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**Placing Matter: A Summary of a Convenient
Vocabulary, for the Experiencing of Metaplasticity,
Spatial Assemblages and Typological Boundary
Conditions**

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Placing Matter: A Summary of a Convenient Vocabulary, for the Experiencing of Metaplasticity, Spatial Assemblages and Typological Boundary Conditions

ABSTRACT

This paper addresses the topic of 'Placing matter' into spatial assemblage and provides a suitable vocabulary for theorists and designers. Taken from recent discourse in material engagement theory the paper takes the position of reframing 'Thinging' from being a mere material concern, to a notion as a 'Framing' of materials to reveal certain 'typological boundary effects' in matter. Such effects establish the assemblage process to meta-plasticity with 3 states of assembly being indicated: minimal, topical, and comprehensive, which can then be utilized to in-fluence the meta-plasticity from one event to another. We illustrate how this may avert spatial illusions in cognitive and abstract thought. We analyzed multi-year architectural design projects to establish a range of links between Material Engagement Theory (MET), Decision theory (DT), with cognitive Spatial Thinking Theory (ST) to show how, framing experience of materials; the 'placing of matter' affects spatial assemblage and how this contributes to Framing experiences and emotions and further develops theoretical approaches to materials and matter in architecture. This paper proposes, a new architect's toolkit of a convenient vocabulary for the experiencing of Metaplasticity, Spatial Assemblages and Typological Boundary Conditions in the pursuit of a new theory and emergent terroire of architecture.

Keywords: spatial assemblage: spatial cognition, meta-plasticity, spatial thinking, material agency, typological boundary condition

Introduction

This paper attempts to build a convenient vocabulary to place matter (Material Engagement Theory) alongside spatial and grid cells cognition (Spatial Thinking) and upon the assemblages of spatial experiences. It seeks to describe and understand how to link recent Material Engagement Theory (MET) with Spatial Thinking Theory (ST), through design projects to propose particular vocabulary, researchers could use to explore and test new materials in the built environment. What follows from this is an understanding of how designers, material scientists, and others could engage in material innovation practices to determine what Meta-methodologies inform our research praxis and understanding of spatial cognition.

By reviewing theoretical and conceptual frameworks and analytical methodologies from 3 main areas it provides a means to which we can arrive at a suitable method of research and analysis into new materials and typologies alongside their role in spatial assemblages: Enabling us to be able to place matter (Material Engagement Theory) alongside spatial and grid cells cognition (Spatial Thinking) together with; frames and choices of cognitive bias (Decision Theory) upon the assemblages of spatial experiences.

Our current methodology is introduced by situating Spatial Assemblage as a material matter through design praxis, thereafter section one introduces the notion of Spatial Thinking Theory as a structuralist project with the mind in motion shaped by action, while Section two discusses the psychophysics of decision theory as connected to spatial assemblage. Section three posits, MET theory as one part within the praxis of architectural design, alongside spatial assemblage, and spatial thinking. Section four describes the design praxis within architectural design its methodology and results over a 3 year period. We then introduce some conceptual distinctions in and between Spatial Thinking, Decision Theory, and MET theory applied to architectural design. It finishes with a discussion on how materials and their unique and novel processes might alter Architectural Design praxis and sets out a summary of a Convenient Vocabulary, for the experiencing of Metaplasticity, Spatial Assemblages and Typological Boundary Conditions, that allow an exploration of the full range of sociocultural and experiential factors concerning the nature of materials and our emotional response. And finally, how this position might contribute to the ability through design; of attuning the environment and world around us while finding the suitable vocabulary to describe it.

There is a need to find a suitable vocabulary to look at alternative material and spatial research outside of the built environment field to provide forth important terms and concepts that can be successfully deployed as a discursive vehicle.

Material and typological investigations have invariably focused on the comfort of users¹ or the operability of services² and interpretability of designed

¹Guy, Karvonen, and Lewis, "Conditioning Demand: Older People, Thermal Comfort and Low-Carbon Housing"; Neven, "Representations, of the Old and Aging, in the Design of the New and Emerging: Assessing the Design of Ambient Intelligence Technologies for Older People."

products³. Little has been investigated from the potential of physical materials and spatial assemblages to enable engagement and experience⁴. A lack of material agency⁵, and poor experience⁶ may be factored into the exploration of design studies in modelling and drawing by designers of architecture, with an emergent intersection between experience design, material agency⁷ and Material Engagement Theory (MET)⁸ being outlined here to provide more robust attention to the experiential and speculative spatial qualities of new materials, (their potential architectural applications⁹) and material agency to evoke positive experiences¹⁰. As part of the architectural design studio at Hong Kong, I lead a studio called ‘Framing Material Invariance’ which aims to explore creatively the intersection of experience, material agency and spatial & typological thinking in design and modelling.

What we refer to as placing matter in a new architectural terroir is illustrated in Figure 1. The next sections attempt such an outlining of this architectural terroir to assist in developing a suitable design praxis and convenient vocabulary. However, an exploration of the conceptual domain of Spatial Thinking Theory as a structuralist project follows first.

²Grandclement, Guy, and Karvonen, “Negotiating Comfort in Low Energy Housing: The Politics of Energy Policy.”

³Guy and Henshaw, “Embodied Thermal Environments: An Examination of Older-People’s Sensory Experiences in a Variety of Residential Types.”

⁴Peine et al., “Science, Technology and the ‘Grand Challenge’ of Ageing—Understanding the Socio-Material Constitution of Later Life.”

⁵Getto et al., “User Experience in a Networked Environment: How Latour Can Help Us Do Better UX Work”; Stephan and Fredreich, “Designing ‘matters of Concern.’”

⁶Heekyoung and Erik, “Form and Materiality in Interaction Design: A New Approach to HCI.”

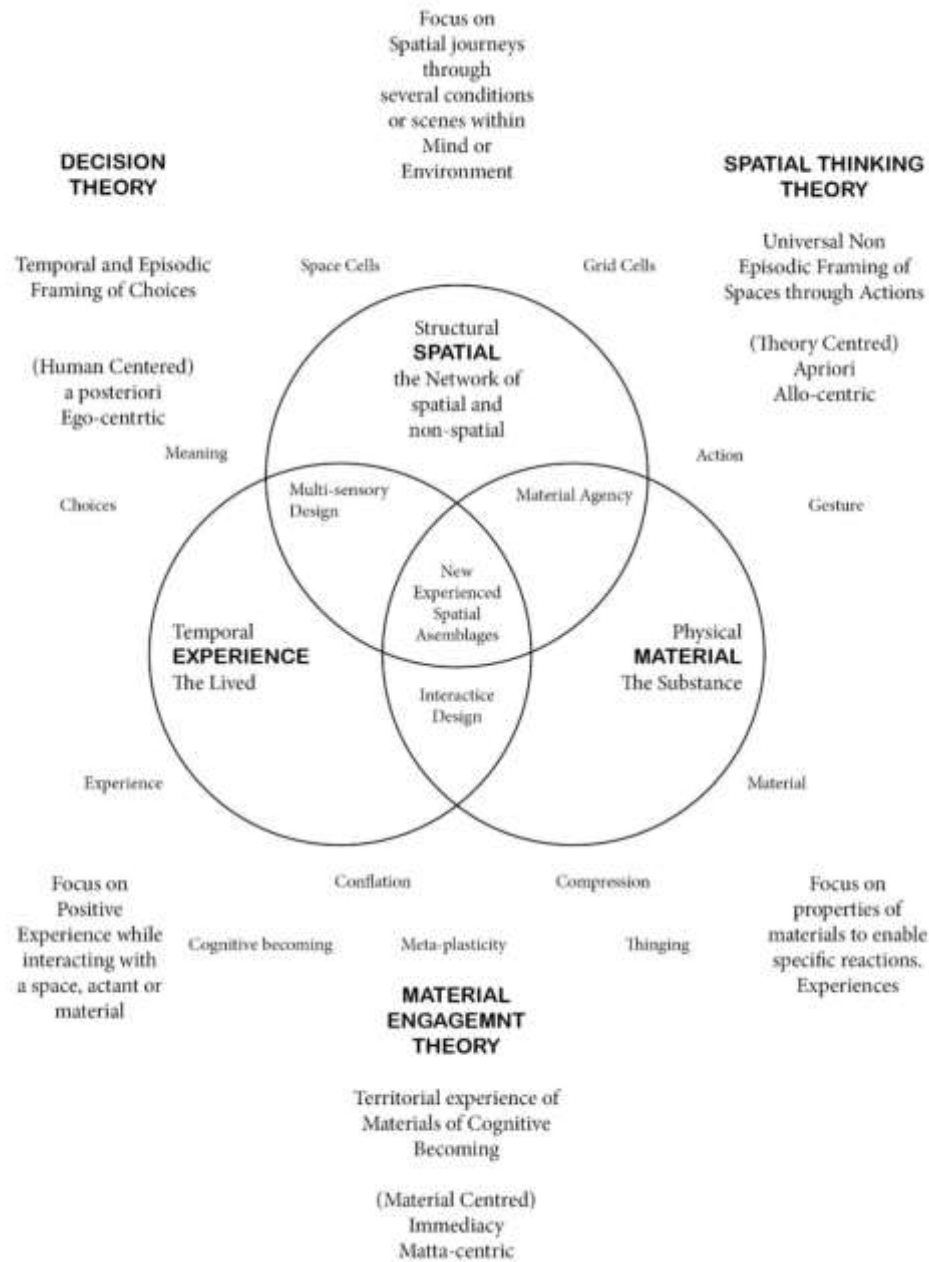
⁷Knappett, “Animacy, Agency, and Personhood”; Niinimäki and Kääriäinen., “Studying Experimental Touchpoints between Material Science, Synthetic Biology, Design and Art.”

⁸Malafouris, “Mind and Material Engagement.”

⁹Peine and Neven, “From Intervention to Co-Constitution: New Directions in Theorizing about Aging and Technology.”

¹⁰Burnard et al., “Building Material Naturalness: Perceptions from Finland, Norway, and Slovenia.”

Figure 1. Author, *Depiction of the Terroir in Placing Matter*, 2020. Mixed Media. UK. ©



Spatial Thinking Theory (ST)

How one thinks, alters our understanding of space and, how we use space alters the way we think¹¹

¹¹Tversky, Mind in Motion: How Action Shapes Thought. 1st.

Figure 2. Author, *Depiction of Spatial Thinking Theory as Applied to Architectural Design*, 2021. Mixed Media. UK. ©



Actions and gestures are key to understanding and thinking which relies not only on the composition but the contour and orientation and context of an experience. Actions are precursors to thought and space. Changing space and thought from a structuralist viewpoint creates a temporary composition of cognition which observes certain rules.

These rules of cognition set up Spatial thinking as mirrored in abstract thought as well as social and cognitive thought

Spatial thinking is core to our very existence... Spatial thinking: we are more experienced in this than abstract thinking one has been co-opted by the other, Spatial thinking can substitute for abstract thought¹².

‘Actions’¹³ for Spatial Thinking Theory are precursors to thought and space¹⁴ that create temporal assemblage in the mind. ‘Acting’ with Tools extends the conscious body image and scheme within this assemblage, while helping to sense - simultaneously- with seeing and feeling, while Mirror neurons in the brain show that actions and perspectives are joined in action mirroring and motor reasoning of such experiences.

¹²Tversky, *Mind in Motion: How Action Shapes Thought*. 1st.

¹³This includes gesture, action and motion within the body as experienced by the mind

¹⁴Tversky, *Mind in Motion: How Action Shapes Thought*. 1st.

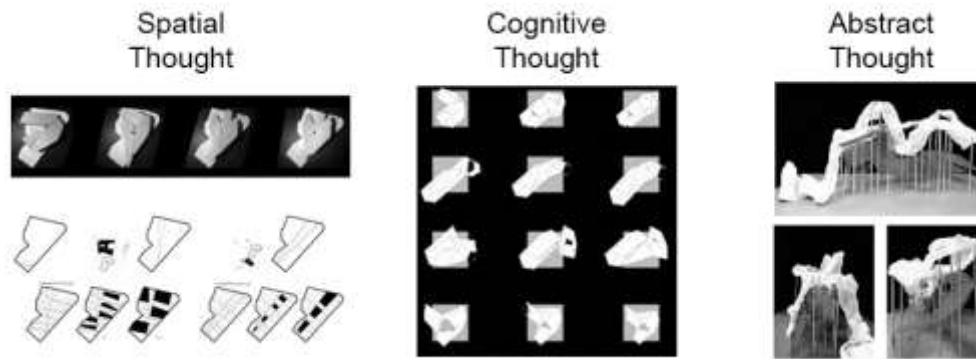
For designers, the driver of modelling materials as spatial assemblages is not in the ‘making’ in abstraction, but in the relationship between matter (a model), and spatial assemblages (the perceived experience) that emerged from the act. An action which is framed in differing spatial experiences, in differing matter.

Actions Gestures and Motions, set within ‘Frames’ and ‘events’ in this context provides us with useful examples of choices and decisions in the sequential and transitional experience of actions within an architectural context. Such motion and action set in sequence, to provide temporal relationships between the matter of that context, and the spatial domain of the experience, has been an underdeveloped aspect of the work by spatial thinking theory.

Change Blindness and Spatial Illusions in Cognitive Thought

This acting in perception, through constructions of people, places and things can be imperfect and therefore are perhaps naturally biased¹⁵.

Figure 3. Author, *Examples of Spatial Thought Leading to Abstract Thought, 2021.* Mixed Media. UK. ©



To deal with inherent biases, categories and taxonomies in the brain and mind, are said to sort through 3 distinct levels, one as a basic level (Cognitive), with a superordinate level above (Abstract) and a subordinate level below (Spatial), one more generalized the other more specific (Figure 3). Clues to how these categories function together are through action and gesture¹⁶, bridges action with perception to facilitate meaning acquisition. The actual place of these set within scenes or ‘frames’ are of particular importance architectural speculative design. The setting of an action and gesture within context, helps to differentiate and establish when a change occurs. Thereby enhancing the experience and quality of a space. The ability to embody experience through perception of one’s own place (one’s body image) within that experience directly correlates to one’s ability to perceive illusory experiences.

The spatial place of these actions and gestures are important for recognition. These settings are potentially a meta-methodology of ‘Framing’ to help us

¹⁵Tversky.

¹⁶-what they do, what we do, with them-

investigate the potential of sequencing and framing experiences and matter, upon perception and cognition. Referred to as ‘Change Blindness’, transition between scenes of gestures, or frames display differing degrees of variance and invariance of perceptions¹⁷. ‘Acting’ with tools (and modelling materials), may extend the conscious body image and schema through sensing, to avert such illusions of change blindness in spatial thinking and cognition. Therefore, the acting in perception, by designers specifically averts spatial illusions in cognitive thought.

However, Change blindness¹⁸ can occur as a cognitive bias in places and events. Discrepancies may occur between perception, experience, action, space (and objects), and meaning. The place of this cognition, within the mind is the Hippocampus: the location of the place cell¹⁹ neurons, and the Entorhinal cortex: the location of the grid cells²⁰ (Figure 2). These are the central locations and commanding roles within the mind for creating the structure of local cognitive maps (or rather cognitive collages) from an allo-centric perspective, that illicit meaning from memory within the spatial framework.

Place and grid cells for spatial thinking create the condition as an ecology of the mind for neural networks which interact together to allow perception of the outside world. For spatial thinking this can be enacted and extended into the real world through the interplay of sensations and meaning with spatial representation²¹. It is a structuralist view that facilitates navigation; provides visual cues; controls over motion and evidences an A-priori systemic model of constructing places²². It is this papers contention that these space and grid cells may at once be the framework to build upon material engagement, and decision theory while at the same time be contingent on more than merely vision dependent inputs.

Spatial frameworks are posited as necessary for memory formation and meaning²³. This foundation stone of spatial frameworks in the framing of choices and the nature of embodied and enacted thought in materials may be extended to the conceptual level of thought in abstract imagination.

The same neural formations that serve spatial thought; serves abstract thought. The same brain mechanism in humans that represents actual places in real spaces also represents ideas in conceptual spaces, spatial thinking enables abstract thinking²⁴

Spatial thought has a systemic biased process in its mechanisms and judgments²⁵. Spatial judgements bias is mirrored in cognitive and conceptual

¹⁷with visual perception on its own showing the largest degree of illusion in spatial thinking

¹⁸Tversky 2019

¹⁹(O'Keefe and Nadel 1978)

²⁰(Moser, Kropff and Moser 2008)

²¹(Tversky 2019)

²²(Tianyi Li 2020,) More commonly they have -for spatial thinking- been associated with a vision dependent world: “a model of continuous dynamic loop like interactions between grid cells and place cells in which the main functional parameter is the feedback strength in the loop”: the visual domain

²³(Manns and Eichenbaum 2009) Here the theoretical framework, is a precursor to the Material engagement of things, in MET, and framing within decision theory

²⁴(Tversky 2019).

²⁵(Tversky 2019).

judgment²⁶. Such thought and judgement are mapped cognitively to ‘places’ and ‘grids’.

Cognitive Maps and Terroires

The place of this cognition, however for Spatial Thinking Theory is within the mind, in the Hippocampus: the location of the place cell²⁷ neurons, and the Entorhinal cortex: the location of the grid cells²⁸. Such cognitive maps we may fruitfully call a type of Cognitive Terroir: a cognitive ecology of the mind. More commonly they have been—for Spatial Thinking discourse—initially associated with a vision dependent world:

A model of continuous dynamic loop like interactions between grid cells and place cells in which the main functional parameter is the feedback strength in the loop²⁹.

Tversky asserts that spatial thought has a systemic biased process, in its mechanisms and judgments and that spatial judgement bias is mirrored in cognitive and conceptual judgment. Spatial thought displays an inherent preference to organize partonomies rather than merely the organization of spatial taxonomy to avert such bias³⁰.

Partonomies: Assembling Frames

Spatial thinking theory highlights an important distinction in types of categories and groups. Hierarchies in ‘kinds’ of things, inferred with properties of similar or dissimilar cases from an evidential basis; It refers to as taxonomies³¹. Hierarchies of parts, inferences of containment alignment and correspondence to an order or systems from an abstract conceptual point; it refers to as Partonomies. To be able to move from a taxonomy of materials that correlate with emotive states of well-being to a partonomy of materials; an appreciation of the more abstract ordering and grouping of materials by the mind is necessary to be laid out. Spatial thinking has laid out this case for action and gesture, but matter and materials has yet to be established.

²⁶here we see the overlap with the decision theory and the significance of framing

²⁷O’Keefe and Nadel, *The Hippocampus as a Cognitive Map*.

²⁸Moser, Kropff, and Moser, “Place Cells, Grid Cells, and the Brain’s Spatial Representation System.”

²⁹Li, Arleo, and Sheynikhovich, “Modeling Place Cells and Grid Cells in Multi-Compartment Environments: Entorhinal–Hippocampal Loop as a Multisensory Integration Circuit.”

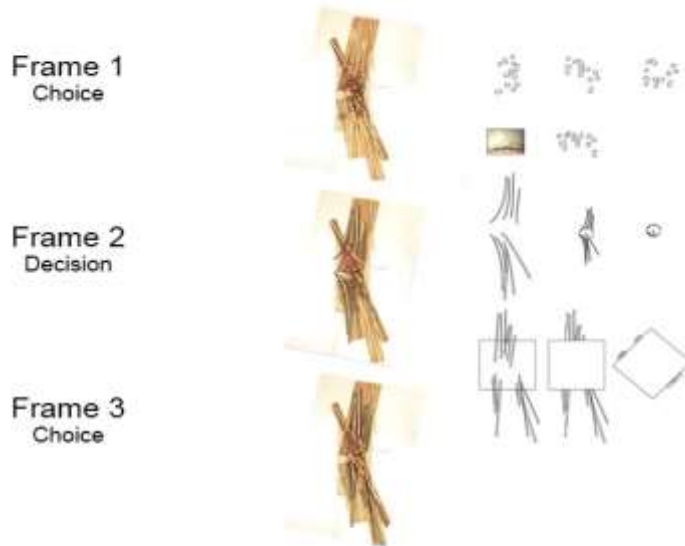
³⁰How the designers experienced space was a material matter. It was a vehicle for conceptual thought. How they cataloged and structured their work was also an important meta-methodology that went beyond the merely labelling of taxonomy.

³¹Tversky, *Mind in Motion: How Action Shapes Thought*. 1st. They may be part of meta-methodologies that form cognitive ecologies as a process with spatial terroires as territorial experiences, and assemblages as momentary ‘Framings’ (or Thingings) that by their nature exploit meta-plasticity For a more in depth explanation of the categorization process there to Tversky’s explanation of exact and approximate systems.

Decision Theory: Choices and the Temporal Decision

*Researchers and Agents tacitly assumed that decision and experience coincide*³²

Figure 4. Author, *Depiction of Decision Theory as Applied to Architectural Design, 2021. Mixed Media. UK. ©*



Kahneman³³ presents a framing of values and choices in psychophysical accounts and events that form non intuitive responses from agents in their endeavor to limit loss or risk³⁴, through aversion tactics. Some of these characteristics set forth in his seminal work, *Choices Values, and Frames*³⁵, will be shown to have important considerations for the researcher that enquires to the nature and qualities of spatial assemblages and their material concerns.

Cognitive and psychophysical determinants are evident in Decision Theory, categorizing these as either risk or riskless ventures by an agent. In the domain of design, architectural and spatial discourse we can transplant risk for ‘quality’ or ‘favorability’: the degree of ‘favorability’ of an experience, and that ‘change’ in experience leads to an overweighting of ‘sure-things’ or rather in our domain predicted favorable experiences against the moderately favorable experience of a given event. With ‘choices values and frames’ there exists then a relation between decision values and experience. How one values an experience and how one then decides within a series of experiences. This has been shown in Kahneman’s work to lead to extremes of polar views, and value attribution that influence agents and

³²Kahneman and Tversky, “Choices, Values, and Frames.”

³³Kahneman and Tversky.

³⁴Risk here can be viewed as an aversion harm or merely a less favourable choice, in architectural and spatial discussions this can be seen as a risk to less favourable or qualitative experiences.

³⁵Kahneman and Tversky, “Choices, Values, and Frames.”

frames certain aversion tactics. And in ‘non-idealized agents’ the assumption that decision and experience coincide, breaks down. The evidence shows, there are structural biases to decisions based on the framing of temporal episodic events or subjects.

There exists a tension and a choice, between risk and riskless choice: between favorable and unfavorable experiences. Risk/Favorability is amplified by the uncertainty of acceding to events (making choices) and consequences can lead to increasingly pleasurable/probable outcomes if framed correctly.

Framing

Decision theory, views experiences and decisions as ceaseless and ever-changing unconscious ripostes. Kahneman proposes ‘choice’, and ‘risk’³⁶ can be framed or described in different ways even though they are typologically the same. This notion of framing is interesting for the Material researcher as it may point to certain methodological approaches in exploring matter with Framing as a possible guide to the manner and sequencing of Assembling Matter. We may understand framing in this context as the specific and episodic sequences of material presented to warrant different experiences (Figure 4).

Research on Decision Theory, and the axioms presented by Kahneman³⁷ posit 4 axioms of decisions: Transitivity, Substitution, together with Dominance and Invariance. Invariance interests us here: Kahneman’s work holds that invariances is often ‘violated’ by agents in their decisions. If problems are different but analogous to each other they should elicit the same answer. Similarly experiences framed in a different manner should result in the same feeling, this is a common design response to cognitively declining patients’ environment (i.e., if it evokes a simulacra of previous experiences patients might have higher emotional state responses to activities within this context) however the evidential basis for this assumption in design, is limited.

‘This ‘invariance’ however demanding and unconscious it may seem cannot generally be satisfied’³⁸. Kahneman illustrates the bias caused in decisions and experience by careful framing in the violations of the invariance axiom³⁹.

³⁶which depends on the possible and on the probable,

³⁷Fishburn and Kockenberger, “Two-Piece von Neuman-Morens utility Functions.”

³⁸Kahneman and Tversky, “Choices, Values, and Frames”; Kahneman, “A Perspective on Judgement and Choice: Mapping Bounded Rationality.”

³⁹Here we see a key method and approach to examining this by the inversion of a test and its questions in two blind experiments which leads to different outcomes. If ‘framing-effects resemble perceptual illusions more than computation errors’ is it possible to say ‘framing’ (assemblage) effects resemble perceptual experience more than the accumulation of memory failings? It’s not yet clear.

Typological Boundary Effects

Psychophysics and decision theory evidence certain triggers and mechanisms that rely on what they call ‘Category boundary effects’; or ‘Typological boundary effects’ where changes in context and type effect the framing and ultimately the decision of agents⁴⁰. One such example is the difference from impossible to possible. ‘A change from impossibility to possibility or from possibility to certainty has a bigger impact than a comparable change in the middle of the scale’. It is a relativistic standpoint⁴¹. This is referred to as ‘Category boundary effects’ a boundary between two or more relativistic positions or conceptual frameworks.⁴² The notion of a ‘typological boundary effect is a category boundary effect applied to a physical space, experience or typological object and is of keen interest to material studies. For when one materials boundary or typological presentation is changed what is anticipated in the mind that experiences and feelings maybe, over-weighted to actual experiences and connected to the probability or anticipated difference rather than the real difference.

The Assemblage Process

Figure 5. Author, *Depiction of States of Assembly as Applied to Architectural Design, 2021. Mixed Media. UK. ©*



Within decision theory, there is a conception of decisions and choices becoming a form of assemblage, with a discrete and particular process of formation as an assemblage. Such an assemblage process creates the “pseudo certainty” effects⁴³. For example, an event or experience that is actually uncertain but is treated as if it is certain. Such effects are referred to as ‘Formation effects’ and are

⁴⁰Kahneman, “Evaluation by Moments: Past and Future.” Here Invariance breaks down (violates) on two grounds one on Framing; the second in Nonlinear weighting and illustrates the relativism of decision theory. Relativism in value is nonlinear (for example a change from 0-5% of a value of a thing, triggers an effect greater than 30-35% but less than the 95-100%)

⁴¹“The instability of preference produces a preference for stability “ (Kahneman and Tversky, Choices, values, and frames. 1984) p348 It follows then that high instability begets high preference of stability and Kahneman suggests this relativistic position is not a relationship between ‘total state’ (total Experiences) and a new total state (states of Wealth/Ultimate wealth for example) but rather transactions as gains and losses. I.e., temporal, and episodic experiences in a set scene within a chronological timeline.

⁴²Kahneman, “Evaluation by Moments: Past and Future.” pg. 344

⁴³Kahneman and Tversky, “Choices, Values, and Frames.” pg. 345

an important part of the assemblage process that transposes across conceptual, abstract, cognitive and spatial thought⁴⁴.

A spatial assemblage may then exist in the perceived (real) and Actual (objective) and the virtual (Subjective) experience of an agent. States of assembly in this context may refer to 3 types of framing in assemblage (Figure 5):

Minimal-Just the difference between 2 items: a simple comparative analysis

Topical-Relates to consequences to the reference state in context

Comprehensive-Relates to total event between 2 items and other experiences

All three are forms of temporal episodic ‘framings’ to make sense of the decision or environment in front of us. The degree of effort -whether minimal, topical, or comprehensive- is conditioned on the context and perceived value held in that moment. It is transient.

It therefore follows that it is not the overall relativism based on the total experiences of a person -their entire history and memory-, but the episodic and temporal positive and negative⁴⁵ subjective experience of space in relation to the preceding event space. This is a framing of space that therefore lets into the methodological conversation the possibility to arrive at subtle methods to test and evaluate emotional states and experiences without the necessity of understanding and cataloguing -through a taxonomy- an agents cumulative experience and possesses the potential of evaluating common traits and general principles from a sampled data, that may be reliable and trustworthy. This is particularly relevant if the subject is transposed onto a specific demographic such as dementia or cognitive declining agents. As it may highlight or deal with the present and the now; be conscious of the barriers to experience through cognitive impairments and propose potential specificity in space, matter, action, and experience.

A Hedonic Spatial Assemblage

This evidence leads us to the conclusion that it is certainly possible to establish the degree to which spatial assemblage and its material composition and its perceived experience are all factors into this experience value and that this may affect decisions that are either, motor-influenced (mobility navigation) or that of cognitive enquiry⁴⁶ (problem solving) or that of the psychophysical state⁴⁷ (wellness, depression, and outlook).

Hedonic psychophysics -the degree of emotive response to such events- is a topical and relativistic phenomenon to the preceding events and an enquiry into the

⁴⁴It is a process of positioning the base line knowable expected position to which changes are perceived that creates the relativistic reference point for perceiving space and objects as well as decisions and choices.

⁴⁵loss and gain are the equivalent terms in Decision theory

⁴⁶Kahneman, “A Perspective on Judgement and Choice: Mapping Bounded Rationality.”

⁴⁷Kahneman and Deaton, “High Income Improves Evaluation of Life But Not Emotional Well-Being.”

levels of ‘aspiration that separate positive from negative outcomes’⁴⁸ would certainly be a welcome enquiry.⁴⁹

Material Engagement Theory

*There is only a territorial experience of material as Thinging or rather a presence embodied and extended in acts of assemblage*⁵⁰

Figure 6. Author, *Depiction of Material Engagement Theory as applied to architectural design*, 2021. Mixed Media. UK. ©



Material Engagement Theory (MET)⁵¹ allows us to view materials as a compression of the conflation (Figures 2 & 4)⁵². Conflation occurs where the brain, and the body interact with a wider cultural⁵³ context. The compression of this conflation for MET theory is experiencing all aspects related to the subject, object, and context of a phenomenon. Its’ matter⁵⁴.

The experience of matter in materials is then the process towards a conflation of the compression where encounters, such as the action of experiencing, the matter of material and the measure of intent behind spatial assemblage are

⁴⁸Kahneman and Tversky, “Choices, Values, and Frames.” pg.349

⁴⁹Such an enquiry would seek out such things as Hedonic adaptation, dynamic change of category effect.

⁵⁰Overmann and A., “Thinking Materially: Cognition as Extended and Enacted.”

⁵¹Iliopoulos, “Material Engagement Theory and Its Philosophical Ties to Pragmatism”; Malafouris, “At the Potter’s Wheel : An Argument for Material Agency”; Renfrew, “Towards a Theory of Material Engagement.”

⁵²Malafouris, “Mind and Material Engagement.”

⁵³Goh and D, “Culture Sculpts the Perceptual Brain.”

⁵⁴A compression of the ground to which we experience; ontologically, epistemologically, and methodologically upon 3 levels of ‘action’, ‘material’, and ‘meaning’ And recently for a fourth level to be considered, that of experience. Kay-Jones, “The Rupture as a Drawing-in of Experience.” Huiskamp, *A Matter of Mind and Matter: Applying Theories on Material Agency and Mind-Set to the Objects of the Vlaardingen Culture in the Western.*

conflated as a unified experience at an unseen fourth level. This in MET theory, is what Malafouris refers to as the ‘Thinging’⁵⁵ (Figure 6) as applied to material and spatial qualities⁵⁶.

Territorial Experience of Material as ‘Thinging’

For MET theory there is only a territorial experience of material as Thinging or rather a presence embodied and extended in acts of assemblage⁵⁷. Territorial experience for MET is placed on the material surface as interface between the external and internal dialogue of subjectivity and objectivity. What we think about the object as the object is molded or affected by our actions. Such a theory acknowledges also the mental or absence of parts yet unrealized of a spatial experience not just a material experience. The role of spatial assemblage seen in this light, is to enable conflation and compression and to offer a vehicle to apprehend the act of this conflation and compression in action, in Thinging most obviously through the medium of matter but for our discourse also the context and landscape, its territorial experience of the material object.

MET theory positions the ‘Thinging’ as distinct from ‘Thinking’ about experiences. Rather than thinking about things in their absence, it posits things, as experiencing with and through things⁵⁸. MET has so far concentrated its focus on the objects of culture and their material engagement only⁵⁹. Spatial qualities therefore theoretically allow the experiencer to explore the presence and absence of a spatial assemblage in unison *through matter*⁶⁰.

Meta-Plasticity and the Experience of Spatial Assemblages from Materials

Material engagement applied to material and spatial qualities then allows for a form of plasticity in subject and context at varying scales and temporal rhythms to coexist⁶¹. MET refers to this approach as a human cognitive becoming (Figure 7)⁶². Matter becomes the medium of experience⁶³ that evidences the plastic mind drawn into a plastic culture. An experiencing of meta-plasticity⁶⁴. Such a Meta-plasticity

⁵⁵Malafouris and Renfrew, “The Cognitive Life of Things: Archaeology, Material Engagement and the Extended Mind.”

⁵⁶Accepting the compression of the conflation of matter is to accept the compression in experience, to conflate where the brain, body and culture are existent and acknowledge where they are experienced together connected to matter . Clark, “Where Brain, Body and World Collide.”

⁵⁷Overmann and A., “Thinking Materially: Cognition as Extended and Enacted.”

⁵⁸Malafouris, Gosden, and Karenleigh, “Creativity, Cognition, and Material Culture: An Introduction.”

⁵⁹However, There is a gap in recent MET research literature from this perspective of the impact of spatial qualities as a collection of materials (assemblages) upon the Thinging as defined here

⁶⁰Malafouris, “At the Potter’s Wheel : An Argument for Material Agency.”

⁶¹Kahneman, “Evaluation by Moments: Past and Future.”

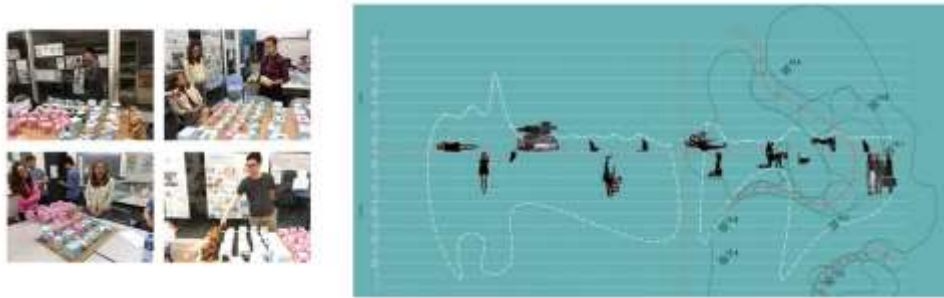
⁶²Malafouris, “Metaplasticity and the Human Becoming: Principles of Neuroarchaeology.”

⁶³Pallasmaa, *The Eyes of the Skin. 1st.*

⁶⁴Malafouris, “Metaplasticity and the Human Becoming: Principles of Neuroarchaeology.”

can easily be apprehended into spatial configurations if we extend the theory to a territorial experience of the material surface that abounds spatial frameworks.

Figure 7. Author, *Examples of Human Cognitive Becoming and Illustration of Temporal and Episodic Approaches as Applied to Architectural Design, 2021. Mixed Media. UK. ©*



Experiencing this meta-plasticity, across a territorial experience of the material surface to spaces, could be helpfully labelled a cognitive life of spatial experiences. Those collections of material surfaces – their assemblages- may provide for a realization of the sentience of the act of experiencing itself. A strength to the MET theory, is that it connects the subject with, and to, external materiality together with the culture of experience as it is enacted⁶⁵. And unlike decision theory, it breaks the temporal and episodic approach to engaging with an event, that preceded the experience of the materialization of the space.

Reframing architecture in this way opens up the full potential of analysis through MET theory to investigate a reflective approach to designing, situated within the subject of a chosen context in the construction of a spatial assemblage as a point of architecture⁶⁶.

Cognitive, and Urban Ecologies as a Terroir

The tension between a presence and absence of a material surface in relation to architecture becomes the ‘Frames’ for ‘cognitive ecology’⁶⁷ and the material surface of whole spatial assemblages evidences a formation of that Terroir as an Urban Ecology⁶⁸. This more practical and physical grounding of the impact of the material surface as an experience has not fully been investigated from this perspective.

‘Thinging’ in architecture offers then the possibility of a useful methodological approach within the emergent theory of Material Engagement as they become realized in different contexts and situated actions and as a method offers the potential for significant and insightful opportunities in understanding the role of

⁶⁵Tewes, “Embodied Habitual Memory Formation: Enacted or Extended.”

⁶⁶Kay-Jones, “The Rupture as a Drawing-in of Experience.”

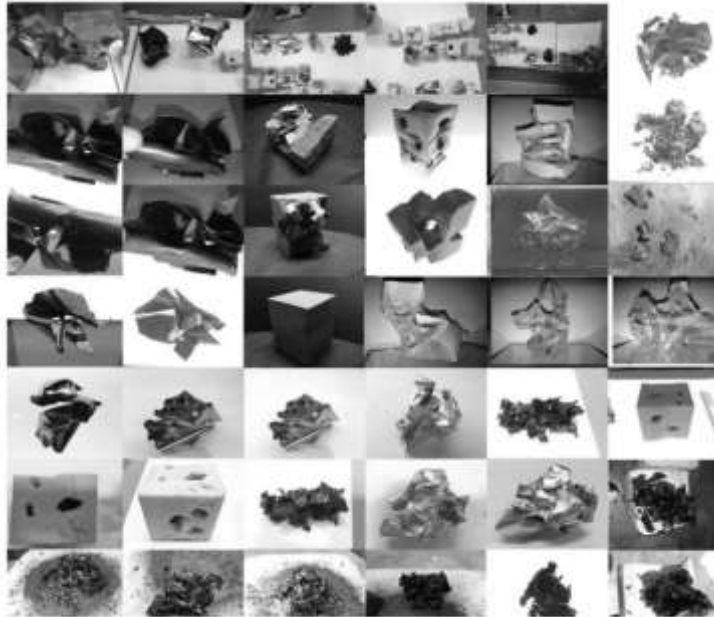
⁶⁷Hutchins, “Cognitive Ecology.”

⁶⁸Rossi, *The Architecture of the City*. And while the notion of an Urban Ecology has a longer architectural history based on more conceptual theoretical foundations

materials, spatial assemblages, and experience in architecture to further MET theory's main aim of establishing humans as Thingers.

Spatial Assemblage: Design Praxis, Methodology and Results

Figure 8. Author, *Compilation of Material Compression and Conflation in Matter*, 2018. Mixed Media. UK. ©



Within the studio and over the course of a 3 year period, designers engaged with the studio aims as a design praxis, based on the conceptual terms and ideas of spatial thinking theory (ST), Decision Theory (DT) and Material engagement Theory (MET). Titled 'Framing Material Invariance' the following work illustrates those theories put into action, a collection of projects at the intersection of experience, material agency and spatial & typological thinking in design and modelling. For such projects, there was an explicit praxis in design. Designers approached local places as a free play and *dérivé* typically within a contemporary city, recording their perceptions, observations, and journeys as a compilation of material compression (Figure 8).

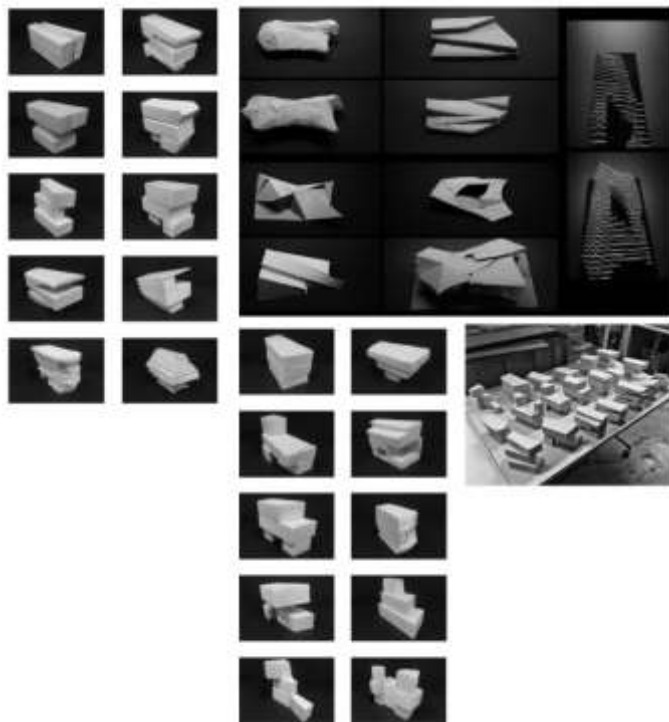
Figure 9. Author, *Comparative Analysis of Ruptures in Material and Matter*, 2018. Acetate Print. 1680 x 8190mm. UK. ©





By constructing a compositional abstraction and placing these into one continuous drawn and modelled ‘framing’ exercise, designers explored ruptures⁶⁹ in material and meaning (Figure 9).

Figure 10. *Author, Analysis of Material. Thinging, 2018. Mixed Media. UK. ©*



Omitting scale; transposing materials; dissecting and manipulating form, the designers brought forth new ambiguous forms as a formal process of ‘thinging’. Distinct and separate from the original source but analogous to it designers were able to enact and extend meaning onto the forms while experiencing temporal episodic perspectives for further enactment (Figure 10).

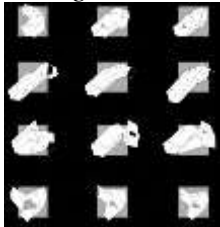
⁶⁹Kay-Jones, “The Rupture as a Drawing-in of Experience.”

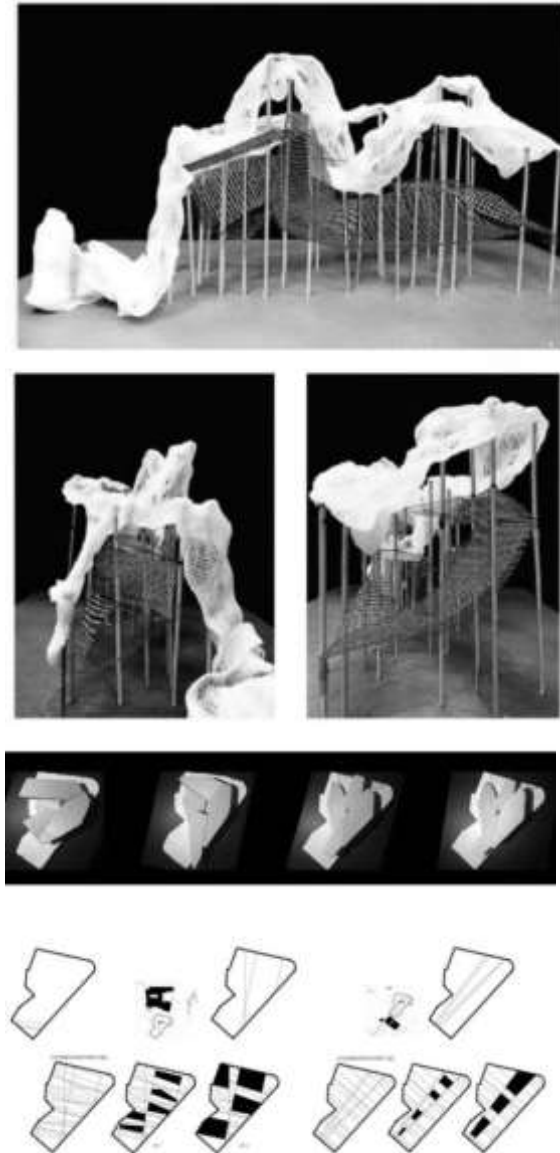
Figure 11. *Author, Analysis of Materials Choices and Frames, 2018. Mixed Media. UK ©*



By framing material modelling in this context and calling it '*thinging*', designers were able to reveal or provoke certain forms, experience them, and then reflect on the next choice, in frame for further exploration. Such architectural investigation went on to discuss the theoretical frameworks and suite of meta-methodologies extrapolated from ST, DT and MET theories (Figure 11).

Figure 12. *Author, Analysis of Materials Grids Spatial Frames as Cognitive Collages, 2018. Mixed Media. UK. ©*



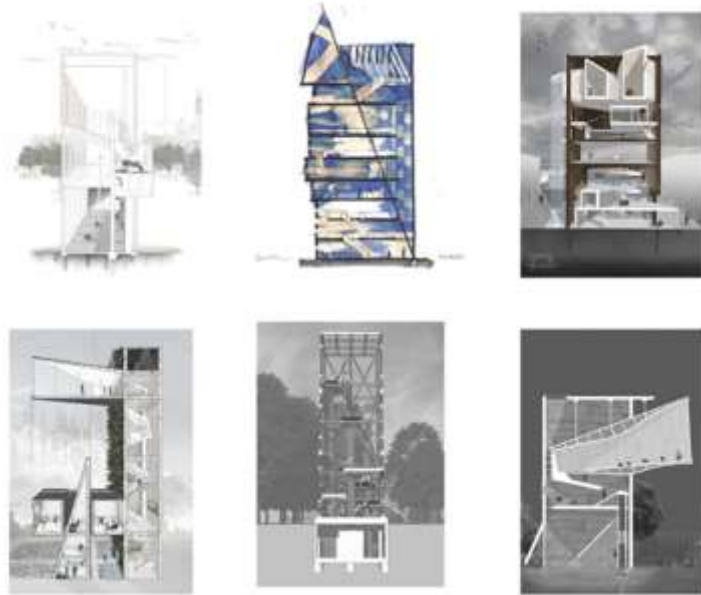


Such modelling in experience revealed certain unwritten principles to spatial assemblage, These principles of cognition set up and evidenced Spatial thinking theory's claim that spatial thinking is as mirror to abstract thought as well as social and cognitive thought (Figure 12)⁷⁰. The mirror in essence was a framing and the designers found this 'Framing' as an important vehicle for thinking about space and material to enable further abstract thought. They were acting in perception or 'Thinging' to facilitate abstract thought about design, materials, and space. This observation, of the role of motion in perception, can be extended to the role of experience from matter and spatial constraints on perceptions also. What seems most intriguing is the potential impact of sequencing and framing of experiences

⁷⁰Spatial thinking is core to our very existence. [In] Spatial thinking: we are more experienced in this than abstract thinking, one has been co-opted by the other, Spatial thinking can substitute for abstract thought' Tversky, *Mind in Motion: How Action Shapes Thought. 1st.*

upon perception with the transition between sequences being the transition between typological boundary conditions (Figure 13).

Figure 13. Author, *Examples of Cognitive Collages Evidencing Typological Boundary Conditions*, 2018. Mixed Media. UK. ©



Placing Matter: Discussion and Conclusion

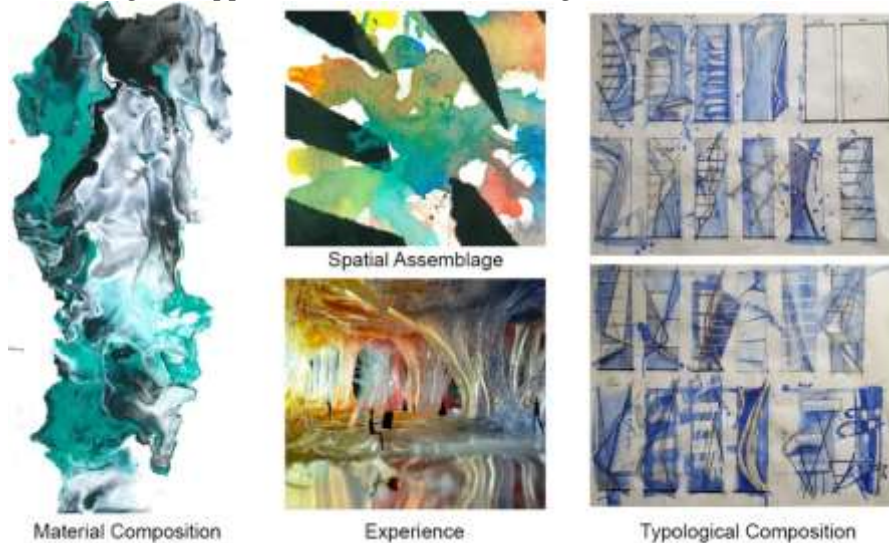
Through the process of assembling spatial qualities of new materials, the designers work positions the experience of spatial assemblage at the heart of a reframing of the interactions of things and experiences of material agency and material imagination through the act of experiencing materials; an ‘Ecology of mind’ as ST theory refers to it or rather the Terroire of experience put forward here. A cognitive Ecology, set in this context can be argued to be the urban ecology of the environment (MET), plus the ecology of the mind (ST) and the Ecology of Reason (DT), what we propose here as the architects Terroire, where spatial assemblages exist and are set, within this collective Terroir. designers produced collectively a Terroire of spatial assemblage for the design studio.

MET theory shows us materials exert influence on our cognitive being, and becoming, Decision Theory, shows us that choices, are influences from episodic, and temporal situations through the act of framing, and Spatial thinking shows us that they are built upon spatial and grid cells constructs within the mind that are non-episodic allo-centric structures within the mind.

Matter as an embodiment and enactment of thought in objects over time and generation, is evidenced in culture (the Physical). An agent’s choice fits into a sequential and transitional role of framing experiences to elicit cognitive biases. (The Temporal). And the mind in action is the prevalent framework to which matter may be placed in the event (the structural) (Figure 1).

Contested Links

Figure 14. Author, *Illustration of Material, Typological and Experiential Assemblage as Applied to Architectural Design 2021. Mixed Media. UK. ©*



The degree to which matter influences mind rather than actions and gestures is a contested link (Figure 14). All 3 key threads disagreed upon time frames; MET sees the change of development as cultural time generationally. Decision theory addresses this timeframe over the period of an event and the preceding one⁷¹. And spatial thinking disavows broad memory and meaning across an agent's lifetime. Spatial thinking sees the structuralist view as immutable and universal in nature.

MET theory also disagrees with the Decision theory on the role of memory and embodiment, and enactment. Decision Theory disagrees with Spatial Thinking, in the role of the structure and frames perspective, while Spatial Thinking disagrees with MET theory to the degree to which material influences mind rather than actions and gestures. These contested areas are not easily resolved.

MET theory's approach to mind and Thingness can be argued by extension that there are no universal things as spatial qualities conceptually, but more pertinently numerous variants of experiences enacted by specific subjects or Actants in specific situations. The process of assembling is not then limited to the body that follows the mind but rather the process of experiencing in, of experience to the specific situation of investigation⁷². A plasticity in MET terminology that illustrates a mind becoming through experiencing materials to which spatial thinking may find difficult to reconcile. And the act of framing models by designers as a series of spatial assemblies through matter, illuminated certain conditions that were more aligned to the notions of paronomies than taxonomies in meta-plasticity.

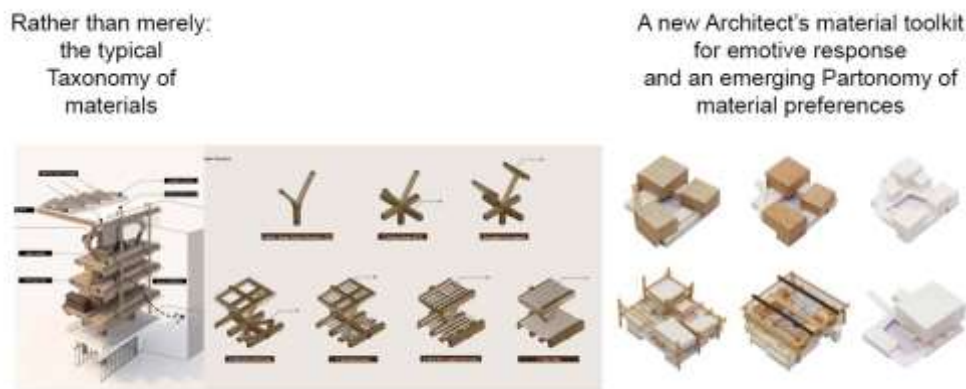
⁷¹Note how many preceding events has not yet been validated.

⁷²Malafouris, "Metaplasticity and the Human Becoming: Principles of Neuroarchaeology."

Typology and Matter in Architecture

Spatial Thinking allows us to see how framing and frames may be constructed upon certain universal places and assemblages of perception from action and gesture. Being that the space and assemblages of experience are posited as universal, while people, places, and objects that we interact with are a combination of extended and enacted territorial experience, each of these facets display a form of meta-plasticity and mutability in the presence and absence within the experience we are aware of this when we cross the threshold of a typological boundary condition. How we organize and utilize formation effects to make sense of these experiences relies more on partonomies than taxonomies. This is a framing of what we've known, what we think we will experience and what we sense.

Figure 15. Author, *Illustration of Partonomies as Applied to Architectural Design* 2021. Mixed Media. UK. ©



This is a framing of space that lets into the methodological conversation the possibility to arrive at subtle META-methodologies to test and evaluate emotional states and experiences through partonomies then, without the necessity of understanding and cataloguing through taxonomy a person's cumulative experience (Figure 15). And therefore, possesses the potential of evaluating common traits and generalized principles from a sampled data, that may be reliable and trustworthy. We may be able to establish typological boundary conditions for space and matter related to specific emotive responses empirically. An empirical phenomenology. This is particularly relevant if the subject is transposed onto a specific demographic such as persons with cognitive decline for example and may allow for an introduction rather than a withdrawal from the potential of physical materials and spatial assemblage to enable enhanced engagement and experience.

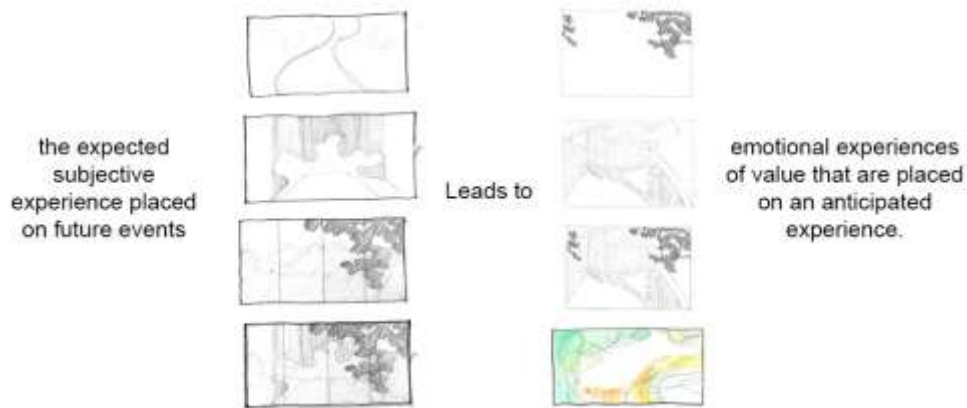
MET theory's approach to mind and 'Thinging' can be transposed into Spatial Thinking Theory as a strong corollary to 'Framing', How one chooses, to navigate through this territorial experience becomes an important determining factor and the object of that choice becomes the Typological boundary conditions of the material surface. Spatial assembling is therefore:

the formation, -through thinging or framing- of specific and episodic assemblages in matter that display certain variance of experience from one assemblage to another, they are structured as paronomies rather than taxonomies of experience, matter, and space.

Material and Human Experience

Based on this illustrated work it is certainly possible to establish the degree to which spatial assemblage, its material composition and its perceived experience are all factors into the experience value, and that this may affect decisions that are either, motor-influenced (mobility navigation) or that of cognitive enquiry (problem solving) or that of the psychophysical state (wellness, depression, and outlook) to form a wider scope of space and matter directly affecting experience that can be evidentially proven.

Figure 16. Author, *Illustration of Experiences to Speculative Design*, 2021. Mixed Media. UK. ©



In architecture this could be written not as, the utility of the experience, but the expected subjective experience placed on future events; emotional experiences of value that are placed on the expected experience (Figure 16). Such expected subjective experiences once tested and verified could fruitfully be utilized as speculative architectural design tools to devise important analogous typologies in material form. To conclude, a summary of a convenient vocabulary for the experiencing of Metaplasticity, Spatial Assemblages and Typological Boundary Conditions is listed.

A Summary of a Convenient Vocabulary for the Experiencing of Metaplasticity, Spatial Assemblages and Typological Boundary Conditions

*ST: Domain of Spatial Thinking Theory
'Acting' (through Gesturing)*

Actions, Gestures and Motion by an agent are precursors to spatial thought, cognition, and abstract thinking. One thinks through the movements and gestures of the body. One thinks by acting.

Axioms: 'Cells: Grids and Places'

Central locations and commanding roles within the mind for creating the structure of local cognitive maps -or rather cognitive collages- from an allo-centric perspective, that illicit meaning from memory within the spatial framework.

'Partonomies'

Hierarchies of parts, inferences of containment alignment and correspondence to an order or systems from an abstract conceptual point. In contrast to Taxonomies which are Hierarchies in 'kinds' of things, inferred with properties of similar or dissimilar cases from an evidential basis.

'Ecologies of the Mind'

Place and grid cells for spatial thinking create the condition as an ecology of the mind for neural networks to interact together to allow perception of the outside world. For spatial thinking this can be enacted and extended into the real world through the interplay of sensations and meaning with spatial representation.

'States of Emplacement' (Spatial Cognition & Change Blindness, Cognitive Maps and 'Spatial Frameworks)

Through gesture and acting, agents are emplaced within a particular spatial framework such as an ecology of the mind, that creates temporal cognitive maps for orientation and reasoning, as a spatial cognition. Enabling spatial thought to lead to abstract thought.

*DT: Domain of Decision Thinking Theory
'Thinking (through Frames)'*

The specific and episodic sequences of material or abstract choices presented to warrant different experiences and decisions contingent on the order of the sequence.

Axioms: 'Transitivity, Variance/Invariance. Substitution and Dominance

4 axioms of decisions: Transitivity, Substitution, Dominance, and Invariance. Structural biases to decisions based on the specific framing of temporal episodic events or abstract concepts. Such biases create pseudo certainty, or contradiction in judgments and decisions together with the formation effect. The formation of category or typological boundary effects. Variance and Invariance between frames

is of particular note for spatial cognition.

'Typological Boundary Effects'

Formation materially or cognitively of a boundary distinction between multiple stimuli into distinct partonomies of type, that can create biases in cognition. Typological presentation can change what is anticipated in the mind that experiences and feels and is connected to the probability or anticipated difference rather than the real difference⁷³.

Ecologies of Reason (the Formation Effects)

Thinking through framing, while experiencing 4 axioms of decision, as an event create the condition as an ecology of reason, within the mind that interact together to produce 'formation effects' narratives of experience and perception of the outside world. For Decision Thinking this can be the creation of typological boundaries projected into the real world through the interplay of sensations and meaning with spatial representation.

This phenomenon creates the 'pseudo certainty' effect an event that is actually uncertain but is treated as if it is certain. The framing process (or spatial assemblage) is then a perceived experience that is actively unknown but is recognized as if it is known. A perceived recall or illusion. This may affect the experience but similarly may affect choices and decisions by designers and agents.

Sates of Assemblage (Minimal Topic and Comprehensive)

Spatial assemblage of matter exists in the interrelation between the perceived, actual, and virtual perception of an experience, with 3 states of assembly or 'Framing' possible for reflection and examination for their impact upon experience and perception⁷⁴:

Minimal A difference between two items: a simple comparative analysis.
(Between matters in a 'Frame')

Topical A difference between two items in the context of an environment.
(Between matters compared to a 'Frame')

Comprehensive A difference between two items in a context compared to other concurrent or preceding experiences.
(Between Matter compared to previous or collection of 'Frames')

⁷³Kahneman, "A Perspective on Judgement and Choice: Mapping Bounded Rationality." maybe over-weighted to actual, previous experienced events

⁷⁴It is transient. It therefore follows that if experiences of space and matter are not a form of relativism based on the total cumulative experiences of a person, but in fact the episodic and temporal loss and gain of a person's experience of space in relation to the preceding event space, then the framing of experience can be utilized to influence experience from one event to another.

*MET: Domain of Material Engagement Theory
'Thinging'*

A territorial experience of material as a presence embodied and extended in acts of assemblage between the agent and the subject. The experience of matter in materials is then the process towards a conflation of the compression where encounters, such as the action of experiencing the matter of material, and the measure of intent behind spatial assemblage, are conflated as a unified experience.

'Axioms: 'Action, Material, Meaning and Experience'

A compression of the ground to which we experience; ontologically, epistemologically, and methodologically upon 3 levels of 'action', 'material', and 'meaning' And recently for a fourth level to be considered, that of experience.

'Metaplasticity'

Material engagement applied to material and spatial qualities as a form of plasticity in subject and context at varying scales and temporal rhythms to coexist. Matter becomes the medium of experience that evidences the plastic mind drawn into a plastic culture and can easily be apprehended into spatial configurations of territorial experience of the material surface that abounds spatial frameworks. A mutability of form, matter, and type. Simultaneously with experience action and meaning.

'Urban Ecologies'

Thinging and Meta-plasticity create the condition as an urban ecology for embodiment and enactment within material surface boundary between the mind and the context that interact together to allow perception of the outside world. For Material Engagement this can be Embodied and Enacted into the real world through the interplay of Actions, Materials, Meanings and Experiences with spatial representation.

States of Becoming ('Human Cognitive Becoming through')

The interrelation between the act and experiencing of Meta-plasticity as a cognitive life of material and spatial experiences. collections of material surfaces that provide for a realization of the sentience of the act of experiencing itself. It connects the subject with, and to, external materiality together with the culture of experience as it is enacted.

META: Domain of Matter, Experience, Typology, and Architecture, 'Framing (through Experience)'

Devices, to construct upon certain universal places and assemblage of perception -including action and gesture-specific and episodic assemblages of matter and typologies that an agent can experience.

Axioms: 'Terroirs' 'Lustre and Ruptures'

3 axioms of experience, that describe the context, ground, and process of a cognitive ecology. Temporal ruptures⁷⁵ between the subjective and objective perception, create the condition of perceiving specific qualities of the experience that avert spatial illusions and allow for a met-plasticity to occur. Lustre evidences the degree of separation between the objective and subjective temporal frames while the terroir assembles a collective experience of frames as comprehensive experience or becoming.

'Spatial Assemblage'

The formation, -through thinging or framing- of specific and episodic frames in matter and spatial cognition that display certain variance of experience from one assemblage to another, they are structured as paronomies rather than taxonomies of experience, matter, and space.

'Cognitive Ecologies' (UE + EM + ER)

A cognitive Ecology exists when frames of spatial assemblage bind together the Urban ecologies, Ecologies of Mind, and the Ecologies of reason into a shared terroir of experience. where spatial assemblages exist and are set, within this collective Terroir.

'States of Experiences' (Cognitive Terroirs)

Experiences can be traced and navigated cognitively through a cognitive terroir with varying states of experience including motor-influenced (mobility navigation); cognitive enquiries (problem solving); and psychophysical states (wellness, depression, and outlook) to form a wider territory and scope of spatial cognition, typological boundaries and material surface directly affecting experience.

⁷⁵Kay-Jones, "The Rupture as a Drawing-in of Experience."

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