

# Dreaming with The Pantheon in Rome

spekulativ arkitektur  
arkitektur och fantasi  
arkitekturteori  
materialitet och (icke mänsklig) agens  
**speculative architecture**  
**architecture and imagination**  
**material engagement theory**  
**agency and responsivity in matter**

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*Att drömma med Pantheon i Rom, är en spekulativ essä om byggnadskonsten i det antika Rom med utgångspunkt i frågor som rör agens hos materia och respons, eller svarande, i det vi kallar material. I denna undersökning utgår vi ifrån vetenskapliga upptäckter inom en rad fält som undersöker dessa frågor på olika sätt.*

Utmärkande för byggnadskonsten i antikens Rom var att den i hög grad baserades på en direkt materialkänedom, vilket i sin tur var ett resultat av ett till synes oändligt antal experiment. Om vi föreställer oss alla byggplatser i det Romerska riket under tiden då Pantheon byggdes ser vi kanske tusentals människor som på olika sätt arbetar med och samtidigt undersöker material på olika sätt för att dessa skall komma till användning inom arkitekturen.

Den massiva kollektiva insatsen och mängden experiment och undersökande tror vi är en av anledningarna till att just Romersk arkitektur var så framstående. I den här essän undersöker vi arkitektur och byggnadskonst genom att studera och fantisera om relationerna mellan människa och material.

*Dreaming with The Pantheon in Rome is a process-based speculative essay engaging the question of agency and responsivity in matter which depart from current research into the durability of ancient Roman concrete. This is mixed (pun intended) with material engagement theory, quantum field theory and the theory of formative causation to explore the possibilities of consciousness in matter and entanglement between matter and mind in architectural practices.*

In the history of human architecture, The Pantheon in Rome is probably the best-preserved work of ancient Roman engineering. Significant for Roman engineering was its empirical base for knowledge production. When The Pantheon was built, there would have been thousands of people working in different locations across the empire, producing, and engaging in experiments with the material world for the purpose of architecture and construction.

The immensity of the collective effort together with the massive amount of material engagement and relational inquiries into the material world is one reason that Roman engineering was so eminent. In this essay we explore ancient Roman architecture and engineering by studying the materiality of buildings, the acts of material engagement of workers and responsivity and agency of matter.

## METHOD

Since the word *method* implies working in a scientific tradition, we would like to begin by substituting this term for the word *way*.

For the same reason we cross out the word *conclusion*. We would like to state that we recognize multiple ways of seeing. Our ways are tentative. Best described, perhaps, as a temporary stitching together of disparate parts. Our ways are described and performed as text. The most appropriate analogy for this work is the dream, or daydream.

## THE ROMAN PANTHEON

The Pantheon appears in the urban fabric of contemporary Rome as a kind of paradox, both clearing and colossus. Occupying the southern part of Piazza della Rotonda, the former temple, now a church and tourist attraction sits on the muddy grounds of the former marshlands. But the building we encounter today is not the same as was originally conceived of and erected at the site.

The first Roman Pantheon was built between 27-25 BC. It was

a temple building of an unusual circular-shaped, open-air structure, connected to a pedimented portico by a transitional block. It was commissioned by Marcus Agrippa, consul at the time and son-in-law to the emperor Augustus. The Pantheon was devoted to the worship of all Roman gods, including the deified Julius Caesar, Augustus' adoptive father. The first building was severely damaged in a fire in 80 AD. and destroyed almost entirely in another fire caused by a lightning strike in 110 AD. Research today suggests that a total reconstruction of the building could have been initiated already at some

time around 114 AD. (Marder and others, 2015, 87-91).

The second Roman Pantheon was built in the times of emperors Trajan and Hadrian. Who the architect was is not possible to say with any level of certainty. Some scholars suggest that it is likely the work of Apollodorus of Damaskus because of his involvement in other high profile contemporary building projects in Rome such as the baths of Trajan (Marder and others, 2015, 96). When building the new structure, the architects and/or engineers of the second Pantheon reused the ground plan of the former temple. Apart from that the building was completely new. The main differences between the old and new building were the dimensions, the domed interior space, and the rotunda. The fact that the building is standing after almost two thousand years makes it a good example of Roman construction at its prime.

One factor that should also be considered when discussing the well-preserved Roman Pantheon is that it was consecrated and made into a church in the 7th century AD by the pope Boniface IV (Marder and others, 2015, 233). Because of this the building has been cared for and protected over the years.

The engineering behind ancient Roman architecture was highly empirical. It was rational, methodological, and technical. Thanks to the works of Vitruvius Pollio and his "Ten Books on Architecture", that was written around the time when the first Pantheon was built, we know a great deal about the theory, practice, and knowledge production in and through architecture in ancient Rome. At the time, it was believed that everything which exists in the natural world was made up from combinations of the four basic elements fire, water, earth, and air.

Vitruvius wrote:

*"Therefore, because all things seem to come together and to be born from the conjunction of these bodies, and are distributed into infinite types of natural objects, I thought that I should*

*expound on their varieties and the criteria for their use, as well as what qualities they have in building, so that when this information is known, those who are planning to build will avoid mistakes and assemble supplies suitable for buildings."* (Rowland, Noble Howe, 1999, 35).

The architects and engineers of ancient Rome had deep knowledge about the materials they were using. For example, the cementitious compound in ancient Roman concrete, which was a key component in brick-faced construction that was standard practice at the time when The Pantheon was built, was extremely durable. A quality that has been one of the mysteries of human engineering since. This could be considered rather peculiar since Vitruvius wrote extensively on the matter.

Reading Vitruvius two things are notable that could be of importance regarding the prospect of solving this mystery. When writing about the preparation of mortar and the use of limestone in concrete masonry Vitruvius talks only about the uses of slaked lime. The technique is not elaborated further. But recent studies of ancient Roman mortar made at the Massachusetts Institute of Technology suggest that non-slaked lime was also used in the mix. If we were to listen to Vitruvius, which we have been doing for the better part of the past two thousand years, the pozzolanic material would still be considered the main reason for the extreme toughness and durability Roman concrete (Rowland, Noble Howe, 1999, 37).

So, we have reason to believe that the builders in ancient Rome had a profound understanding about the material world that go well beyond any textbook and formal technique.

## MATERIAL ENGAGEMENT THEORY

One of the things that is often said to separate human beings from other species is our sense of

self, our supposed free will, and our cognitive functions. These qualities, when combined and performed, seem to define us as both *thinkers* and *makers*. Our thinking, whatever this is, and acting in the world by making has in time turned into production of descriptive categories and highly technical knowledge production like physics, mathematics, and history. This Western notion of making sense of things can be traced to practices in oral cultures like storytelling, and poetry.

Sense-making or looking at things trying to understand them by defining and describing them from the outside has turned out to be a slippery slope. Where instead of perceiving the world, or worlds, as complex systems of activities where everything is connected Western culture, specifically by means of the natural sciences, have constructed an idea that both ourselves and other things are defined as being separate. There is, however, research being done today even in the more strictly scientific disciplines like theoretical physics and biology that are challenging this notion of being and becoming.

Lambros Malafouris, researcher in the field of Cognitive and Anthropological Archaeology, is studying sense-making in design practices and the *becoming with* things. Something he himself describes as: *"the hylonoetic field of human becoming"*. Hylo from the Greek word *hyle* (matter) and noetic from the word *nous* (mind). Malafouris describes sense-making by material engagement:

*"Humans are organisms of a creative sort. We make new things that scaffold the ecology of our minds, shape the boundaries of our thinking and form new ways to engage and make sense of the world."* (Malafouris, 2014, 141).

In the article *Creative thinging: The feeling of and for clay* he discusses human being and becoming with things. Malafouris adopts the term thinging from the philosopher Martin Heidegger who says in *"Das Ding"* (The Thing):

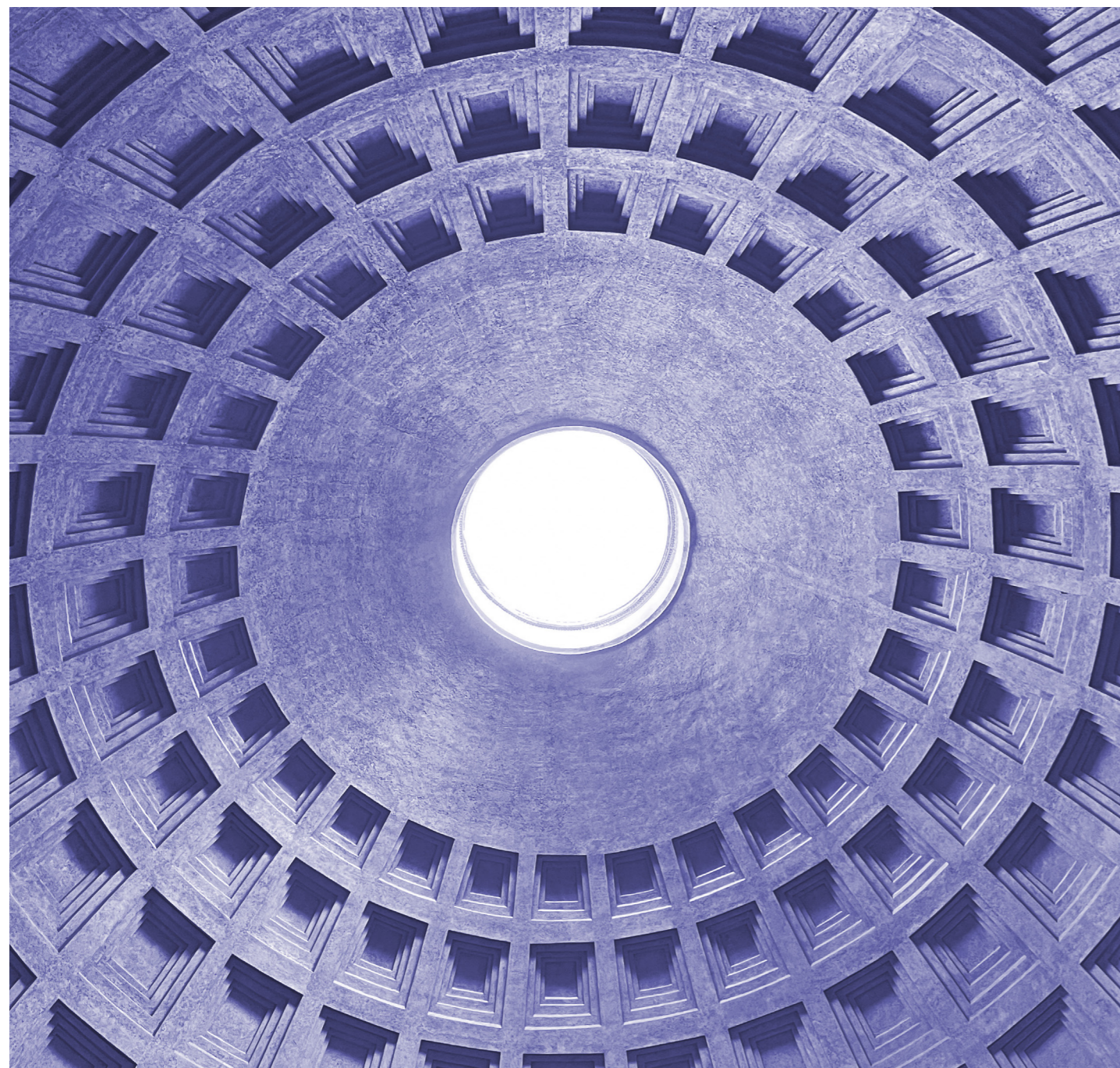


Fig.1 - Dome interior detail, The Pantheon, Rome (2023).

*"To understand the 'thingness' of things one needs to reflect on the phenomenal power of things to 'gather' space and time."* (Malafouris, 2014, 142).

This poetic concept of things gathering space and time should be considered in relation to all aspects of our knowledge and relation to the material world. When Roman workers extracted marble in the quarries of Carrara or collected low density volcanic ash stone material from the regions around Baiae in Naples, they would have been acutely aware of the specific properties each material had and their possible uses for building.

After acknowledging the brilliance of the Heideggerian notion that things *gather* space and time, Malafouris takes a turn from the phenomenological path of Heidegger and starts to lean towards the process philosophy of Alfred North Whitehead. He does so, we believe, to level the playing field between 'maker' and 'thing' and to allow for the *"thinking (and feeling) with, through and about material things"* (Malafouris, 2014, 142). This should be seen as an act made to bridge the perceived phenomenological gap between human (mind) and thing (matter) to establish a kind of continuity between the two on an ontological

level. In his words:

*"The notion of 'thinging' signifies the ontological synechism (from the Greek synēches, meaning continuous) between mind and matter. I use the term 'things' to denote energetic compounds of form and matter and the term 'thinging' to signify flow. I do seek a more enactive and ecological approach to the study of the creative process. Specifically, I am interested in one aspect of 'thingness' that is typically cast in the shadows: the vitality, affect and agency of 'things' in human thinking, or else, the cognitive life of things"* (Malafouris, 2014, 142).

In material engagement theory

there is said to be a constitutive intertwining of mind and matter at work in an ontological sense. However, this idea seems to rely solely on the human mind and cognitive functions of the more human being. In which case the vitality, affect and agency of things is considered real only in how they relate to a human being doing the thinking. Iterating once more the linear hierarchical power structure between human (mind) and matter. But what if we flip the script. What if there is a thinking of things that does not rely on human presence. A mind like quality of another kind.

## THE THING WITH ROMAN CONCRETE

In the article *Hot mixing: Mechanistic insight into the durability of ancient Roman concrete* a team of researchers from MIT claim to have solved the old mystery of durability in ancient Roman concrete. Up until the publication of the article the main explanations for the immensely durational qualities of ancient Roman concrete were thought to rely solely on the mix of compounds and the use of volcanic pozzolan material. Vitruvius wrote about the pozzolana: *"There is also a type of powder that brings about marvellous things naturally. It occurs in the region of Baiae and in the countryside that belongs to the towns around Mount Vesuvius. Mixed with lime and rubble it lends strength to all the other sorts of construction, but in addition, when moles [implying this powder] are built into the sea, they solidify under water."* (Rowland, Noble Howe, 37).

Engaging the material with a highly technical proxy the research team from MIT used a multiscale correlative elemental and chemical mapping approach to perform rather intimate studies of relict lime clasts from the archaeological site of Privernum southeast of Rome. They found evidence which suggests that the mortar used in ancient Roman masonry was mixed using not only slaked lime but also quicklime, or non-slaked lime, in a method called *hot mixing* (Seymor and others, 2023).

The tests indicate that non-slaked lime was used in the mortar together with sand, clay, volcanic ash, and stone material. Perhaps in combination with slaked lime. This process allowed for the non-slaked limestone to transform into sources of reactive calcium integrated in the cementitious compound. These deposits of various size and capacities were found to provide the mortar with long-term pore and crack-filling abilities referred to as self-healing properties (Seymor and others, 2023).

These properties are described as responses to physical events. When the concrete cracks open it exposes it's inside to the elements. In periods of heavy rain, water will flow into the cracks and when the water comes in to contact with the lime deposits created by the non-slaked lime a chemical reaction occurs that makes the concrete able to close smaller cracks. The research show that there is responsiveness and reactivity in the material composition of ancient Roman mortar. As we can read in the title of the article researchers from MIT calls these properties mechanistic. That means that the observed events are thought to be mechanically determined. But what if there is something more, or other, at play here. Something systemic and relational on a particle level.

## THE AGENCY OF MATTER

In the article *TransMaterialities: Trans\*/Matter/Realities and Queer Political Imaginings* published in *GLQ: A Journal of Lesbian and Gay Studies* the American scholar of feminist theory and theoretical physicist Karen Barad explores the notion of agency and responsiveness in matter through research processes in experimental biology and quantum field theory.

Engaging concepts such as origins and agency, responsiveness, desire, yearning, touching and monstrosity, Barad carefully guides us through a variety of phenomena such as lightning, regeneration, the void (or vacuum) asking questions about

the agency of matter, activity, and performativity as possibilities in all parts of the material world.

*"Matter is promiscuous and inventive in its agential wanderings: one might even dare say, imaginative."* (Barad, 2015, 395).

In the article Barad discusses the notion of origins and being referencing the dreams, desires, and practices of Mary Wollstonecraft Shelley's fictional doctor Victor Frankenstein. And, perhaps more importantly Frankenstein's monster. The role of electricity is introduced as a factor in the human history of the ontology of matter. It establishes the electromagnetic field as one of many fields that make up a kind of playground for material wandering(s). Digging where they stand, Barad looks to quantum field theory to explore the notion of material agency. They write:

*"From the viewpoint of classical physics, the vacuum is complete emptiness: it has no matter and no energy. But the quantum principle of ontological indeterminacy calls the existence of such a zero-energy, zero-matter state into question or, rather, makes it into a question with no decidable answer. Not a settled matter or, rather, no matter. And if the energy of the vacuum is not determinately zero, it is not determinately empty. In fact, this indeterminacy not only is responsible for the void not being nothing (while not being something) but may in fact be the source of all that is, a womb that births existence."* (Barad, 2015, 395).

Discussing the agential qualities of matter further, Barad uses quantum field theory to invoke a spatial category to the pointiness of classical physics. The category is structured like a field, and a field is constituted by waves. Fields are spaces for activity and play. For relations.

The field is exemplified in Barad's text by the electromagnetic field which we all know and can sense by the build-up of electromagnetic tension in the atmosphere during the onset of a storm. We feel the atmosphere change in our bodies.

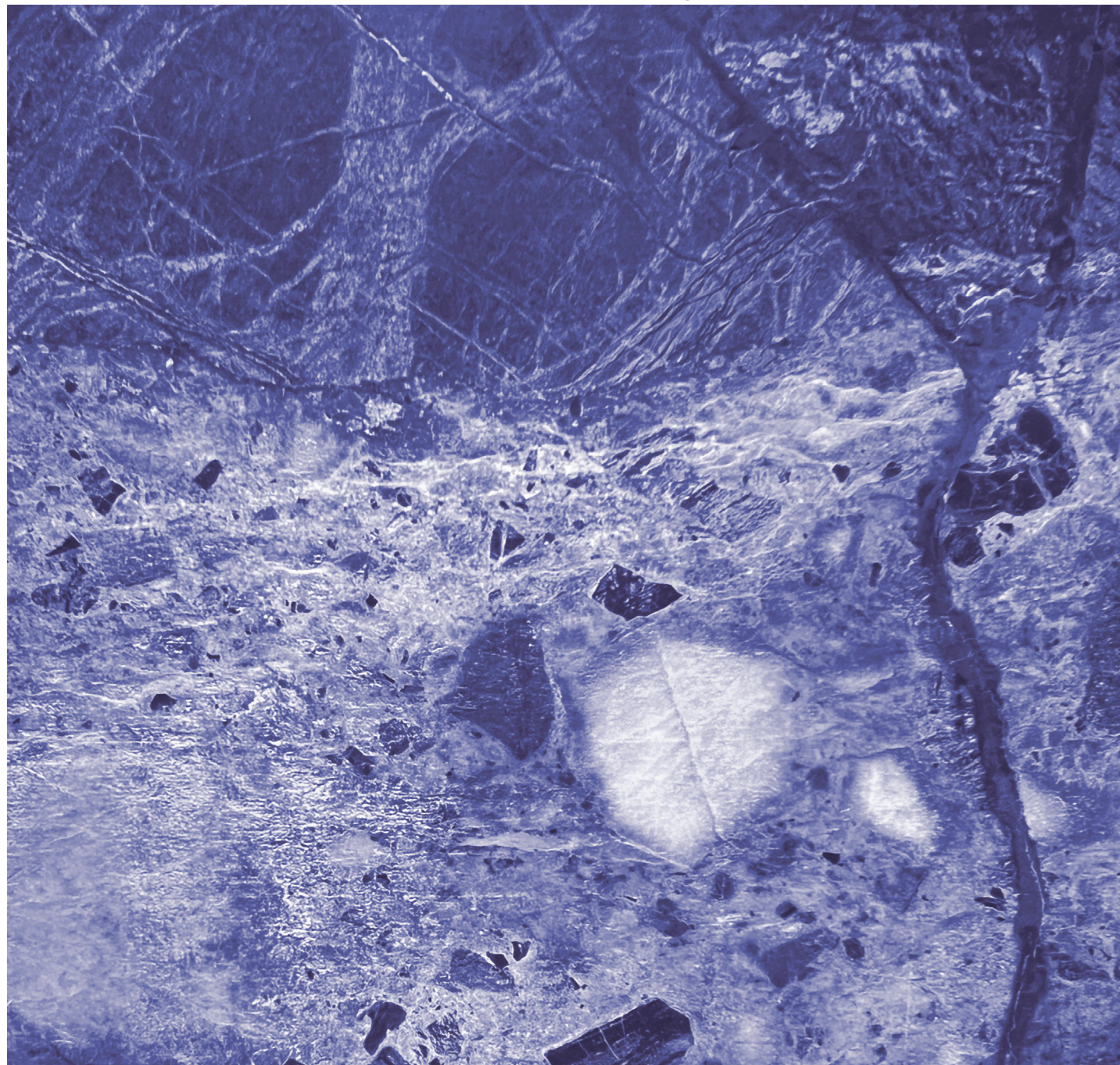


Fig.2 - Marble detail (wall) The Pantheon, Rome (2023).

*"The electric field is a desiring field born of charged yearnings. When it comes to mutual attraction, the rule is opposites (i.e., opposite charges) attract. The notion of a field is a way to express the desires of each entity for the other."* (Barad, 2015, 399).

In quantum field theory physical observables are made discrete by applying quantum physics and special relativity. However, all quantum phenomena are characterized by an ontological indeterminacy due to the "energy-time indeterminacy principle". In their research Barad considers the indeterminacy principle to have a closer look at the number of particles associated with the

void, or vacuum, making it not (determinately) empty, and not (determinately) not empty (Barad, 2015). The indeterminacy principle when applied to the vacuum invokes, or gives birth to, strange and wonderful virtual particles that lies at the heart of all matter – including this paper.

*Virtual particles are not present (and not absent), but they are material* (Barad, 2015, 395).

Remaining within quantum field theory Barad tells us a story about an electron. The electron is "a point particle", a particle without structure. But because of the indeterminacy principle the electron does not exist solely as an isolated

point in time but is associated with the vibrant activities in- and of the vacuum. Imagining the material explorations of this performative particle Barad writes:

*The electron will emit a virtual photon and then reabsorb it. This possibility is understood as the electron electromagnetically interacting with itself. Part of what an electron is, is self-energy intra-action [...]. In addition to the electron exchanging a virtual photon (that is, touching itself), it is possible for that virtual photon to enjoy other intra-actions with 'itself': for example, the virtual photon can metamorphose/transition – change its very identity* (Barad, 2015, 399).

So, with this in mind, let us dare say that matter can be imaginative. That seemingly inert stuff like sand, clay and stone made for instance to build The Pantheon in Rome, on a particle level can have a mind like quality, or some degree of consciousness.

## THE INTER-CONNECTEDNESS BETWEEN ORGANISMS

In a revised and expanded edition of "A New Science of Life" with the new title "Morphic Resonance: A Theory of Formative Causation" the author Rupert Sheldrake, biologist, biochemist, and essayist continues work on his elaborate theory of formative causation and morphic resonance first published in 1981. The theory of formative causation could be described as a way of trying to understand the interconnectedness of organisms and explain developmental aspects and memory within species (Sheldrake, 2009, 105-106).

According to Sheldrake's theory all organisms are interconnected through a morphogenetic field. The morphogenetic field acts as a kind of medium. It is an organizing field for developmental functions and memory between organisms. Together with a phenomenon called morphic resonance the morphogenetic field enables organisms of the same species or by closest structural semblance to develop in a parallel way without regard to time and space. It enables storing and communication of collective memories across all dimensions (Sheldrake, 2009, 105).

Sheldrake, as well as Malafouris, draws on Alfred North Whitehead and his organismic process philosophy. The morphogenetic field and the possibility of morphic resonance suggests that everything that exist are involved in complex systems of relations. All these fields make up endless spaces of play for interaction, or intra-action, between matter and mind that are not restricted by time and space.

## CONCLUSION

Imagine the construction site around the time of the building of the second Roman Pantheon. At any given moment there would be hundreds of people on site performing tasks and engaging with materials of various sorts (Marder and others, 2015, 160). Deposits of fired brick would be laying around and preparations of bricks for construction (cutting et cetera) would create noises sounding across the site. Extractions of sand and clay materials for the concrete masonry would have been done either on site or in smaller quarries around the urban centre. For a project of this scale there would have been an area for the burning of limestone on site. The pozzolana would be shipped from Naples to Rome. In quarries in other parts of the empire more people would be engaged in extracting stone material (pillars and blocks of marble et cetera) for this specific construction and others. More would be engaged in the freight of the various materials back to Rome. Ships navigating the Mediterranean Sea would carry pillars and blocks of marble weighing up to around 50 tons each (or more).

Thinging with Lambros Malafouris this fantasy tells us a story about human beings gathering things which themselves (by virtue of being things) have been gathering both space and time. Collecting material, working with stone, becoming with them, as it were, on every level in a constitutive intertwining that should be extended to the more than human. There is little surprise that the amount of material engagement in ancient Rome resulted in such a deep understanding of the materials used.

The responsivity and agency of the Roman mortar would have been understood both formally through technical knowledge production like noting and writing, and bodily through material engagement. The latter being a more aesthetic kind of learning and knowledge, but nevertheless real. Since we have come to know the performative qualities of the electron, we

cannot ignore the thought that everything that exist, whether we can differentiate/sense it or not, has agential qualities. Events which are thought of as mechanistic responses in the natural sciences can at the same time be understood as expressions of will, desire, and yearning stemming from various degrees of consciousness in matter.

Much like things, in fact exactly like things, human beings also gather space and time. Or as British biologist Merlin Sheldrake puts it in conversation with fermentation expert, chef, and writer David Zilber at Wanås konst: *"Humans are fields of stability through which matter passes"* (Wanås konst, 2023). With this way of seeing, we can allow ourselves to imagine other perspectives on both buildings and being(s).

*Remember: The rules, like streets, can only take you to known places. Underneath the grid is a field – it was always there – where to be lost is never wrong, but simply more. As a rule, be more* (Vuong, 2019, 192).

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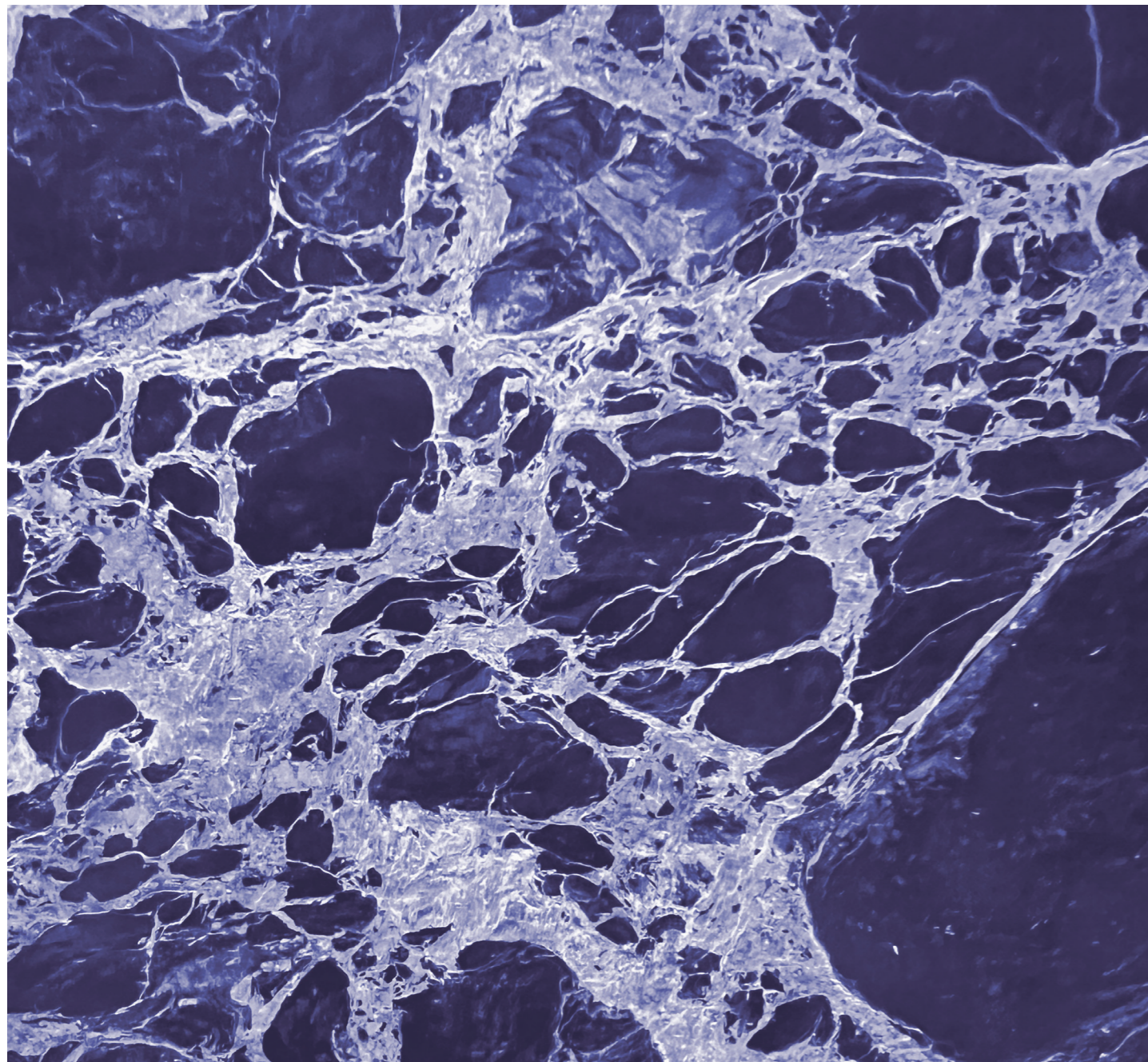


Fig.3 - Marble detail (wall) The Pantheon, Rome (2023).