftsman and the execution of the work. The level of skill, involving both mind and body of the craftsperson, usually determines the quality of the model (Loh et al. 2016, 653). The greater the skill, the more one is able to form the material to one’s will and to create an accurate physical model based on one’s mental model. The lack of skill, as personally experienced, takes away one’s control over the material and makes the material an active participant, an agent with the ability to influence the outcome. This is the moment where the interaction between the material and the human body and mind is the most obvious.

As a skilful craftsman, this interaction would resolve quite smoothly with humans forming the material as close as possible to their initial intention. As an unskilled craftsman, the interaction becomes much more dynamic and at times rather frustrating, since the material’s agency can influence the final result, making it different from the initial idea. No matter the outcome, intimate relationships form between humans and the material as a consequence of that process. Humans use all their senses, body, and knowledge to form the material. The material on the other hand informs the human how it can be formed, and of its limitations and possibilities. A skilled craftsperson listens to the material, works with, and reaches the compromise, which represents the mixture of the workman’s idea and the material’s final physical form.

As easy as this might seem in theory, multiple factors can affect the quality of the craft product in practice. For instance, the knowledge of the craftsman plays an important role in their ability to handle the material. Knowledge can be obtained from different sources such as personal experience with the material (learning while doing), theoretical knowledge of the material’s properties, and learning from other people’s experiences. Because of the mind and body coordination when working with the material, manual skills have to be trained too.

THE INTERACTION BETWEEN MATERIAL AND BODY

Through experience and practice, a craftsperson has to learn how to control their body, senses, and tools to create the desired outcome. A skilled craftsman’s movements are both smooth and precise, involving a form of muscle memory that is cultivated by repetition. The mind of the craftsman is focused on the work and the interaction between their body and the material. Every move and moment is important since a single mistake could result in the failure of their vision. Even though I acquired quite some theoretical knowledge and learned from my mistakes, I realized that achieving that the level of trust in your skills and the material takes years of practice which I was missing. Nevertheless, the pliable properties of clay gave me the opportunity to acquire a more experimental and intuitive workflow, which encouraged my creativity when shaping objects.

Even though the process requires a lot of direct contact between hand and material, it is often necessary to use tools. Tools, can therefore act as the extension of the body and a good craftsperson has to learn how to control them as well as their own body. The interaction between tools and human bodies is something that can be observed throughout our history. The need to extend the physical limitations of our body has been rooted in us for several millions of years. Since everything made by humans depends to some degree on tools or technology, it is not uncommon for craftsmen to modify or invent tools, which would simplify their crafting process and make the manipulation of material more efficient. In this sense, the craftsperson fabricates not only the end product itself but also the tool.

Since clay-working is often romanticised and stereotyped as objects handmade on a pottery wheel, we have to keep in mind that craftsmanship nowadays not only involves hand-held tools but also digitally controlled machines. When observing the craftspeople at work, we can notice that they constantly improve and experiment in their way of making, which can lead to new inventions and early adoption of new technologies (Harrow and Brayman 2014). In that way, the craftsman is not only the person behind the pottery wheel but also an innovator, a pioneer, or an engineer. The craftsman is nowadays able to use an array of mechanical equipment like electrical kilns, extruders, and CNC (computer numerical control) tools. The craftsman has to learn how to skilfully control or even modify electrical tools as well as hand-guided tools to improve and innovate in their working process. Even though the conventional idea of craft usually does not bring to mind a high-tech process, technology has always been there to advance craftsmanship (Rodriguez Carrion 2013, 376).

THE CRAFTSPERSON AND THE DIGITAL FABRICATION

In the late 20th century we entered the so-called “Third industrial revolution” or the “Digital revolution”, which began as a shift from mechanical to digital. That shift also affected the field of pottery where introducing the digital in the process of making resulted in the wide use of CNC[2] tools in creative practices and studios. The development of more powerful and smaller computers, programming languages that are easy to use, as well as the more widespread availability of highly technical information through the internet, all contributed to the introduction of digital technologies to the craftsman’s making process (Harrow and Brayman 2014). To elaborate on just how this computer numerical controlled and digitally driven production system affected the craft and craftsman behind it, I am going to examine the example of 3D printing with clay.

Within the last decade or so, 3D printing technology has made its way into almost every type of production, including pottery and other objects made of clay. 3D printing, also called Additive Manufacturing, is an advanced technology that combines layers of printed material into three-dimensional entities using a computerized numerical control model. In short, 3D printing is the process of layering material (in this case, clay), to produce three-dimensional objects (Luo et al. 2020, 564). This way of shaping clay allows the craftsman to explore a variety of shapes and techniques that were previously impossible.

Digital fabrication as such has multiple advantages like increases in speed, scale, precision, complexity, and less laborious forming than traditional techniques. It also provides the opportunity for repetition, small-batch production, and the shareability of a digital file via the internet (Sharif and Gentry 2015, 684). On the other hand, 3D printing also has its limitations. For example, 3D printing with clay tends to produce layered marks from forcing or extruding material through the nozzle, which is common to all 3D printed objects. This may represent an aesthetical limitation where additional action is needed to change the surface of the material. The limitations also occur on a more practical level, since the (3-axial) limitation of its movement does not layer the material in certain shapes. One could argue, that these limitations associated with digital fashioning techniques would limit the creative process, and lead to homogeneity or a lesser variety of material culture techniques. Based on the continued inventions in the use of other tools, however, I would argue that craftspeople use new tools in unexpected ways, which continues to contribute to the variety of material culture. For example, the potter’s wheel, which has its limitation in forming round symmetrical objects, has been in use for more than 5000 years and it is still in use today by the craftspeople to produce unique and highly varied forms (Harrow and Brayman 2014).

Technological innovations play a central role in the development of identity and visual elements in a period of time and culture. When the pottery wheel was developed, the visual language of rotated symmetrical pottery became the image of clay forming as we know it today. With the invention of digital fabrication technologies, we can speculate that the visual language of 3D-printed ceramic objects will become synonymous with clay forming in the future. Because of the increasing use of digital fabrication technologies today, many people fear the tradition and skill related to craftsmanship will be lost. On the contrary, I believe that even with the extensive use of digital tools among craftspeople, there will always be a need for skills and knowledge related to hand-forming craftsmanship.

[1] With extruding technique, the clay is pushed through mechanical device called extruder. With the force of the lever, clay is formed through the device to achieve a specific elongated shape.

[2] CNC or computer numerical control is automated control of machining tools (for example drills, mills and 3D printers).

CRAFTING WITH DIGITAL MATTERMATTER

Because of the nature of digital tools, the practical knowledge and the making process of the craftsman changes from working directly with the material through touch to working indirectly with the material digitally. The craftsman needs to not only gain knowledge and understanding of the limitations and possibilities of digital tools, but also needs to acquire new skills in digital modelling and software controlling. Because clay 3D printing becomes one of the construction techniques (which resembles the traditional coiling), we have to remember that digital skills alone are not enough. Significant material knowledge is still required as well as knowledge of many of the other traditional clay-working methods (Keep 2019, 18). This kind of knowledge can only be obtained by working directly with the material, in which case hand-forming skills are necessary to acquire. In other words, the new does not replace the old; the digital skills coexist with the material know-how of working with clay.

Digital tools also profoundly influence the craftsperson's creative experience, their way of thinking and working. The interaction between our body and tools, our senses, and the material in the making process shapes the cognition of the maker. The emotive or sensory touch is considered an essential part of traditional craftsmanship, mainly because this interaction promotes material knowledge, encourages one's creativity, and forms an emotional connection. One could claim that the use of digital tools can hinder this intimate connection between the craftsman and the material since the craftsperson can not rely on their senses in the software environment. On the other hand, I believe that the maker does not lose the connection between him and the material but merely interacts with a different kind of matter, existing in a digital world. This way of making can open the door to work that explores new visual content rather than manual dexterity (Keep 2019, 18).

New theoretical models suggest that materiality is not only connected to notions of physical substance or matter, but that it embraces both the material substrates and abstract programming languages (Casemajor 2015, 6). Digital information which allows 3D printed digital output does not only exists in the immaterial realm like we tend to imagine. It consists of physical inscriptions coded in bits (1 or 0) and stored on hardware devices made from physical matter, that depend on the operating system (Casemajor 2015, 7). Just like clay, a 3D printing system has its limitations and affordances that makers need to master if they want to create a skilful physical model. Furthermore, if the craftsperson lacks skills and experiences in digital making, the control over the final product will shift over to the 3D printer, which could result in execution divergent from the initial idea of the maker. In that way, we can see a resemblance between the material properties of clay and 3D printing software.

CONCLUSIONS

Due to the misconceptions and stereotypes of what digital fabrication and craftsmanship are, it is easy to assume that these fields are contradictory and that in the future only one will prevail (with a higher possibility of craft extinction). I would argue that as long as the craftsman finds joy in experimenting and working with either tangible or digital matter, future craftsmanship will include both ways of creating new works. Traditional pottery and clay 3D printing demand a different way of working. However, because of this variety in knowledge, skills, and material culture, that comes with a new way of working, manual and digital production become complementary.

I believe that the way we work and make affects the way we think, so craft is not only about the final product but also the making process itself. Through it, the craftsmen gather knowledge, skills, experiences, and develop their relationships, and creativity. As previously established, the making process heavily differs when working with clay manually or digitally. But at the same time, these differences offer a wider variety in our material culture and craftsperson's skills, coming together in a richer, more diverse practice. Incorporating digital tools in studios allowed the production of different shapes and techniques, but most importantly allowed the craftspeople to explore and experiment with materials, tools, and techniques that were previously not accessible.

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