

Thesis For The Degree of Doctor of Philosophy

MAKING is MORE

Exploring Latent Meanings and Capacities of Architecture's Concept CONSTRUCTION

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Brussels - Ghent, Belgium 2026

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ISBN 978-91-8103-415-8

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Doctoral Dissertation at Chalmers University of Technology

Doktorsavhandlingar vid Chalmers tekniska högskola

Ny serie nr 5872

ISSN 0346-718X

DOI: <https://doi.org/10.63959/chalmers.dt/5872>

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doctoral dissertation n° 2026/3E150050

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Chalmers Reproservice

Göteborg, Sweden 2026

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to Lisa, Milan and Elco

Above all we must remember that nothing that exists or comes into being, lasts or passes, can be thought of as entirely isolated, entirely unadulterated. One thing is always permeated, accompanied, covered or enveloped by another; it produces effects and endures them.

And when so many things work through one another, where are we to find the insight to discover what governs and what serves, what leads the way and what follows? This creates great difficulty in any theoretical statement; here lies the danger of confusion between cause and effect, illness and symptom, deed and character.

Goethe 1825/1995, pp.145-146

Making is More is a doctoral project and research into one of architecture's prime concepts, i.e. construction. It is an inquiry into how we think about, attend to, and work with it, and a search for what remains concealed due to the prevailing conceptual framing. In architecture, construction is primarily conceptualised as a technological knowledge domain that instrumentally addresses its realisation and performance. Though important, this approach is reductionistic and fails to take construction's more comprehensive capacities into account. This is why I argue that the habits of thinking about construction as technological concept and practice need to be scrutinised, questioned and criticised.

In architectural construction the analytical way of thinking dominates. It is conditioned by a logic of parsing in individualised entities that are abstracted and made autonomous from each other and their contexts. The generative complexity emerging from interactions between things is veiled or disappears altogether. This research is an informed response to this general problem. It prioritises connections, relational dynamics, collective agency, mutual influences and contingency. Besides, construction is conceived as a domain determined by an intricate reciprocity between forms (things and objects) and processes (dynamic, fleeting, generative, transformative), and one that is affected by the specific circumstances and occurrences applying within event-spaces.

The work is rooted in personal experience acquired through architectural practice and education (design and construction), is formulated from the point of view of the architect and directed towards the discipline of architecture. Architecture is acknowledged as a technological practice that uses technical means and produces technical ends; but the technological is seen as a (cultural and political) venture that is rich in imagination, creativity and effort, and that cannot be reduced to the practical and feasible. The overall aim is to think through the concept of construction and what it affords, to show that it is possible to conceive construction in other ways, and in so doing, bring latent alternative capacities to light. The objective is to generate and evoke different connections and trajectories and not to solve problems by means of rational reasoning and proof. This work is thought of as a map, rather than a program or a plan. It depicts a territory to explore, rather than tracing one path that directs to instrumental and clearly identifiable goals and ensuing results.

The thesis is a construction that articulates a variety of subjects and concerns. They have a capacity to function as entities in themselves, but together they form an inter-related whole. They are the result of an endeavour to understand construction in multiple ways, to address it from the point of view of complexity rather than simplification, and from connections and situated assemblages instead of the dissected and scattered analytical creations that currently dominate the field.

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PREFACE

PROBLEM STATEMENT

In this work I explore the meaning and use of the concept ‘construction’ in the domain of architecture. In this context, the term construction refers to the generative processes that bring architecture’s designs (projected forms) into existence as physical entities in the world (built forms); and to the extensive body of knowledge that aims at making those processes intelligible and controllable. I prioritise the term construction over others that are often used alongside of, or interchangeably with it, and that supposedly cover the same ground; for instance architectural technology, building science, architectural engineering and tectonics, although the last one has quite distinct overtones in relation to the others. I make this choice because I consider that construction has a wider range, is more versatile, and most important, has a verb-form whilst these other terms do not.

My stance is fourfold. First, I take the perspective of the architect, as one of the many stakeholders in architecture. This perspective is in accordance with my personal experience as a professional practicing architect, as a teacher of both architectural design and construction, as a D.I.Y. building practitioner, and finally as an inhabitant and dweller of the ‘built human artifice’.¹ Second, I consider construction as an integral part of architecture and one of its basic subjects and concepts; one that cannot be discarded nor separated from it. On the issue I support David Leatherbarrow’s position that ‘*Although building technology is not a skill practiced by the architect, it is one of the basic subjects of the discipline, one that we have been too willing to abandon in recent years in pursuit of an architecture of communication that is indifferent to its means of realisation*’.² I situate myself within a tradition that considers architecture as something that must be built for it to become present, situated and physically participating in both life and environment. Consequently, it cannot be reduced to image and discourse. Third, I see architecture as a technical practice that uses technical means and produces technical ends. Architecture can obviously not be reduced to a technical practice, but at same time the architectural work is by any means a technical work besides being potentially many other things. Furthermore, I consider the technical domain as inherently human and cultural, rich in imagination, creativity and effort.

1_ Arendt 1958/1998, p.136

2_ Leatherbarrow 2001, p.97

It is more than instrumental for realising an architectural purpose framed elsewhere. Finally, I situate this work within a landscape of learning -not to be equated with formalised education- rather than the domain of architectural and building practices. In this way I can take the necessary reflective distance to think and work more freely, without being constrained by the short-term instrumental demands of those practices. Making this move opens up the possibility to see construction in terms of exploration and evolution, and not primarily in terms of replication, production, performance and control. Besides, in educational settings the concepts of a discipline, its habits and conventions, need to be handed over, and for this purpose be brought into the open. I deem that these environments can therefore in some cases make those concepts more explicit or function as magnifiers.

This project is based on the hypothesis that construction in architecture has a range of meanings and uses that is too tight and restrictive, and as a result it is difficult to both see construction's actual potential, and to attend to it accordingly. The hypothesis gradually gained more prominence during years of personal involvement with construction in both architectural practice and education. The statements used to back up my arguments —some of them used in this problem statement— are based upon and constrained by my personal experience and situated knowledge, or in other words, they capture and map entanglements in a 'local environment-world'; the field where I have been operating.³ I do not claim any universal validity for the assertions I make, which does not mean that they can be considered invalid though. What I hold to be at stake are not merely imaginary issues produced by a vivid imagination that is not grounded in an actual territory. They are based upon and emerged from specific practices and what I think can be achieved from those positions in relation to what I think can rightfully be claimed to be pertinent problems.⁴ This problem statement is my personal reading of a problematic state of affairs that I recursively encountered in the field. There is a genuine risk that my diagnosis is not accurate, valid or generally applicable, but my intuition tells me there definitely is some truth to it. So let's proceed.

This project is based on the assumption that the ways of conceiving construction in architecture need to be expanded and/or rethought. My idea was and is that the prevailing approaches are incomplete and possibly also inadequate for conceptualising

3_ Frichot 2016, p.

4_ Frichot 2016, p.21

construction as an assortment of complex generative processes of becoming.

This work maps the territory I (dis)covered when surveying and interrogating a number of conceptual assumptions and habits of thinking that I think are sedimented in architecture's epistemological infrastructure, and that unknowingly condition views and actions. The orientation of my questioning is more philosophical in nature than it is technological; more focused on the relevant concepts and on more comprehensive ways to think about and work with them. It is less concerned with actual technical performance and the principles that have been developed to achieve and sustain it.

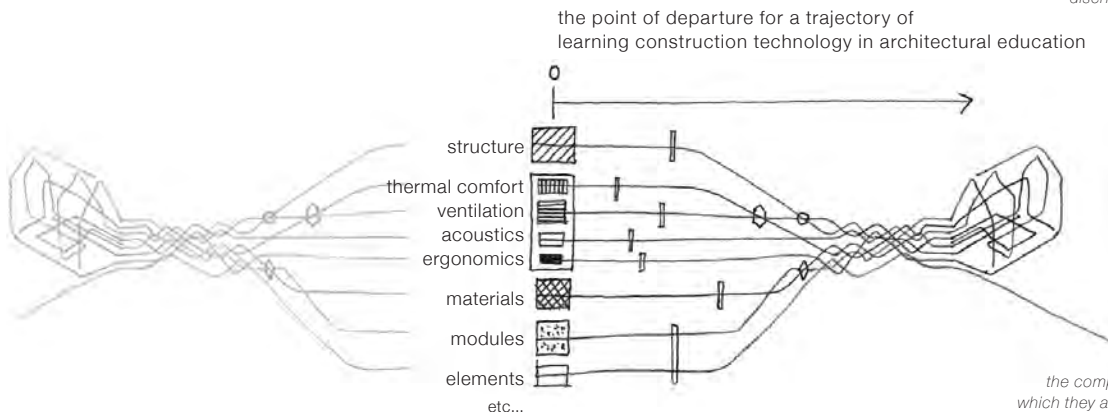
One prominent approach to construction in architecture that I repeatedly and consistently came across is analytical, and it uses its specific associated means and methods: *'... analysing a whole into parts and then attempting to model it by adding up the components will fail to capture any property that emerged from complex interactions, since the effect of the latter may be multiplicative (e.g. mutual enhancement) and not just additive'*.⁵ If we assume for the time being that construction can indeed be defined in simple terms as putting or organising things together as for instance Peter Zumthor does, it is striking that within the realm of the formalised knowledge about construction technology for architecture, one attempts to understand this togetherness by doing the opposite. The complex whole and relational congregation that a system labelled 'building plus environment', is represented, organised and conceptualised on the basis of what is disassembled, separated and individualised, de-contextualised and presumably independent. In the textbooks construction is framed in terms of discrete constituent parts, static relational patterns, sharply delineated categories, quantifiable properties, uni-vocal and precise propositions and definitions, fixed models, abstract diagrams, etc. The general feel is that priority is given to formalised and codified knowledge remote from particulars, sites, applications and situations. I acknowledge that a certain degree of independence from external influence can be both useful and necessary to figure certain things out, but in the context of architectural artefacts and the situations they happen to find themselves in, I grew convinced that it is advisable to be mindful of the following very valuable advice: *'If we take the trouble to discriminate between things, it is not just to keep them apart but to see more easily how they relate to one another'* (Evans 1995/2000, p.xxxvi).⁶ Autonomy and partitioning make it exceedingly easy to disregard context, relational and distributed agency, mutual influences and generative interactions, and I believe this is a genuine problem.

5_ De Landa 2000, p.17.

6_ Evans 1995/2000, p.xxxvi

As far as I can tell, the analytical approach is present in architectural education from the very start, and manifested by how curricula of architectural technology tend to be organised as a set of sub-divided and specialised domains of technological knowledge, and is taken as the starting point. But this scheme does not accurately represent the state in which whole technico-architectural artefacts actually are when situated within a complex context. A building is not a foundation + walls + windows + insulation + roof + floor + wallpaper + steel + electrical wiring + sinks and taps; all neatly ordered, piled up and juxtaposed on the building site like they would be in a building supply store. It is a hybrid conglomerate of all these things mixed and amalgamated to a point that one thing cannot be distinguished nor separated from the other; which in reality often has to be taken quite literally. When an analytical logic of parsing is applied to construction, what remains is a collection of self-enclosed domains that describe general technological principles and partial technical solutions to intricate architectural problems. All this stuff loosely hangs together, if at all.

ill.1.1:
The column at the centre of the diagram visualises some of the categories according to which the knowledge of architectural technology, curricula and the disciplinary domains of building practice tend to be organised. They appear self-sufficient and autonomous. But the way in which they can be recognised within, and disentangled from



the complex whole in which they are combined often remains outside the field of view. On the opposite side of the spectrum, the manner in which they can or must be intertwined in order to compose the whole called building, is entrusted to the care of architectural practice. As a result the inherent relational complexity of architectural construction is circumvented.

Drawing by author

On top of that, the partitions also express a hierarchy that is not by definition made explicit or explained and therefore again seem self-evident. The underlying rationale is articulated as a linear and incremental sequence that starts from an supposedly amorphous substance that is then transformed into useful materials that are in turn used to make (relatively) small and individualised parts, subsequently these are combined/assembled with other parts to eventually create a (relatively) bigger and more elaborate whole or complete building. Architectural construction is conceptualised as a seemingly logical sequence that follows a uni-directional movement, i.e. as 'an additive chain from small to large'.⁷ Moreover, it is also emblematic for

both the organisation of the knowledge about construction in architecture, and the unfolding of a construction process in time and place. Since this assumption can be found all over, and also has a certain reasonable and common sense feel—which is maybe rather an indication of habit—it does not seem far-fetched, let alone wrong. But in my opinion it is pretty bold nonetheless, because of the implicit message that the entire transgressive system of movements, transformations, extractions, incisions, appropriations, exploitations, energy and material flows, waste disposal etc. can be condensed into this simple scheme. From an abstract and alienated point of view, I guess it can indeed be done to a certain extent, but then again, it absolutely cannot capture the complexity and implications of the whole endeavour.

The organisational structures depicted above possess two additional potentially problematic characteristics that need to be highlighted. The first is that the perspective taken on the architectural system is internal, hence thematic subdivisions like materials, methods, modules, elements, infra-structures (load-bearing, partitioning, networks, finishings, etc.) and the disciplines that follow those partitions. The second is that when the interface between the artefact and an external context is addressed, it is done in terms of either specialised parts encroaching on the environment (foundations, façades, etc.) or in abstract and quantifiable terms (climatic comfort, heat exchange and temperature gradients, water vapour and humidity, air pressure, etc.).

An additional distinctive feature of construction in architecture is the dissociation between the processes of construction—i.e. the actual activities of building—and both of its temporal extremities before and after: the initial state or the (designed) model is situated on the input side of the process, and on its output side the output as final state, that is, the (built) result or the thing made. On the upstream (or input) side of the construction process (i.e. before), the notion of construction is identified as the technological knowledge that, when used correctly, must ensure an accurate prediction of the envisioned and desired but yet unbuilt architectural aim. On the downstream side—that is, after the building process has come to an end—the term construction refers to the result, meaning the object in a tangible and stable material state. As a consequence, construction's processes—the actual constructing/building/fabricating—can be identified as the dynamic activation of all the necessary means and methods for transforming architectural input into a compliant architectural output. Besides being the presumed authors, the role given to—or appropriated by—architects and engineers alike, is that of safeguarding the desired conformity and performance of the realised final state to what is or was projected and determined by them.

In the same vein a need for control and the management of contingency, uncertainty and unpredictability is injected into the processes of construction. The question is whether these aspects are merely characteristics or necessary conditions to be accepted or can also be problems that need to be sorted out? In the current state of affairs they certainly are part of the former, but they can also be or become the latter, because the requirements they set or approaches they induce have a potency to be reductive, inhibiting and/or detrimental.

To a large extent, the body of knowledge embedded within the practices of construction, and emerging from active engagement in its processes, falls outside of the boundaries of architectural disciplinary knowledge. The separation of domains of knowledge and practice/labour appear to make sense and may well be necessary and inevitable within the context of architectural practice, and this due to an ever increasing complexity and specialisation. But it can also be troublesome if not outright problematic in the context of learning construction. In any case the full scope of implications for architecture can never be covered when a contiguous territory is sliced up and unpicked, and when only some of the fragments remain accessible while the others disappear. What is presented to architects as the knowledge to learn is cleaned, or rather purified from the supposedly obfuscating influences of architecture's concrete reality, both during its realisation and after. I believe that it is an issue that has to be confronted rather than brushed under a blanket of convenience or blindness, regardless of it being deliberate or unintended.

The segregation between what I from here onwards refer to as the realm of forms (i.e. states of organisation - both projected and built) and the realm of processes (acts and processes of organising, f.ex. designing and building) is a cause of difficulty, even though it might be framed as the opposite. It is troublesome because it encourages disregard for the fact that both states of organisation (forms) and processes of organising are intricately connected and mutually dependent. It also makes it difficult to see that construction is a process of gradual formation and transformation that progressively in-forms what is being made by and through its means, and finally it facilitates its reduction to a process of replication. On top of that, it impedes the development of an understanding of what it takes to actually construct something, and what it means to do so whilst being immersed in, subject to, and dependent upon changing conditions set by time, place, weather, matter, social context, etc. As far as I am concerned, all of this is cause for concern, especially at times when a reconsideration of architecture's

environmental implications has become imperative and unavoidable. Moreover, these attitudes regarding construction do not apply exclusively to issues of technology and technical performance, but also to the issues of meaning imposed upon architectural material form and framed by the concept of tectonics.

I consider that construction's actual meaning and implications for architecture cannot become truly intelligible if it is not conceptualised and deliberately addressed from the perspective of the complex dialectical relation between forms and processes. Form needs to be interpreted here as *'something that already possesses a relatively stable, relatively permanent existence in the world'*.⁸ Process in turn can for now be interpreted in two distinct ways; first as the series of actions and events through which above mentioned forms are initiated or come into existence, and second as actions and events that put these forms to use or into practice. In *'Architecture, Means and Ends'*, Vittorio Gregotti writes that *'construction concerns the use and the thought of operation'*. He explains that the expression *"to put into operation (porre in opera - mettere in opera)"* means both planning and construction: *'It covers not only problems related to raising, positioning and connecting the various parts and elements of a project but also, more generally, the overall conception of the project as a physical entity'*.⁹ Gregotti's interpretation articulates is one that focusses on what happens in a time before the tangible work is realised, i.e. 'before or ante object'. This needs to be extended to include another temporal space, namely that 'after or post object', when the architectural artefact has been realised, and is engaged within processes of use, interpretation and inhabitation.

It deem it relevant, useful and above all necessary to contextualise form in the potent dynamics of process, and conversely to conceive of process as a temporal and spatial frame of reference for form. For this to be possible, construction must be re-conceptualised as progressions or movements along spatio-temporal trajectories within territories shared with multiple other actors. Some questions that subsequently emerge are for instance: how to understand these interactions; how to identify and access the zones of transaction, of mixed agency and reciprocal influence; what kind of concepts, attitudes, capacities and methods need to be developed in order to raise

8_ Arendt 1958/1998, pp.140-142

9_ Gregotti 2002/2010, pp.70-71

awareness, incite acknowledgement and finally arouse a sense of urgency and necessity for more comprehensive ways of addressing construction in architecture. This work is intended as a step towards finding some answers to these questions.

This problem statement and the entire range of statements it contains can, if one wishes, be read as *ex cathedra* statements of truth. As suggested previously (on p.18) I would prefer that they would be understood as an argumentative stage-setting. The concerns I voice and criticism I express are open for questioning and discussion, and not of the to take it or leave it type. This work can be interpreted as an attempt to create a platform to have or provoke this hopefully generative and fruitful conversation.

The sources and influences I build upon can be organised in four thematic groups. The first consists of architectural theory/history/philosophy: Robin Evans, Stan Allen, James McCleary, Stewart Brand, David Leatherbarrow, Jeremy Till, Jonathan Hale, Jonathan Hill, Jane Rendell, Hélène Frichot, Tim Anstey, Yoshinobu Ashihara, N.J. Habraken, and others. The second is philosophy with for instance Hannah Arendt, Susanne Langer, John Rajchman, Nicholas Rescher, Manuel De Landa, Paul Ricoeur, Henri Bortoft/Goethe, etc. The third is a mixed thematic group in which disciplines like anthropology, sociology and cybernetics are represented amongst others: Gregory Bateson, Tim Ingold, Richard Sennet, David Pye, Clifford Geertz, Bruno Latour/Albena Yaneva, Francis Heyliger, etc. Finally the fourth and more diffuse one, is the complex web of influences embedded in years of practice, the many people encountered during that period, the situations (challenges and possibilities) emerging on building sites and in the workshops of craftsmen, the searches and researches to develop and prepare the projects for building, the Erasmus workshops (students and the tutor-colleagues possessing invaluable knowledge, experience and stunning insights), and many more that I am not able to identify and credit, but that together defined the breeding ground for this work.

This chapter describes the organisational structure of the thesis and provides a general overview of its content. It can easily be skipped by the readers who prefer a gradual and not foretold unfolding of the narrative.

The first part 'Preface' is a pathway into the work. Its first chapter 'Problem Statement' provides a context by sketching the landscape in which the work is situated, what it aims for, and where and it is supposed to contribute. The second chapter 'Tour d'Horizon' clarifies the overall structure of the work. Finally, the third chapter 'Way of Working - Making Connections' contains notes on the method I used, and that is based on the principles of a practice described by John Rajchman in 'The Deleuze Connections' that discusses Gilles Deleuze's ways of constructing philosophy and the implications this has on what can be thought and made.

The second part 'Construction IS' is organised in two sections entitled 'What We Talk About When We Talk About Construction' and 'Patterns of Interaction Between Process and Form'.

The first section 'What We Talk About ...' aims at an unwrapping of the concept construction by means of distinct ways of framing it. Its first chapter entitled 'Construction IS Con and Struere' departs from the Latin roots of the composite word, and unfolds its meanings on the basis of the intricate connection between the constitutive stems 'con/together' and 'structure/order/organisation'.

The second chapter 'Construction IS Making' starts from the Dictionary as a repository of the meanings of concepts, and establishes a connection with the concept 'making'. The latter is often used interchangeably with the term construction. However, both concepts do not cover exactly the same ground. Combining them expands construction's reach. In the chapter 'Construction IS Objects, Relations and Mediation' construction is contextualised in relation to tools, techniques and technology, framed according to Peter McCleary's essay 'Some Characteristics of a New Concept of Technology', and looked at through the lens of its mediating capacities. The final chapter 'Construction IS Multi-Layered' looks at construction from the perspective of a definition used in the introduction of a book entitled 'Re-Inventing Construction' from 2010 that is one of the more 'recent' works that contains reflections on construction in architecture.

The second section 'Patterns of Interaction Between Process and Form' addresses the dialectical relationship between the distinct manifestations of construction as activity (process) and as object (form). The first chapter 'The Dissociation Between Process and Form' describes the implications of the separation that since centuries has gradually but firmly been established between both in architecture. The second and third chapters 'The Bi-Polar and Hermeneutic Models of Construction' and 'Time-Form' describe how the relationship between process and form can be mapped, proposes a way to get to grips with the far-reaching dissociation and achieve a more intricate reconceptualisation of the dynamic and generative relation between both.

The third part entitled 'Territories' consists of two sections, 'Growing Islands' and 'Encounters'.

'Growing Islands' is a parable based on an account of a short stay on an island in the Stockholm archipelago, where I attended a conference on Gilles Deleuze, and participated in a doctoral writing course named 'Transversal Writing'. The role of the parable is to inform on an attitude, and on ways of thinking about things and attending to them in more general terms. Its content engages the disciplinary topics of construction and architecture obliquely rather than directly. To some readers it may therefore appear unrelated at first. It is preceded by a contextualising 'pre-script' and followed by an outro entitled 'Scripting - Making Connections and Collectives'. The latter addresses the specific capacities of the narrative for connecting things that can otherwise not be, for creating a form of relational complexity and for inducing an understanding that is more than strictly factual. Note that a preliminary reading of the pre-script is not compulsory for the parable to play its role adequately.

The second section 'Encounters' gathers five essays in which I present a number of intricate issues that emerged during the process of making this work. They pointed at topics that deserve more attention; showed things previously unseen; connected what was unrelated before; influenced a subsequent take on things; triggered reflections and insights; and opened new territories for exploration.

In 'Generative Interactions and Emergence' I portray a variety of coexistences and interactions between architectural artefacts and their places of residence. It is a take on construction that, paraphrasing Jane Bennett, honours matter's inherent creativity. An architectural artefact is a material assemblage and therefore a context for the material parts out of which it is made up. But it also takes part in something bigger than

itself upon which it depends and in which it participates, i.e. a locale where interactions occur with the various other actors that exist outside (and inside) of the artefact itself. It is the level where the latter receives its rightful place as part of a material, social, political, and cultural realm, and in which it is used or put into practice.

'Things We Do Not See' is an account of an Erasmus Intensive Program (EIP) named '*Tectonics in Building Culture*' and subsequently '*Structures in Building Culture*' in which I participated as a tutor from 2010 to 2014 included. It was organised as a summer-school and focused on making architectural constructions at real scale. It is a very popular format nowadays, but it was not that frequent then. Due to its recursive nature it provided first hand experience with the capacities of processes of construction in educational practices of architecture. It induced an increasing awareness of the importance of process for understanding the intricacies and complexity of construction. Due to their fleeting characters processes are prone to be undervalued. In more general terms, what gradually became clear is the existence of a relation between the eclipse of certain things when it comes to construction, and the reduced worth we assign to them.

'Tectonic re-Visions* - Meaning and Interpretation' grew out of a necessity to respond to a recursive framing of this work in terms of tectonics. It is a critique of discourses concerning tectonics in architecture that tend to prioritise meanings imposed by the architect at the expense of meanings that emerge from events and situations in context outside of the architect's will and control. It also clarifies a position that considers that once an architectural work is realised, it gains autonomy from the formative intentions of its maker(s), and from the processes that brought it into existence.

'Queer Bricks - A Unilateral Claim on Freedom' takes aim at the role of the architect as an agent of control in architecture's processes of realisation. It is a critique on self-serving arguments architects can unknowingly develop to support increasing control for themselves at the expense of others. The subject used for this purpose is the brick that is one of the oldest and most common material components for building in the western architectural tradition.

'Washing Windows - Construction Enhanced' is a short text that can be understood as a plea to expand construction to material processes that are temporally situated after the building process and after the architect's work came to an end. It shows in an almost naive way that maintenance and repair, housework and cleaning can be taken into consideration for their potential to be both creative and formative processes.

The fourth part 'Constructing With' is an assemblage of two parts, 'Constructing with Lines' and 'Constructing Things for Constructing Other Things'. They more explicitly connect with the instrumental and technological approach of construction in architecture, but from a perspective that is inspired by the philosophical and political projects that Jane Bennett develops in 'Vibrant Matter', that draws attention to matter's vitality and vibrancy, and its capacity to act as a quasi agent or a force with trajectories, propensities, or tendencies of its own.⁹

Both essays of 'Constructing With' are constituted of close readings of material collectives and situations, portrayed through thick descriptions, informed by the concept defined by Clifford Geertz.¹⁰ They gradually and patiently unravel the relations, multiplicity and distributed agency inherent in a number of material configurations. This is done by entangling empirical observation, physical engagement and theoretical reflections (remote from sites of operation), and by using multiple modes of articulation besides text, i.e. drawings, diagrams, collages, photos, etc. They actively apply the principle of modifying ones point of view and the associated transformation in threshold conditions in-between, when one goes from one to another; assuming that shifting ones position alters what can be seen, thought and done, or in other words, '*It draws attention to the idea that point of view is ever-mobile in relation to a world*'.¹¹ The movement is interpreted as both physical and intellectual, both tangible and abstract, or stated in classical terms, both sensible and intelligible.

The title of the first section, 'Constructing with Lines' mirrors the title of a chapter in Stan Allen's book '*Practice: Architecture, Technique + Representation*', but has a different orientation.¹² It is not focused on projection, but rather on multiple instances and transformations of lines, ranging from abstract and representational to tangible lines in material contexts.

In the second section 'Constructing Things for Constructing Other Things', the aim is to highlight the role played by apparatus, that is, the means whereby a specific production is made existent or a task accomplished. The term embodies an orientation towards an end, and a preparation or making ready for that end. It entails a construction of means and the establishment of a complex of resources, i.e. the things collectively necessary for the performance of some activity and the equipment used in doing it. It also includes the activation and directing of those resources. The argument is developed

9_ Bennett 2010, pp.vii-viii

10_ Clifford Geertz, 1973

11_ Frichot 2015

12_ Allen 2009

starting from tools and gradually expanded towards the more comprehensive theme of apparatus. It is grounded in a number of practical situations that occurred within the Erasmus Intensive Program (EIP) 'Tectonics/Structures in Building Culture' and the embedded activities for learning architecture by making it in full scale.

In the fifth part 'Process and Form' the overarching subject is the reciprocal relationship between generative (initiating) processes and (recursive) processes of use on one side, and the forms that are both outcomes of and instruments for use within those processes. It is situated in a realm of learning construction, and more specifically an exercise set within the context of an introductory course in construction (technology) for and with starting students in architecture. It was centred on the development of a *modus operandi* for assisted self-learning that is structured according to a process of making a material artefact at real scale. It also took aim at connecting the modes of immediacy characteristic of practice, with the remoteness typical of the reflective spaces of theory. It depicts some key movements and moments occurring in the event spaces of construction during the process of the object's formation, including a reflection on why and how they are relevant for learning construction and its manifold implications.

In the final part entitled 'Exit' I reflect on the findings and the contributions made in relation to the subject under investigation. I also identify some gaps that need to be investigated and elaborated in the future.

WAY OF WORKING

MAKING CONNECTIONS

In the problem statement I mentioned that this work is based on a conviction that valuable insights are missing in how construction is attended to in architecture. Hence these remain concealed, unarticulated and unaddressed. This view was based on intuition rather than demonstrable facts or clearly identifiable problems. And even though the territory that I engaged was familiar from practice and education, it was not clear to me what I had to look for, nor how to do so. Being acquainted with a domain of enquiry is an advantage, but can be a hindrance too, because the methodological instruments of a certain knowledge system are set up for achieving compliant results. I experienced that these are ineffective for unearthing what falls outside or is situated between the folds of a domain's conventions. Visibility and accessibility are constrained by disciplinary concepts and the way in which knowledge is organised. Initially, I had to make do with the tools I had at my disposal, but it gradually became clear that I had to look elsewhere to diversify my conceptual toolbox. I needed instruments that make it possible to *'challenge the status of a major or dominant paradigm and aim to create a different practical landscape'*.¹³ I needed a method that is *'not logically determined by an image that supplies it with suppositions or helps determine its modes of address'*.¹⁴

In 'How to Make Yourself a Feminist Design Power Tool' Hélène Frichot writes that *'method (quite simply, how it is we do what we do in our ecology of practice) and methodology (how, once we have undertaken some research action, we reflect and thereby describe the logic of our approach or method) are not a question of meaning but one of use and application'*.¹⁵ An approach must be open-ended and should not follow pre-given restrictive rules. A methodology should be oriented towards new ones that lead to different outcomes.¹⁶ A practical model for dealing with the situation that I was confronted with is set forth by philosopher John Rajchman in 'The Deleuze Connections' in which he discusses French philosopher Gilles Deleuze's style of constructing his philosophy, and how concepts are explained and ideas presented.¹⁷ Connections is the term that he uses to designate both an attitude (a style of thought) and an approach (a way of doing). It focuses on forging relations to make synergistic

13_ Frichot 2016, p.15

14_ Rajchman 2000, p.36

15_ Frichot 2016, p.33

16_ Frichot 2016, p.34

17_ Rajchman 2000, p.21

combinations with emergent properties. These are identified by the term assemblages, or alternatively and more specifically suited for this work, constructions. The term ‘assemblage’ refers to the concept developed by Gilles Deleuze and Felix Guattari, and for which I follow philosopher Manuel De Landa’s interpretation and explanation named ‘*Assemblage Theory*’. I use it because of its clarity: An assemblage is a whole that has properties of its own, that is, properties that emerge from the interactions of its parts with one another. In those interactions the parts exercise some specific capacities. Due to the existence of emergent properties, the assemblage as a whole is irreducible to its parts, but nevertheless remains decomposable because the parts maintain their autonomy. In other words, the identity of the parts is not constituted by their relationships (i.e. they are relationships of exteriority).¹⁸ The different constituent parts of ‘Making is More’ ought to be seen as constructions. They were created by using some of the connection-principles outlined by Rajchman, and in what follows I point at a number of them. My intention is not completeness nor enquiry, discussion, and critique of Rajchman’s and Deleuze’s work, nor to prove conformity to the original. My aim is rather to give an impression of an enabling style of thinking and doing that inspired me.

Connections have to be established, and are therefore premised on the recursive generative actions by means of which they are instituted: ‘*We must always make connections, since they are not already given*’; connect one and another and yet another and so forth, in a potentially endless process.¹⁹ Since the emphasis lies on making and on things in the making, or in other words on processes rather than states, the paradigm of connections can best be understood as a mode of practice. Rajchman identifies it as empiricist, pragmatist and experimental. Working and thinking occurs within existing, already occupied and soiled material and conceptual ‘*local environment-worlds*’ and by using the material that is available there. Hélène Frichot’s compelling associated concept ‘*Dirty Theory*’ refers to a practice that holds such a position: ‘*... that seeks out approaches and plots trajectories close to the ground. ... The dirty theorist follows the materials, tracks the soiled effluent, observing from where it came and the direction that it appears to be taking. Dirty theory messes with mixed disciplines, ... is wary of the strictures of disciplination, preferring instead indiscipline, a wayward approach to problems. Dirty theory appropriates and critically, knowingly, misappropriates,*

18_ De Landa 2015, lecture

19_ Rajchman 2010, p.6

because ideas do not belong to singular authors, the dirty theorist avers'.²⁰ The dirty local territory can also be described in more fashionable terms as a complex mixture of geological, biological, social and linguistic constructions that are nothing but accumulations of materials shaped and hardened by history.²¹

In other words, we don't write on a blank tablet, but instead always start in the middle of a kind of loose unfinished patchwork, itself capable of changing shape through accretion of new elements and new connections.²² The crux of the matter is to get the process in motion and recursively perform the constitutive actions that produce combinations from which something novel and/or useful may emerge. New assemblages generate new meanings by re-situating the parts out of which they are constructed, and in turn they themselves are re-connected and re-contextualised as parts nested in other assemblages. De Landa adds that we are immersed in a world populated by constructions with which we interact in a variety of ways, and that in these interactions we generate novel combinations, some of which possess emergent properties. In turn, these synergistic combinations, whether of human origin or not, become the raw material for further mixtures. This is how the population of structures inhabiting our planet has acquired its rich variety, as the entry of novel materials into the mix triggers wild proliferations of new forms.²³

The style of working that Rajchman describes, produces comparable conditions. Simply stated, it is tantamount to using an abundance of both conceptual and material bits and pieces, and making them converge into a profusion of constructions through ceaseless iterations and roamings around problematic points. What is created is not a simplification but rather an increasingly full and extensive territory of interrelated material: *'... there are different conceptual "bits", each initially introduced in relation to a particular problem, then re-introduced into new contexts, seen from new perspectives. The coherence is not given by "logical consistency" among propositions, but rather by "series" or "plateaus" into which the conceptual pieces enter or settle along the web of their interrelations. There are new "encounters" with problems that arise in the arts or sciences, or with events that "problematise" ... , introducing new questions that call for a rethinking or reinvention*'.²⁴ The metaphor of territory is suitable because of the multi-

20_ Frichot 2019, pp.6-7

21_ De Landa 1997/2011, pp.25-26

22_ Rajchman 2010, p.145

23_ De Landa 1997/2011, pp.25-26

24_ Rajchman 2000, p.21

directional nature of the endeavour, the wandering from place to place or from matter of concern to talking point. Even though it may seem to be the case in the supposedly final version of this work, in practice it did not proceed from a beginning to an end, in the direction of a predetermined goal, and never followed a logic of inference.

It rather moved forward and back and forth by continuous variations, bifurcations and ramifications. The outcome is an intricate landscape formed by accretion and growing over time. It is specific, not generalising, and *'built from local connections, each with their concrete rules, not globally set, [and] not indifferent to materials ...'*²⁵

This work came into being by constructing, i.e. through recursive cycles of making and un-making and re-making connections between all kinds of at times disparate things. I used the generative capacities of construction as an exploratory and generative way of working, meaning both method and process. A considerable part of the work consisted in creating conditions for issues to emerge, in order to expose and articulate them, and in so doing find possibilities for expanding construction's scope. My orientation was towards creating diversity and abundance, based on the premise that in architecture one has to deal with a multitude of often heterogeneous and sometimes conflicting issues too. This is not a sign of indecisiveness or hesitation about the one right path to follow, but has everything to do with a necessity to increase, engage and think/work with intricacy and complexity.

The current outcome is a manifestation of processes that have been stabilised in order to be shareable. The sequential and linear arrangement of the narrative has been imposed on it as a consequence of constraints set by the book-like formatting in combination with conventions/requirements for a doctoral thesis. But this does not adequately reflect the way in which the work came into being. Its current state of organisation will undeniably influence how the content is perceived and interpreted, but it should preferably not be regarded as an expression of hierarchy or as an indication that latter parts build upon or evolve from those that are positioned before them.

The organisational structure of this work is a post-construction that resulted from a search for a connective tissue between thematically heterogeneous entities developed separately. It is a provisional state of organisation; fixed for now but open to transformation. Conclusions or findings put forward along the way are indications of possibilities, keeping in mind that they would need a re-framing when the contexts or

25_ Rajchman 2000, p.8

situations in which they are applied changes. They are not intended as instructions or methods for solving problems. There is not one correct answer but many, and the plurality of trajectories present in this work hopefully indicates this.

‘Making is More’ must be seen as ‘*a map*’ rather than ‘*a program, a plan or a project*’.²⁶ This is consistent with the idea of a situated practice dependent on a territory and its local conditions. Besides, the concept of the map is useful because it supports an engagement with the content from the perspective of a wanderer rather than the goal-oriented traveller who follows a path already set out towards a pre-defined point of completion. The map depicts a mesh-work of interweaving paths that connect a multitude of places. It affords many lines of movement and can be used as a navigational tool, whereas plan and program imply one or at least a more limited amount of fixed itineraries between localising points. According to Tim Ingold the latter are route-plans that enable to virtually reach a destination even before setting out: ‘*As a cognitive artefact or assembly, the plan pre-exists its enactment on the ground*’.²⁷

For this work I had no pre-existing plan, nor the guidance of a concise problem-statement. Rajchman argues that for the pragmatic and empirical practice of connections, one does not in the first place need the support provided by knowledge or the handiness associated with particular skills. What is needed is a belief in the power of the process and a confidence that possibilities will emerge from the connections made and the relations that are forged through them. Rajchman also refers to this attitude as experimental and requiring a style of thought that puts experimentation before ontology, ‘and’ before ‘is’.²⁸ The language-tool for making connections is the conjunction ‘and’. It is identified as the basic logical operator that works prior to the ‘is’ of predication or identity, and liberates from ontological determination or saying what there is.²⁹ In ‘*Mind and Nature, A Necessary Unity*’, Gregory Bateson provides an indirectly supporting argument for the former when he explains that an increment of knowing can be expected when two or more descriptions are combined, especially when they come from different sources. This is even more so when they are articulated in different languages, which in this case cannot be reduced to verbal expression, but must be extended to include the myriad of ways in which things can be articulated. Bateson argues that two (or more) sources of information are enormously better than

26_ Rajchman 2000, p.4

27_ Ingold 2007, p.86

28_ Rajchman 2000, p.6

29_ Rajchman 2000, p.56

one because a combination of two or more things makes a relationship come into being through which the distinctions that exist in-between them will be expressed.³⁰ The news of these distinctions is what Bateson calls information: *'to produce news of difference, i.e. information, there must be two entities (real or imagined) such that the difference between them can be immanent in their mutual relationship'*.³¹

The 'and' signifies a device for making connections and collectives. There is always a prospect that something useful or promising can emerge from the interactions instigated by the connections made, but one can never be sure. In any case the process needs to be iterative, and therefore similar to design processes. When recursively executed a profusion can be created that forms the ground for exploring, finding and multiplying the number of productive combinations. Some of the created constructions will generate something that makes sense, but quite as often they turn out to be dead ends. One has to keep those that actually do what is needed; opening a path, creating a possibility, drill a peephole that provides a view on and eventually an access to *'problems for which there exists no program, no plan, no "collective agency", problems that therefore call for new groups, not yet defined'*.³² The consistent selection of those assemblages that are productive and having emergent properties, is identified as *'the principle of affirmation'*.³³ What does not work can be left behind or kept for a re-integration at a later stage. The point is not just to get going, but also to trust the process and keep on going, unrelenting, because in the end something is bound to come out of the (sometimes exhausting) process. But alas, there is no other way than to gradually figure things out and step by step discover, adapt and improve.

One of the potential rewards for putting the constructive/connective and also metaphoric conjunction 'and' at work, provides a methodological possibility to move away from an exclusionary either/or-logic. In *'The Hidden Order: Tokyo Through the Twentieth Century'* Japanese architect Yoshinobu Ashihara makes an illuminating connection between ways to conceptualise the world and the ways of creating the spatial conditions for a place. He provides two compelling architectural metaphors to articulate the distinction: 'the architecture of the wall' and 'the architecture of the floor'.³⁴ The first has a propensity to create high degrees of distinctness with hard and static

30_ Bateson 1979, p. 89

31_ Bateson 1979 p.78

32_ Rajchman 2000, p.8

33_ Rajchman 2000, pp.7 & 13

34_ Ashihara 1989, pp.54-56

boundaries; the second is more inclined to see things as less distinct, with permeable interfaces and interstitial spaces. The architecture of the wall upholds sharply delineated outlines, and to do so it imposes restraints on the function of architecture and the degrees of freedom for the life that develops within it. It demands the establishment of rules, norms, codes and the like, as measures to keep control, and to fix and preserve outlines. Territories are partitioned by means of highly impermeable enclosures that emphasise the distinction between either belonging to (in-side) or being excluded from (out-side). Discrete form and individual agency are prioritised. The architecture of the floor in contrast, is characterised by permeable borders with a high degree of lateral openness and horizontal connective capacities; inside and outside flow into each other. It is a conceptual system grounded in a contextual view of the world, and with a sense of collective agency that contrasts with the former where agency is seen as a property of the individual.

The ‘architecture of the floor’ is a concept that matches with an idea of construction as making assemblages/collectives. In order to be properly understood they require the careful consideration of a host of factors that operate in relation to each other in no simple deterministic way, and are susceptible to change and contradiction. Therefore one also needs to gain some understanding of the circumstances that form the setting for an event, statement, or idea, or in other words its context. The notion of context is interpreted here as the circumstances that form the setting for an event, statement, or idea, and in terms of which it can be fully understood, and not in the more restricted way in which it is more commonly used in architecture, i.e. the environment of the building (place and climate). When an individualised and de-contextualised object is taken as the starting point, it is cut loose from its history or process of becoming. *‘When one begins with the outcome, rather than with the initial event or catalyst, the chronological order of events is destroyed’.*³⁵ As a consequence their spatio-temporal context is lost. Bateson’s statement that *‘nothing has meaning except it be seen as in some context’* -if considered truthful and correct- makes the implications of upholding a floor versus wall view of architecture palpable.³⁶

The multiple assemblages constructed by using the principle of connections can also be considered as more or less complex environments in which things are not isolated, but part of and immersed in a context of other things to which they can relate

35_ Nisbett 2003, p.128

36_ Bateson 1979 pp.24 & 25

and by which they are affected. In these assemblage-environments, points of view with regard to subjects and objects can deliberately and recursively be modified. In so doing, the number of aspects taken under consideration is multiplied, and a space is created in which different features and meanings can cohabit, and where no single point of view is granted unwarranted priority over another.

Construction cannot be reduced to an assortment of material and intellectual practices situated within a highly predictable and simplified world where problems of physics predominate, and situations are only defined on the basis of distinctive and unchanging properties. The crowded co-habitations or congregations that can be established by mixing multiple modes of articulation, and by putting the practical methodological principles of connections highlighted before into practice, are artificial environments intended to be or become instrumental in the creation of more intricate, comprehensive, dirtier and more truthful contexts for understanding construction in architecture.

2

CONSTRUCTION IS

2.1

WHAT WE TALK ABOUT WHEN WE TALK ABOUT CONSTRUCTION

CONSTRUCTION IS ... CON & STRUERE

The Latin word ‘construere’, being the etymological root for the word construction, is a compound word, assembled by connecting two component words or stems –con and struere– to form one new word. This new word has a composite meaning that is different from the meanings of the two component words taken separately, much like concrete and steel that can function separately, but together form a new material with distinct capacities.

CON & STRUERE (STRUŌ)

together, with, together with	& pile, make by joining, build, erect, fabricate, make
in the company of	form, set in order, arrange, organise, dispose, regulate
in connection, along with	prepare, instigate, etc.

‘CON’ qualitatively modifies the orientation or inclination of ‘STRUERE/STRUŌ’ and through its presence, the relational meaning of the composite word becomes more prominent and explicit. The role ‘con’ plays is comparable to that of an adverb, since it determines the meaning of the word with which it is associated. The connective implications of ‘con/together’ become even more clear by association with some analogues that have a similar orientation and semantic content: ‘in the company of, collectively, in cooperation, in close association, in combination, in collaboration, etc.

Antonyms like ‘separately, individually, independently,...’ provide additional clarity and precision by emphasising the opposite, i.e. disconnection. By analogy they facilitate a link with the method that is used for achieving such an outcome, namely ‘the process of separating something into its constituent elements; decomposition into components in order to study a complex thing, concept, theory etc.’ or in other words analysis. ‘Con-Struction’ can therefore somehow be interpreted as a mirror-concept for analysis, and together they can potentially form a conceptual pair instead of being two mutually excluding and irreconcilable notions. When combined, analysis and construction can define a range for active oscillation or shuttling back and forth between putting stuff together and taking it apart. In short, construction can provide a counterpoint for analysis.

In the architectural usage of the word construction, the emphasis implicitly lies on the morpheme ‘struere/struŏ’. As a consequence tends to be the primary determinant of the meaning of the compound word. This is not entirely surprising in

view of how structure is defined as noun and verb. The Oxford Dictionary indicates that the noun refers to the arrangement of, and relations between, the parts or elements of something complex, that in turn possesses the quality of being organized. The verb refers to organisational actions, or more specifically to constructing or arranging according to a plan; giving a pattern or organization to something. Multiple entities are involved, and organising them in a certain way instigates relations amongst them. The notions 'together with/in combination/in connection' added by the stem 'con', are undeniably already implied in the term 'structure', and from this perspective one could argue that 'con' is redundant. On the other hand it also places an absolutely necessary and undeniable spotlight on its collective or congregational nature.¹ Due to the prevalence of analysis this is not a small advantage. The meaning of *struð*/structure in the composite word construction is also substantially wider than the meaning commonly associated with it in architecture, where it mainly refers to the load-bearing and bracing parts of a building, and the specialised discipline of structural engineering that determines those parts, and it should be noted that I do not connect to this more focussed use here.

To clarify the implications of the stem '*struð*/structure' for the term construction I follow cultural philosopher Suzanne K. Langer, who explains 'structure' by connecting it with the concept 'form'. The connection of 'structure' with 'form' can be confusing and not without risk in the context of architecture, because of its ubiquity and long history. It is fairly easy to get stuck into a muddle of conflicting interpretations. The reason why I use Langer's take on the subject is because she makes a fairly clear distinction between 'form as structure/arrangement/order/organisation' and 'form as shape/geometry/outline/gestalt'. The use I make of the concept 'form' in the overall context of this work is almost entirely associated with the particular interpretation of form in terms of structure/order/organisation. I prefer not to draw on the shape/geometry side of things, or at least as little as possible, simply because it is both not necessarily useful for the subject under scrutiny and confusing. Two things with a similar or same shape can be organised on the basis of different ordering principles. Take for instance a rectangular wall in brick masonry with a certain height, length and width and another with the same geometrical and metric properties in reinforced concrete. Both have the same shape-form but a (very) different structure-form.

1_ The concept of 'Congregational Agency' as opposed to 'Individual Agency', is coined by Jane Bennett in *Vibrant Matter* (Bennett 2010).

I use the shape versus structure distinction as a kind of discursive axiom. Therefore it is crucial to accept the existence of this distinction and make it hold. If it does not, my argument runs into danger of falling apart. I realise that the meaning of form is a debated philosophical issue, and that *'the ontological status of form is not agreed on'*, and on top of that it is potentially a debated architectural issue.⁴ I have no ambition whatsoever though to engage in either one of those contentious fields. Moreover, I am aware that Langer's explanations about the concepts form and structure are not recent and may not be at the forefront of present day debates, but I consider the way in which she deals with the subject very useful for clarifying and supporting the arguments I am trying to develop. This cherry-picking may be seen as a disputable practice, but it is no more and also no less than accepting that concepts are tools that must be used and be useful. It is something Hélène Frichot points at regularly and one of the many things I learned from her: *'... a word is not exhausted in its coining or invention. Words have to work, they have a job to do, and for concept-tools this is especially the case. A concept-tool ... does not simply offer a solution, nor describe a state of affairs, but challenges you to do something, to make a difference, to make a change (where change is what is needed). Concept-tools are neither good nor bad, but entirely ambivalent, achieving nothing until they are put to a specific use. ... a dormant concept that to some may appear anachronistic can be awakened again and played out across a new stage, amidst a problematic field that is troubling you right now in your environment-world'*.³ I also find it difficult to accept that the value of concepts could be inversely proportionate with their age.

Suzanne Langer indicates that form exists in many guises, from physical to grammatical and social *forms*; over psychological *types*; *norms* of conduct, of beauty, of intelligence; *fashions* in clothing, speech, behaviour; *designs* of automobiles or motorboats; architectural *plans* and buildings; to musical compositions and many other instances. Langer argues that the synonyms for 'form' she uses —types, norms, fashions, designs, plans, pattern, standard, mode, etc.— signify essentially the same thing, but in a specialised and distinct usage or with more or less subtle variations in meaning. Langer also emphasises that *'anything may be said to have form that follows a pattern of any sort, that exhibits order, internal connection'*.³

2_ Renz 2016,

3_ Frichot 2016, pp.116-117. Her arguments are based on the philosophers W. James and Deleuze/Guattari.

4_ Langer 1967, p.23

Form can range from abstract and immaterial to tangible and physical form. This is demonstrated persuasively by musical form, which is not material but 'orderliness'.⁵ In music, the variations in orderliness are referred to as rhythm, which in turn must be understood as a recursive systematic arrangement according to time, duration, intensity and emphasis. Gregory Bateson points out that rhythm can also be recognised in the domain of biology: *'The anatomy of the crab is repetitive and rhythmical. It is, like music, repetitive with modulation. ... the direction from head toward tail corresponds to a sequence in time'*.⁶ Langer concludes that all the different variations of form share a general feature that can be used to connect them together, and is identified by a concept named 'structure': *'The bridge that connects all the various meanings of form - from geometric form to the form of ritual or etiquette - is the notion of structure. The logical form of a thing is the way that thing is constructed, the way it is put together. Any thing that has a definite form is constructed in a definite way'*.⁷ Conversely, something constructed is organised in a definite way, and therefore has a definite form or structure. Order, organisation, arrangement and the specific relations that result from them, are intrinsic to the concepts form and structure, and also to their analogues anatomy, morphology and of course, 'construction'. Construction in terms of manifestation as process can thus also be understood as something that generates form and in this sense is morphogenetic or generative of structure.⁸

Defining construction as putting things together —straightforward and obvious as it may seem— is therefore a reduction, because putting or joining things together is a method, be it one that in the realm of architecture appears both obvious and inevitable, as following statement expresses: *'The body of architecture in the primary stages is construction, anatomy, putting things together in a logical fashion'*,⁹ or expressed in a different way, according to a system or set of principles that underlay the arrangements of elements. And another articulating a similar idea *'Construction is the art of making a meaningful whole out of many parts'*.¹⁰ It is good to keep in mind that this is primarily due to issues of scale, size and practicality. Langer emphasises that one must not make

5_ Langer 1967, p.23

6_ Bateson 1979, p.18 'a sequence in time' expresses process and evolution. See also section 2.II, chapter 'Time-Form'.

7_ Langer 1967, p.24

8_ In *'A Thousand Years of Non-Linear History'* (De Landa 1997/2011), Manuel De Landa's gives a prominent role to the idea of structure generating processes as drivers of evolution and change.

9_ Zumthor 2006, p.51

10_ Zumthor 1998/2010, p.11

the mistake of associating structure and form with something deliberately put together by somebody, out of parts that were previously separate. Form can be preconceived or accidental, grow naturally, crystallise, and so forth.¹¹ Although this may not be very common in architecture (yet), examples that go in this direction exist, like the churches of Lalibela in Ethiopia and the cave churches and carved out dwellings of Capadocia in Turkey for instance. More recently, Swiss architect Valerio Olgiati has advocated an architecture that is materialised as one entity with a continuous fabric, as opposed to something that is composed and assembled out of (pre-existing) parts. He argues that it can be realised by means of reinforced concrete, and the associated method of pouring. The increasingly popular constructions in loam and adobe and the procedure of 3D-printing can also be considered more akin to this idea of a continuous fabric than to the assembly of parts.

Why then make the distinction between two readings of form in the first place? Form in terms of structure signifies arrangement, orderliness or composition, and points at the co-existence of several things (members/parts/components) that are connected or related in a definite way and together ‘form’ a collective. There is always more than one thing and therefore always something or someone to relate to and with. It is a characteristic that is non-dissociable from construction, and a crucial side-effect is that complexity becomes a matter of concern that cannot be discarded or neglected. Form in terms of structure is congregational, i.e. a group-thing, whereas form in terms of shape connotes outline or contour and is an external property assigned to an individual. That individual can of course have an intricate internal composition/structure but does not necessarily have to be identified or described on that basis when it comes to its form as shape. Making the distinction affords a two-tier interpretation of the concept form which in turn provides more possibilities and versatility.

For the subsequent uses of the concept construction, two postulations are extracted from the etymological root of the term construction. The first is that the concepts form, structure and construction refer to an organisation of some sort, and the associated internal or external static and/or dynamic degree of orderliness, regardless of the method used to bring it into being. It applies to a brick or a snowflake as much as it does to a text, a wall, a plan or a building. The second is construction’s fundamental collective or congregational nature with inter-connections between what constitutes

11_ Langer 1967, p.24

it, and a complex weave of relations. Dealing with construction meaningfully requires that these two principles are taken into account together, in a composite way. It is worth noting by the way, that the methodology used for bringing the word 'construction' into existence, harmonises and synchronises with its meaning, i.e. the acts of making the word feed back into its semantic content.

CONSTRUCTION IS ... MAKING

‘Technology is simply the making of things’.¹⁰

Labelling construction in architecture as building-technology, construction technology, architectural technology or architectural engineering affirms a constrained outlook. The fact that architecture is also a technical practice causes this naming to appear logical and innocuous, because it merely indicates a more specialised or dedicated sub-domain of architecture that needs a degree of specificity and autonomy. But in order to achieve a more versatile and less restrictive re-calibration of the concept, I prefer to prioritise the core-term ‘construction’ over any of these alternatives. I consider that it includes them anyway, as well as others that cover more or less similar ground such as tectonics. Moreover, there is a crucial difference between all of them and the word construction itself, being that the latter has a verb-form and the former do not. Some exceptions in a more extensive list, are the verbs build, fabricate, manufacture, assemble, etc. but those have more restricted meanings and more limited scopes. The presence and use of verbs is primordial, because construction also unfolds as actions and happenings.

The title ‘Making is More, Exploring Latent Meanings and Capacities of Architecture’s Concept Construction’, uses a double identification of the main subject. The concept make/making is closely related to construction and it is also similar in the sense that it has both a verb-form and a broad range. I establish a connection between the concepts making and construction to introduce a broader palette, less repetition, more variation and hues. But more important, the main aim of a double conceptual labelling is not their presumed interchangeability, but to achieve an extension of meaning, to move away from homogeneity, and to inject more depth into the concept construction. A substantial overlap exists between both concepts, but at the same time some meaningful divergences too. Even if in some cases the differences may appear subtle, their potential implications are not necessarily unimportant.

To gain understanding of this issue, I selected and listed the relevant sub-entries from the dictionary definitions of the concepts construction/construct and

10_ Pirsig , p.273

making/make.¹¹ Even though the list of is long and potentially challenging to read, it is nonetheless relevant, because the words under scrutiny have multiple meanings. Moreover those meanings are not homogeneous and cover various and distinct sub-concepts. Instead of being straightforward and simple, they are actually ‘... *swamps of complexity*’.¹² From the list I extracted three thematic motifs for each of the primary concepts. I see these as ‘*both generative themes and connectives*’ (Bloomer 1993, p.153) that reveal distinctions and similarities that reach across the porous borders between ‘construction’ and ‘making’.¹³ I consider it a necessary step towards a more comprehensive understanding of construction in architecture, and towards the activation of its multiple/multiplied meanings in relation to its partner concept.

11_ I used following sources: The Apple Dictionary Version 2.2.2 (203) © 2005–2017 Apple Inc.; Shorter Oxford English Dictionary; and Wiktionary.

12_ Hofstadter and Sander 2013, p.4

13_ Bloomer 1993, p.153

14_ A similar distinction as the one mentioned here between a ‘process of organising’ and a ‘state of organisation’ was made by physicist Henri Bortoft in ‘The Wholeness of Nature, Goethe’s Way of Science’ (Bortoft 1996/2013, pp.127-128). The distinction and the reference will return later in this work, but in view of its importance I already presence it at this point.

CONSTRUCTION DICTIONARY-DEFINED

1st SET of meanings - CONSTRUCTION [noun]

- the *action* of building/constructing something (material or mental);
- the *process* of constructing;
- the *method* used (or style, or a way of doing), *in a process of organising*;
- the *constitution* or *structure*, or a *state of organisation* (the way in which something is arranged or disposed);¹⁴
- the *object*: a building/model/artefact, or another constructed thing (material or mental); i.e. anything that has been constructed;
- a *domain of activity*;
- a *domain of knowledge*;
- a geometric figure of arcs and line segments;

2nd SET of meanings - CONSTRUCTION [noun]

- the *creation* of an *abstract entity*;
- an *interpretation* or *explanation*;
- the *act* or *result* of *construing the meaning* of something;
the meaning or interpretation of a text, action etc.; the way something is viewed by an observer or onlooker;
- and more specifically related to language:
 - the *arrangement* of words according to syntactical rules;
 - a group of words arranged to form a meaningful phrase;

3rd SET of meanings - CONSTRUCT [verb]

- *build* or *make* something;
- *make by fitting parts together*; to build or *form* (something) *by assembling* parts;
- *form an idea or theory* by bringing together various conceptual elements;
form in the mind, devise;
- form a sentence; combine words according to grammatical rules; to build (a sentence, an argument, etc.) by arranging words or ideas;
- *draw* or *delineate* (a geometrical figure) accurately to given conditions;
or *by following precise specifications*;
find a geometrical construction for (a problem);
draw precisely (a geometrical figure); and
- *interpret*, understand (in a certain way);

4th SET of meanings - CONSTRUE [verb]

- *interpret*, understand (a word, action, thing, or person) in a particular way;
- *to interpret*, give the sense of or explain the meaning of something;
- deduce, infer;
- *analyse* the grammatical construction/structure of a clause or sentence; to *parse*;
analyse the syntax of (a text, sentence, or word);
- *combine* (a word) grammatically or with others;
- *to translate*;

5th SET of meanings - (a) CONSTRUCT [noun]

- an *idea* or *theory* containing various conceptual elements;
- a *group of words* forming a phrase;
- a *physical thing* which is *deliberately built* or *formed*;
- *something constructed from parts*;
- a *concept* or *model*;

6th SET of meanings - CONSTRUCTOR [noun]

- a person *who construes* or *interprets*;
- a person *who* (or thing that) *constructs*;

Based on this extensive overview of sub-entries, extracted from the definitions in three dictionaries, following particular motifs can be identified for the concept construction:

motif C.1 is the conceptual pair 'PROCESS and FORM';

motif C.2 is the couple 'CONCRETE and ABSTRACT';

motif C.3 is the concept of 'INTERPRETATION'.

The motifs point to distinct meanings and the ensuing specific perspectives on the main subject. In what follows these are unwrapped and commented upon. The aim is to instigate a more intricate and nuanced understanding of the concept. Subsequently I will move on to the concept 'making' that will be addressed in a similar way, and also will be related to its partner-concept in order to articulate where and how there meanings both correspond and diverge.

CONSTRUCTION / motif C.1- PROCESS / FORM

The noun-forms of the term construction refer to PROCESS (events / occurrences / happenings / actions ...) and FORM (static states / enduring things or objects).

Construction encapsulates these two contrasting meanings that refer to ontologically different content. In architecture our understanding of them is also burdened by a historic bias and ensuing hierarchy that favours form over process.¹⁵ This bias is not specific for architecture though. Philosopher Nicholas Rescher explains that from the time of Aristotle, western metaphysics has had a marked bias in favour of things, and that Aristotle's insistence on the metaphysical centrality of ostensibly indicatable objects made an enduring and far-reaching impact. He also argues that it does not stretch matters unduly to say that the Aristotelian view of the primacy of substance and its ramifications (see *Metaphysics IV, 2, 1000b6-11*) - with its focus on mid size physical objects on the order of a rock, tree, cat, or human being - have proved to be decisive for much of Western philosophy.¹⁶

However, when more prominence is given to process, other related topics like change, passage, emergence, time and history enter the field of view and become issues to reckon with.¹⁷ These are veiled when the emphasis is unilaterally placed on form, or in Rescher's terms: *'concentration on perduring physical things as existants in nature slights the equally good claims of another ontological category, namely processes, events, occurrences; items better indicated by verbs than by nouns. Clearly, storms and heat waves are every bit as real as dogs and oranges. ... becoming is no less important than being, but rather the reverse'*.¹⁸

He also emphasises that *'processes are not in general a matter of the doings of things'*, which is no less important.¹⁹ *The fire's heat causes the water to boil. But it is clearly not a thing. To be sure, some events and processes relate to the doings or undergoings of things (the collapse of the bridge) or of people (Smith's learning a poem). Other events and processes relate to the coordinated doings of things (an eclipse of the sun) or of people (a traffic jam). But many events and processes are patently subjectless in that they do not consist of the doings of one or more personal or impersonal agents (a frost or a magnetic field). What is at work in these self-subsistent*

15_ See also part 2_Construction Is, section 2.II Patterns of Interaction between Process and Form; part 3_Territories, section 3.II Encounters, chapter 'Things We Do Not See'; and part 5_Process and Form.

16_ Rescher 2000, p.4.

17_ See part 2_Territories.

18_ Rescher 2000, p.4.

19_ Rescher *ibid*, p.4

or subjectless processes are not “agents” but “forces”. These can be diffusely located (the expansion of the universe) or lack any real location at all (the big bang).²⁰ ‘When water freezes or evaporates, it is not a “thing” (or collection thereof) that is active in producing this result. The “freshening” of the wind, the forming of waves in the water, the pounding of the surf, the erosion of the shoreline are all processes that are not really the machinations of identifiable “things”. ... For the process philosopher, the classical principle *operare sequitur esse* [action/process follows being/form] is reversed: [the] motto is *esse sequitur operare*, since being follows from operation because what there is in the final analysis is the product of processes, ... processes are basic and things derivative because it takes a mental process (of separation) to extract “things” from the blooming buzzing confusion of the world’s physical processes’.²¹

This brings about the inevitable requirement to expand the reach of architectural construction in order for it to both include and attend to phenomena, forces, flows, intensities, gradients, etc. As far back as 1992, British architect Steven Groak already pleaded for this expansion when writing that we may have to abandon some concepts of equilibrium in favour of what he terms unstable equilibrium, and that flux and turbulence, in contrast with the static or steady state, underpin this way of examining the nature of building and its associated objects, artefacts, energies, materials and processes.²² A building could then be conceived as an unstable system in a dynamic environment; a system of barriers, filters, valves, containers, condensers, conduits, sinks and reservoirs for flows of matter and energy; a transactional and transitional matrix for flows to, from and around.²³ Stated in terms appropriate for topic at hand, it would be a form embedded in and affected by ongoing processes.

CONSTRUCTION / motif C.2- CONCRETE / ABSTRACT

All six sets of meanings (see pp.49 & 50 before) include activities and entities that can either be CONCRETE or ABSTRACT. This applies to both what manifests as process and as form. ‘*Material, object, building, artefact,...*’ are some of the nouns used in the definitions to identify concrete or tangible entities and situations, whereas ‘*mental, thing, idea, theory, geometrical figure, sentence,...*’ label more abstract ones. It should be noted however that the concept ‘*structure*’, can be applied to both spheres.

20_ Rescher 2000, pp.4-5

21_ Rescher 2000, p.7.

22_ Groak 1992, p.9.

23_ Groak 1992, pp.15 & 21.

Robin Evans clarifies that the epithet concrete emphasises corporeal properties, and abstract refers to disembodied ones. They seem diametrically opposed but are not necessarily incompatible: in the one corner involvement, substantiality, tangibility, presence, immediacy and direct action; in the other, disengagement, obliqueness, mediation and action at a distance.²⁴

The interstitial space in-between abstract things and concrete objects, or between a thing described (mode of representation) and an object made (mode of presence), or between a drawing and a building, is a process-space that is dialectical and (trans)formational. The transactions in-between abstract and concrete lead to changes in the features, character, qualities and meaning of things. In the translation something is gained and something is lost. The significance of this interstitial domain and the implications it has on architecture and construction can hardly be overstated nor taken for granted, since *'architecture... brings about its construction not directly by means of materials but by means of a projected use of materials, or, is mediated rather than being immediate'*.²⁵ Robin Evans points at the importance of this interstitial space in-between abstract images (i.e. drawings) and materialised objects in his essay *'Translations from Drawing to Building'*. He argues that *'the transmutation that occurs between drawing and building remains to a large extent an enigma'*.²⁶ This is the case even though it is not a new given that architecture is essentially a divided activity where the subject-matter (the building or space) will exist after its abstract conception and not before it.²⁷ Evans consistently places the locus of his attention on the side of drawing and projection, but only obliquely on the material processes of construction. As far as I can tell, this other side of the relational space and the transformative interstitial space itself, remain largely unarticulated and open for investigation.

The distinction between concrete and abstract is also expressed by the co-existence of the concepts construction and construing, but I consider the use of 'construing' in architecture as confusing and therefore problematic, especially in discourses about tectonics, where it is given some kind of metaphysical twist that I

24_ Evans 1997, p.160

25_ Gregotti 2010, p.87 See also part 4_Constructing With, section 4.1 Constructing With Lines; and part 5_Process and Form.

26_ Evans 1986/1997, p.160

27_ Evans *ibid.*, pp.164-165. See also quote H. Arendt on p.97, opening chapter 'The Bi-Polar and Hermeneutic Relational Patterns'.

prefer not to import in this work.²⁸ For this reason I do not use the concept ‘construe’. A remarkable and potentially far-reaching meaning mentioned in a sub-entry in the dictionary definition of construe is the following: ‘[construing is to] *analyse the grammatical construction/structure of a clause or sentence; to parse; [to] analyse the syntax of (a text, sentence, or word)*’ (see p.50 before).

Apart from the noteworthy integration of the concept analysis in a definition of construction, the definition is also significant for its explicit link with language. Since the idea of ‘construing’ is all over the place in discourses about tectonics, it is worthwhile to go into the topic. Construction in architecture is regularly typified as an analogue of language, and this is more than a unique or one-off figure of speech. For example, in Sverre Fehn’s *‘The Thought of Construction’*, one of the chapters bears the title *‘The Language of Construction’*.²⁹ In the preface of the book co-author Per-Olaf Fjeld writes: *‘Architecture must again become a means of conversation’*.³⁰ Another case in point is following statement from Peter Zumthor: *‘The sense that I try to instil into materials is beyond all rules of composition, and their tangibility, smell, and acoustic qualities are merely elements of the language that we are obliged to use’*.³¹ And one of the more compelling examples is Christopher Alexander’s *‘A Pattern Language’*.³²

This issue of particular pertinence for the reason that language is a mediating technology that in view of its influence cannot be taken for granted, nor can the way it is structured be imprinted on architectural construction just like that.³³ This is nonetheless exactly what happens in the textbook *‘Constructing Architecture: Materials, Processes, Structures’*. It provides a clarifying glimpse into how construction can be (and is) conceptualised in architecture. I start from a telling extract from the preface, written by Andrea Deplazes:

‘When, for example, a literary work is translated into another language the use of the correct grammar or syntax is merely a technical prerequisite - a

28_ See ‘Tectonic Re-Visions’ in part 3_Territories, section 3.II Encounters.

29_ Fehn/Fjeld 1983, p.39

30_ Fehn/Fjeld 1983, ibid, p7

31_ Zumthor 1998/2010, p.10

32_ Alexander XXXX, p.xx

33_ Robin Evans 1995/2000, p.xxxvii): *‘We would ... be well advised ... to resist the temptation that presents itself and which has already proved irresistible to some. We must not assume that a certain resemblance gives us leave to treat ... two situations as identical, taking terminology, arguments, and conclusions lock, stock, and barrel from literary theory, plastering them onto architecture, and calling the result a theory of our subject. Likeness is not identity; orthographic projection is not orthography; drawing is not writing and architecture does not speak’* (Evans 1995/2000, p.xxxvii).

conditio-sine-qua-non. The important thing is to reflect coherently the sense and the atmosphere of the original text, which in certain circumstances may itself have a specific influence on grammar and syntax. Architecture is similar: although it is not a language consisting of sounds, words or texts, it has a material vocabulary (modules), a constructive grammar (elements) and a structural syntax (structures). They are the fundamental prerequisites, a kind of "mechanics of architecture". This also includes the technical and structural basics which establish a set of rules and regulations of construction principles and know-how that can be learned and which are wholly independent of any particular design or construction project'.³⁴

Deplaze's statement is an exemplar of how language is used as a model for a systematic and hierarchical organisation of the knowledge about construction in architecture; and as a legitimisation for a linear and incremental logic of construction's procedures and processes. The rationale is based on a sequence ranging from (relatively) small and individualised parts, which are subsequently combined/assembled with other parts, to eventually form a (relatively) bigger and more elaborate whole. This directionality is articulated explicitly as '*the sequence of architectural construction as an additive chain from small to large*'.³⁵ From a mechanistic point of view this logic can also be applied to a word for instance, since it is formed by putting letters together.

The self-proclaimed similarity between the organisational hierarchy of construction - evolving from units to a fabric of components- with that of language's strings of letters, words, sentences and paragraphs as components of a text seems self-evident. Ultimately all the parts together will form the finished building, as much as words together form finished sentences, and ultimately a meaningful text. This final stage harmonises neatly with the notion of a work of architecture as a physical construct that embodies a construed symbolic meaning.

One of the co-authors explains that out of so-called meaningless materials, modules are formed as basic building units. The formative process, selection and usage of material(s) are thought of in terms of architectural sense-making: '*The raw material, ..., remains "meaningless" in the architectural sense as long as it is "unreflected", i.e. its potential for cognition remains concealed*'.³⁶ This is a point of

34_ Deplazes ed. 2005, p.10

35_ Deplazes ed. 2005, p.12

36_ Deplazes ed. 2005, p.12

view that has been expressed by others in similar ways; for instance Sverre Fehn: *'A given material in itself expresses no constructive thought. It remains anti-social and removed from discourse'*; ³⁷ Peter Zumthor: *'Sense emerges when I succeed in bringing out the specific meanings of certain materials in my buildings, meanings that can only be perceived in just this way in this one building'*; ³⁸ and Herzog & de Meuron: *'Materials lend their reality to our experience of an architectural idea, but only in so far as they give body to the cognitive model the architects offer up for consideration'*. ³⁹

Once these modules are brought into existence, the idea is that they will *'exhibit their own inherent "tectonics", their own inherent jointing principles which are present in the second production stage'*. ⁴⁰ It is worth noting that the notion of (tectonic) meaning that is played out at this scale of small units, can also be recognised on a different level, i.e. that of the architectural detail and its semiotic meaning, which enjoys high esteem in architectural discourse. *'Details are much more than subordinate elements; they can be regarded as the minimal units of signification'*. *The detail is seen as the locus where two faces of technology, i.e. mental construing and actual construction, are supposed to meet and unify'*. ⁴¹

In the second stage, modules are themselves combined to form bigger units called *elements*; alternatively named components or semi-finished goods. The term 'semi-finished' applied to building parts, is an example of disciplinary language with hidden pre-suppositions: *'...semi-finished elements are industrially produced building elements manufactured of raw materials. They are system-neutral and can be utilised in a great range of different building systems'*. ⁴² In construction-technology, semi-finished elements are most often pre-fabricated constituent parts with specific properties, like beams, plates, blocks, etc. They are in fact finished objects in themselves, and ready to be applied, used or put into practice. Using the logic of tectonic discourse and terminology, they are fully ready to be given meaning to or made sensible. On the other hand they are semi-finished in the sense that they are not meant as an end stage in a process. They are intentionally made with certain properties, and they need to be adapted and connected to other parts in order to make their capacities actual in an

37_ Fehn/Fjeld 1983, p.46

38_ Zumthor 1998/2010, p.10

39_ Ursprung Ed. 2002/2005, p.55

40_ Deplazes ed. 2005, p.12

41_ Frascari 1984

42_ Staib, Dörhöffer, Rosenthal 2008, p.43

assemblage. In so doing, they are transformed from semi- to fully-finished. It would therefore be more accurate to say that the closure that is performed, finishes them for a second time, but in a different context and at another level. The label 'system-neutral' is itself also a remarkable pre-supposition. Versatility, or the ability to be used in different constellations, can indeed be claimed, but in most cases the (semi)-finished items are definitely not (system)-neutral, because they have specific properties that incite certain uses and makes others more difficult. For example, the geometry of semi-finished steel profiles and wooden beams, is most often orthogonal and linear. This subsequently leads to results that are in accordance with these properties. Their combinations most easily induce the creation of constructions with orthogonal geometries, and makes them less adequate for making more fluid or smooth, curved or free-form shapes; unless one is ready to accept a segmented approximation. In that case, their geometry remains a distinctive characteristic in the assemblage, and if not desired they must be covered to make them invisible.⁴³ Building blocks like bricks have a propensity for more or less massive morphologies created by means of a method of stacking, whereas linear elements like steel profiles will mostly lead to a filigree or skeleton-like system. This inclination towards certain kinds of outcomes as opposed to others, is an indication that so-called semi-finished items are not system-neutral, and one can wonder why it is relevant to claim this neutrality in the first place.

Correlations between language-constructs and architectural constructs can indeed be made, since they both show an ordering of some kind, but the straightforward and unquestioning way in which it is often done, both in Deplazes 'Constructing Architecture' and elsewhere, makes it appear simple and not in the least problematic. However, the framing unknowingly gives increased credibility to some long-lasting architectural preconceptions, such as: a clear-cut distinction between a generic and self-enclosed (language-)system and the particular (language-)content; the thought that the process of formation is uni-lateral and uni-directional; An implicit legitimization of the idea that the meaning of the work is created by an author-architect, who shapes and organises otherwise meaningless and passive matter.⁴⁴

43_ Frank Gehry's Guggenheim Museum in Bilbao is an exemple of this, but other examples abound.

43_ The collection of statements mentioned some paragraphs prior (Fehn, Zumthor, Herzog & De Meuron, Frascari) are examples of a stance supporting that it is not only form that is given to matter or substance by men, but that also its meaning is. In 'Mind and Nature' and 'Steps to an Ecology of Mind' Gregory Bateson provides ample arguments and examples demonstrating that meaning is not limited to the human realm, and by extension that claiming otherwise is both mistaken and a form of self-conceit.

These thoughts run through the whole chain from small to large, and from the abstract and representational to the tangible. In so doing architectural design and construction are likened to the writing of a text in which architecture's physical components become equivalent to language's abstract components used to construct a discourse. But the interpretation of language used by Deplazes follow the theoretical model of 'structural linguistics' that coins a number of notions and distinctions that can be recognised within views held on architectural technology and construction as well. This does not mean that one originates from the other or vice versa, but merely that they are akin on some accounts.

In structural linguistics a distinction is made between '*langue*'(Fr.), being the language-system or code; and '*parole*'(Fr.), which is the realm of language-use, or the realisation of the system in individual utterances.⁴⁵ Language is parcelled into a self-enclosed and abstract theoretical system on one side, and a realm of practice in which particular content and individual instances are generated. The former is considered objective, fixed, and based on both general and shared properties, common to all. The latter is subjective and changing, as it is modified according to its use within situations. The division between construction-technology as the theory about the system on one side, and construction-practice, i.e. building, on the other is analogous. This does not mean however that the content of the formalised knowledge about technology does not evolve, but rather that its claimed universal validity is considered established, unchanging and beyond question. In the case of construction, this division can be illustrated by some statements taken from Deplaze's preface (see citation on pp.54-55)

At first the ideas on grammar and syntax: '*... the use of the correct grammar or syntax is merely a technical prerequisite - a conditio-sine-qua-non. ... They are the fundamental prerequisites, a kind of mechanics of architecture*'. Noteworthy is the highly ambivalent nature of the association of the term 'merely' with the terms 'prerequisite' and 'fundamental'. Conceptualising and formatting architectural construction as language, in the way that Deplazes and others do, is an open invitation to engage it in accordance to that very framework. Following this line of thought, the use of the correct words, grammar and syntax - or in terms more adapted to the context of construction; the use of the correct compositions, components and rules of combination and transformation is indeed considered a preliminary condition for making valid constructions, i.e. a thing that is required for something else to happen or

45_ Ricoeur 1981/2004, p.29

exist. It seems not to really matter whether construction (as object or product) refers to buildings or sentences. One could argue that these are indeed requisites; but whether they are pre-requisites, i.e. things that have to be granted precedence and assigned primacy, should be subject to questioning. It suggests that meaningfulness comes from the correct application of predetermined rules, rather than emerging from activities and the exchange of information in time and place/context. It affirms the idea that the creation of architectural meaning lies elsewhere, that is, with the writer, which in architecture is a synonym for the architect.

A second telling example is the assertion that immediately follows the previous one, and states that technical and structural basics are completely independent from the particular manifestation that originates within both practices of realisation or building, and practices of use or dwelling: '*... This also includes the technical and structural basics which establish a set of rules and regulations of construction principles and know-how that can be learned and which are wholly independent of any particular design or construction project ...*'. The statement corresponds with a technical-scientific apprehension of language as expressed in structural linguistics, stating that the language-system is independent from context and practice, or simply stated, from what is said with it. This tendency is exacerbated by a predominantly abstract and detached take on architectural construction. In architectural education, learning construction is predominantly de-contextualised, made autonomous from practice and process, and based on static entities with fixed properties. It is embedded in a realm of representation, image, notation in symbols and code; and imposes a hierarchic dominance of a remote approach to construction. Priority is given to the knowledge that can be fixed by inscription in textbooks, in a format that is independent from the particular embodiments in time and place. When we deal with construction as technology in this sense, construction is not something to be performed, but something to be read and listened to.

CONSTRUCTION / motif C.3- INTERPRETATION

A third recurring theme that runs across all variations of the concept construction is INTERPRETATION. In 'The Nature and Art of Workmanship', David Pye articulates the importance of interpretation in fairly clear terms: '*The workman is essentially an interpreter. ... The judge, the pianist and the workman are interpreters. Interpreters are always necessary because instructions are always incomplete... . No drawing,*

however fully and minutely dimensioned, can ever be more than a sketch as regards the appearance of the thing drawn. The eye and mind discriminate things which can never be specified or dimensioned: the qualities and colours of surfaces, the minute variations of profiles, and still other nuances of shape too tenuous and subtle to describe in practice'.⁴⁶ Interpretation takes a particular place amongst the motifs, because it occurs in-between. Examples are the interstitial and connective zones between process and form (motif C.1), and between abstract thing and tangible object (motif C.2).

Robin Evans addressed the subject too and explicitly acknowledges its importance, as do Jonathan Hale and Jeremy Till. Jonathan Hale establishes a connection between three *'historically separate, but thematically closely related conceptions'*. The first is Karl Marx's concept of *'two complementary forms of creative experience, as maker and user'*. The second Marco Frascari's concept of *'symmetry between the process of constructing and both inhabiting and interpreting architecture'* (ibid. p.201); and the third is Paul Ricoeur's hermeneutics (the philosophy/theory and methodology of interpretation), which Hale transforms into a *'hermeneutics of architecture that involves a double process of interpretation: both of the space behind the work and, ... the space in front of the work'*.⁴⁷ Time is introduced by referring to a before and an after, and in the same vein the related presence of a history and a future is suggested. The three conceptions also reveal relationships between formation and use (both are processes); and between sensory experience and mediating technology. Taken together they can provide a context to evaluate and calibrate the relationship between (dynamic) processes and (fixed) states/forms.⁴⁸

Jeremy Till approaches the issue using another referential framework, namely sociologist and philosopher Zygmunt Bauman's distinction between legislators and interpreters. Till argues that architects and architecture need the interpreter's type of thinking, because that would enable them to both accept and deal with contingency, uncertainty, imperfection, ambivalence and lack of order as inescapable features of life and thought. The interpreter's way of thinking is agile and swift rather than rigid and fixed, and the position is one of a situated practitioner and sense-maker who does not assume that there is a perfect answer. In contrast, the legislator's perspective is that of an external observer who sees the world as an ordered totality that can be controlled.

46_ Pye 1971/1995, p.55

47_ Hale 2014, pp.201-202

48_ For an elaboration of this topic I refer to section 2.II 'Patterns of Interaction Between Process and Form', chapter 'The Bi-Polar and Hermeneutic Relational Patterns'.

'Faced with conflicting demands, as any architect inevitably is, the legislator will attempt to smother them through imposition, while the interpreter negotiates with them'.⁴⁹ Till inevitably also makes the connection with hermeneutics, and argues for its necessity by quoting philosophers John D. Caputo and Nicholas H. Smith: '[hermeneutics] pits itself against the notion that human affairs can finally be formalized into explicit rules which can or should function as a decision-procedure', and that needs the idea of contingency 'to define [hermeneutic's] theoretical outlook and practical momentum ... in opposition to the idea that the correct grasp of a matter can be gained by following neutral methodological or procedural rules, hermeneutics insists that what counts as a sound understanding cannot be fixed in advance of the contingencies of real engagement'.⁵⁰

Finally, Robin Evans refers to it in terms of the observer's imagination. In the essay 'Architectural Projection' he writes: *'Projections - the invisible lines that relate pictures to things - are always directional. Drawings arrest and freeze these vectors [i.e. form], but even in this fixed state, projected information can be mobilised [i.e. process] by the imagination of the observer'.⁵¹* One of the observers he refers to as a case in point is a workman looking at a workshop drawing. For the sake of accomplishing her/his task, he or she must imaginatively activate the *projected information* (drawing, image, picture, diagram, etc.), or in other words, translate it.

A brief interruption to raise a concern is necessary here, because the label 'observer' used by Evans is, as far as I am concerned, not adequate in a context of construction processes (or design processes for that matter). It implies remoteness and the point of view of an onlooker rather than that of a participant. Constructors are implicated in the processes of construction, and wilful actors that affect what happens in the event spaces of construction. They are not passive bystanders, but those who construct and in doing so have to actively construe or interpret the information provided to them. Evans obviously acknowledges that, which makes the choice of the word observer to name those participants even more unfortunate.

This being said, we can return to the important topic raised by Evans and a pertinent question he puts forward: *'Yet is there not, in fact, a constant interplay between the passive portrayal [i.e. form] and the active remodelling [i.e. in a process] of reality?',* and then adds the crux of the matter: *'The observer's imagination ... complicates*

49_ Till 2009, pp.163

50_ Till 2009, pp.164

51_ Evans 1989, p.19

the simple two-way traffic between things and their pictures, causing unpredictable diversions and re-routings'.⁵² And these are a consequence of interpretation, because to a large extent, the unpredictability is caused by the fact that the observer's imagination is interpretive and intricately enmeshed in the relationships between the persons who interpret, the information that needs to be interpreted, and finally the conditions that a given context imposes and in relation to and within which it has to be performed. To cite Evans again: *'Imagination is not held within the mind, but is potentially active in all the areas of transition from persons to objects or pictures [i.e. in process]'*.⁵³ In another place he frames it as follows: *'What connects thinking to imagination, imagination to drawing, drawing to building, and buildings to our eyes is projection in one guise or another, or processes that we have chosen to model on projection. All are zones of instability'*.⁵⁴ And again, this is due to interpretation. What happens in these always particular and non-generic zones cannot entirely be predicted nor totally controlled, even though the tendency to do so is sedimented in architecture's culture.

At this point I put a provisional end to the non-exhaustive description of the motifs extracted from the dictionary definitions for the concept construction. The next and necessary step to take in order to unpack and clarify the meanings of the conceptual partnership making/construction, is to go through the same procedure for the concept make/making, that is, make an overview of the relevant sub-entries from the dictionary definitions, and subsequently extract the motifs establishing both the correspondences and the distinctions between the two concepts. The following pages of this section contain the outcome of that work.

52_ Evans 1989, p.20

53_ Evans 1995/2000, p.363

54_ Evans 1995/2000, p.xxxi

MAKING DICTIONARY-DEFINED

7th SET of meanings - MAKE [verb]

- *form* (something) by putting parts together or combining substances; create; produce by combination of parts or ingredients, by giving a certain form to matter, by extraction, or by modification of some other substance; construct, frame, fashion;
- *cause* (something) to exist or come about; bring about. (establish, give rise to,... cause the material or physical existence of something; produce by action, bring about a condition of things or a state of feeling; inflict; produce (a hole, a mark, a sound, etc.); create or take part in the creation of ...;
- *compel* (a person or thing) to do something ..., *cause* (a thing) to be done;
- *constitute*; amount to; establish or create structure, order, organisation;

8th SET of meanings - MAKE [noun]

- the *structure* or composition of something; the manner in which a thing (natural or manufactured) is made; style of construction, kind of composition; build of body; origin or type of manufacture, a brand.
- *doing, action*; esp. manner of action or behaviour. - refers to way of doing something, the *method*, procedures used;

9th SET of meanings - MAKING [noun]

- the *process* of making or producing something; the action of making; production, preparation, appointment, doing, performance (of a specified action), conversion into something.
- (makings) *the essential qualities needed for something*; the *way in which* a thing or person is made; conformation, form, shape, build; the material out of which something may be made; *the potentiality of becoming something*.

Combining this second series of specific dictionary-definitions for the concept make/ making (sets 7 to 9) with the previous one for construction/construct (sets 1 to 6, see pp. 49-50), makes it possible to establish a two-levelled identification of features that are either shared by both (level 1 - convergences) or set them apart (level 2 - divergences).

level 1 - meaningful **CONVERGENCES** between construction and making:

The majority of meanings for both make/making and construction/construct/construe coincide, since for both of them they include the concepts:

- **FORMATION** (building, assembling, fitting, arranging, ...)
- **CAUSATION** (giving rise to, bringing into being or existence, ...)
- **CONSTITUTION** or **STRUCTURE**.

level 2 - meaningful **DIVERGENCES** between construction and making:

The concept-cluster construction/construct is distinct from the concept-cluster make/making with regard to:

motif C.2 **CONCRETE / ABSTRACT**, and

motif C.3 **INTERPRETATION**.

In the various definitions of make/making, both are either absent or implicit to the point of invisibility.

The concept-cluster make/making in turn, incorporates three additional meaningful concepts that remain unarticulated in the former. By analogy to these are framed as distinctive concept-motifs

motif M.1 is '**FORCE**', highlighted in the definitions by the verb '**COMPEL**';

motif M.2 engages two concepts associated with the concept '**QUALITIES**';

motif M.3 is the concept '**POTENTIALITY OF BECOMING**'.

The mere presence of three additional motifs indicates that joining and cross-cutting apparently similar concepts and set-up a reciprocal relationship between them holds a potential for extending their reach. Whether this expansion is meaningful and potentially generates more possibilities will hopefully become more clear in what follows

MAKING / motif M.1 COMPEL - FORCE / POWER

The concept [to] 'compel' is situated in the verb-series of meanings of [to] 'make'. Compelling is always an action or a series of actions to force or oblige (someone) to do something or bring about (something) by the use of force or pressure'.

In *'The Human Condition'*, Hannah Arendt writes that *'Fabrication, the work of homo faber, consists in reification. Solidity, inherent in all, even the most fragile things, comes from the material worked upon, but this material itself is not simply given and there, like the fruits of field and trees which we may gather or leave alone without changing the household of nature. Material is already a product of human hands which have removed it from its natural location, either killing a life process, as in the case of the tree which must be destroyed in order to provide wood, or interrupting one of nature's slower processes, as in the case of iron, stone, or marble torn out of the womb of the earth. This element of violation and violence is present in all fabrication, and homo faber, the creator of the human artifice, has always been a destroyer of nature'* (Arendt 1958/1998, p.139).⁵⁵ Architecture produces tangible works intended for human habitation and strives for their durability and solidity. In order to do so it appropriates the fabric of the earth, both places and matter, and transforms them into resources and instruments. Architecture's works shape and constrain the natural and artificial human worlds of which they are part and by means of which they are produced. The implications are wide-ranging, affect on multiple scales, over extended periods of time, and are often disruptive and violent. Architects participate in the productive processes of architecture and therefore bear a responsibility for what architecture induces, as do all other participants in the architectural production process.

In *'Vibrant Matter, A Political Ecology of Things'*, political theorist Jane Bennett points at an alternative approach and makes a call to acknowledge the world's 'vitality' or 'vibrancy', by which she means *'the capacity of things - edibles, commodities, storms, metals - not only to impede or block the will and designs of humans but also to act as quasi agents or forces with trajectories, propensities or tendencies of their own'*.⁵⁶ Her basic argument in favour of this is worth quoting:

'Why advocate the vitality of matter? Because my hunch is that the image of dead or thoroughly instrumentalised matter feeds human hubris and our earth-destroying fantasies of conquest and consumption. It does so by preventing us from detecting

55_ Arendt 1958/1998, p.139

56_ Bennett 2010, p.viii

(seeing, hearing, smelling, tasting, feeling) a fuller range of the non-human powers circulating around and within human bodies. These material powers, which can aid or destroy, enrich or disable, ennoble or degrade us, in any case call for our attentiveness, or even “respect” (...). The figure of an intrinsically inanimate matter may be one of the impediments to the emergence of more ecological and more materially sustainable modes of production and consumption’.⁵⁷ Bennett puts the finger on a general attitude that also pervades architecture and legitimises the use of power to predict, control and dominate^{2,30}: the power to force things in a certain shape; the power to force processes in certain directions, the power to impose one’s own interpretation and create meaning, the power to claim and appropriate places, matter and energy; the power to direct people, etc.⁵⁸ Looking at these issues from Bennett’s perspective may instil a more cautious approach.

The following illustrative example for a force-based way of thinking that also reconnects with Arendt’s examples on materials, expresses a characteristic biased value-judgement that seems to validate unilateral dominance: *‘We talk as though the material of itself conferred the quality. Only to name precious materials like marble, silver, ivory, ebony, is to evoke a picture of thrones and treasures. It does not evoke a picture of grey boulders on a dusty hill or logs of ebony as they really are - wet dirty lumps all shakes and splinters! Material in the raw is nothing much. Only worked material has quality, and pieces of worked material are made to show their quality by men, or put together so that together they show a quality which singly they had not. “Good material” is a myth. English walnut is not good material. Most of the tree is leaf, mould and firewood. It is only because a workmanlike felling and converting and drying and selection and machining and setting out and cutting and fitting and assembly and finishing ... that a very small portion of the tree comes to be thought of as good material’.*⁵⁹ This statement does not leave much room to see matter and material as something that has worth in itself. If we have to believe what Pye writes, only matter that has gone through the hands of a human and has been manipulated, modified and formed by those hands and its extensions, has quality, and thus value. What is easily forgotten, is that the capacities of the matter that supposedly has to be worked ‘upon’ provides the possibilities for making and shaping in the first place.⁶⁰

57_ Bennett 2010, *ibid.* p.ix

58_ See also part 3_Territories, section ‘Encounters’, chapters ‘Tectonic Re-Visions’ and ‘Queer Bricks’.

59_ Pye 1971/1995, p.18

60_ This topic is attended to in making motif M.3- ‘Potentiality of Becoming’ hereafter.

A degree of power and the capacities to exercise it is necessary for making an artificial world and its material objects. Force, violence and violation are inherent to it, and frequently unavoidable. But taking the implications of these power-issues into consideration is necessary. Although I address this ambivalent theme only indirectly, I consider it relevant to state my personal position on the subject, and for this purpose I use a statement about Gilles Deleuze's philosophy: '*...Difference is difference in degrees of "power"; in interpreting this term we must distinguish the two French words puissance and pouvoir. In social terms, puissance is immanent power, power to act rather than power to dominate another; we could say that puissance is praxis (in which equals clash or act together) rather than poiesis (in which others are matter to be formed by the command of a superior, a sense of transcendent power that matches what pouvoir indicates for Deleuze). In the most general terms ..., puissance is the ability to affect and to be affected, to form assemblages or consistencies, that is, to form emergent unities that nonetheless respect the heterogeneity of their components*'.⁶¹ Simply stated, I personally endorse a position that sees construction in terms of working together with, rather than as both working upon or imposing, and working against or opposing; both by means of force. Stated in the classical terms used in the previous quote, I wish to see architectural construction and technology in terms of praxis, rather than in terms of poiesis, which as far as I am concerned appears as the predominant outlook now.⁶²

MAKING / motif M.2 QUALITIES / PROPERTIES and CAPACITIES

In the sub-entry of the definition qualities is depicted as '(makings), the essential *qualities* needed for something' (see p.63 above). The meaning that is actually intended in the phrasing remains somewhat ambiguous, but for the subject at hand I consider it to refer to both characteristics and capacities, since both terms are mentioned in the thesaurus. As a consequence qualities is not interpreted here as a means of relative measurement of either a standard of something in comparison to something else or a degree of excellence. Specifically for the second motif, the term qualities will refer to properties (attributes, features, and the like) and to the potential or ability to do, provoke or incite something.

61_ The Stanford Encyclopedia of Philosophy; <http://plato.stanford.edu/entries/episteme-techne/#3>; accessed on 19 February 2016.

62_ I use the classical terms as a link with above mentioned quote, regardless of other possible scholarly interpretations that can be given to them.

Properties can be classified in a number of types, for instance categorical and dispositional properties; immanent, latent and emerging properties; first and second order properties; essential and accidental properties and so forth. I need to emphasise that I will limit myself to those properties that are labelled intensive and extensive.

I do so because I consider them useful for the concept of construction in architecture. The other type may well be too, but I have either no particular knowledge about them, and moreover I do not wish to mingle in the philosophical debate about them. As a consequence they will remain outside the scope of this theme.

Intensive and Extensive PROPERTIES

Physical properties such as length, area, volume, amount of energy and number of components are extensive. Examples of intensive properties are speed, temperature, pressure, density, concentration, etc.⁶³ Extensive properties are fixed, discrete, can be sub-divided and can be both represented and made geometrically, meaning that a plan of a building is a map of extensive properties. Intensive properties cannot be divided spatially, and need to be understood in terms of degrees or gradients. According to philosopher Manuel De Landa two additional features have to be taken into account for intensive properties. The first is that intensive differences drive processes and provoke generative interactions. They are productive because they provide the energy needed for a morphogenetic system to modify and transform. The second feature is that intensive properties exhibit critical thresholds, that is, singular moments when certain conditions induce a change in quality, like water transforming from liquid to ice *or* snowflakes. Note that the conjunction 'or' in this case refers to a bifurcation in the process of formation. On one side it can lead to the solid and relatively uniform ordering of ice, which According to De Landa is an example of a non-productive repetition without difference. On the other it leads to the geometric multiplicity of snowflakes, which in turn is an example of productive repetition with difference, because it generates morphological diversity.

The extensive and solid partitioning of space by means of architectural artefacts causes differentials in the magnitude of energy in an environment, both in interiors and surroundings. These intensive differences are invisible drivers of often invisible movements of thermal energy, air, humidity, etc. The presence of the building causes a change in the energy flows acting in a certain place, and in so doing it gives

63_ De Landa 2006/2009, p.6

rise to modifications of climate and environment on a micro-scale. At the same time a building is not only a cause but also a response to intensive phenomena that already exist in a place. In the great majority of cases the architectural response to the inherent energetic dynamics of climate and environment is realised by static means and solid material compositions.⁶⁴ This results in more or less petrified objects that create segmentations in climate zones, and attempt to counteract energy exchanges and flows resulting from intensive differences. Previously mentioned architect Steven Groak refers to the latter as flux and turbulence—in contrast with static or steady states—and proposes to use these concepts of flux, turbulence, movement and change to underpin the ways of examining the nature of building and its associated objects, energies, materials and processes.⁶⁵

Architects Philippe Rahm and Hiroshi Sambuichi propose corresponding ways of dealing with architecture, and question the traditional focus on visible and static physicality of architectural works. They consider the dynamic and intensive processes in an environment as constitutive material for conceiving and making architecture, and in so doing they attempt to extend the range of architecture and construction, or even shift the paradigms from extensive to intensive.

Philippe Rahm argues that we have to move away from a view of architecture that frames it in terms of [static] surface and volume [shape], and is organised on the basis of programmatic concerns and functions. As for him, meteorology, climate and physiological atmosphere should not be seen as something external that imposes additional constraints and requires a technical response. According to Rahm they need to become the aim of architecture: *'The matter is not simply to accept them, but to make sure that the physical elements of climate like for instance pressure, temperature, and relative humidity, become the matter of architecture, the new tools of architectural design' ... 'to shift our focus away from a purely visual and functional approach towards one that is more sensitive, more attentive to the invisible, climate-related aspects of space. Slipping from the solid to the void, from the visible to the invisible, from metric composition [i.e. based upon extensive properties] to thermal composition [i.e. with intensive properties], from structural thinking to climatic thinking, from the narrative*

64_ Some components or (sub-)systems can be more responsive or dynamic of course, like thermostats, pressure valves, regulators of humidity and ventilation, sun-shading systems, etc.

65_ Groak 1992, p.9

to the meteorological. Architecture as meteorology opens up more sensual, more variable dimensions in which limits fade away and solids evaporate. The task is no longer to build images and functions but to open up climates ... landscapes and novel geographies'.⁶⁶ Rahm argues that voids or space must be composed and materialised as stratifications of temperatures, as tracings of air and its movements and rhythms of renewal, as levels of relative humidity, etc.⁶⁷ Phenomena of conduction, convection, radiation, pressure, evaporation, and physiological processes like respiration, transpiration, physical activity, and other transitory meteorologies must become the paradigms of contemporary architecture. Rahm extends the range of architectural means by re-conceptualising physical regularities in terms of architectural matter and material. In this way he upends an attitude towards climatic phenomena that is mainly reactive and defensive, and introduces recursive and transformative phenomena into the architectural equation. However, it is important to note that Rahm establishes or creates climatic geographies and conditions that are fully dependent on detailed prediction, monitoring, manipulation and control. In this sense he is also part of an architectural tradition that puts technological and scientific means at centre-stage in the relation between human, architecture and environment: '*... for Rahm, technology is a tool for defining a place. ... Humans are part of his environments only to the extent that they will insert themselves into a given system in which the atmospheric conditions are all determined*'.⁶⁸

Hiroshi Sambuichi in turn identifies environmental intensive processes in terms of 'moving materials', and describes them in following terms: '*In my mind the form and appearance of architecture derives from the speed, direction and density of various materials. Moving materials such as water and air are especially important in this respect. Although local topography and climate generally dictate the speed and direction of water and air, architecture can also accomplish this. Architecture is, by nature, a product of our desire to change the speed, density, and direction of water, wind, and other moving materials*'.⁶⁹ '*In an ideal architecture, if one looks at its*

66_ Rahm 2009, pp.7-9

67_ Rahm/Scuderi 2014, p.56 completes the argument '*Architects regularly claim that the main subject of their discipline is "space". Indeed, this is traditionally what differentiated architecture from structure: we can enter inside a work of architecture where we have to stay outside of a sculpture, in front of it. If sculpture deals with the solid and its forms, architecture must treat the void and its atmosphere. But until recently, architects have been unable to define the void in another way than designing the solid around it, ...*'.

68_ Borasi 2006, pp.47-48.

69_ Sambuichi 2011, p.9

form, the moving materials ..., such as the wind, water, and sun will become visible'.⁷⁰ Sambuichi attempts to capture the rhythms and metamorphoses of climate and environment in architecture's fabric. His responses are based upon a meticulous long-term observation in context in order to experience and register the dynamic processes in an environment first-hand, and are less technology-driven and based on mechanistic control than Rahm's. A paragon of what his focus on environmental material dynamics can induce, is the observatory on Mount Rokko near Osaka, Japan. It addresses the extensive expressive scope and versatility of water as an architectural material: ranging from the fluidity of the liquid that answers to gravity to vapour's ephemerality escaping it, and from ice's density and hardness to snowflake's fragility and softness. The architectural artefact and the particular climatic conditions of a specific place determine each-other reciprocally, and find an eloquent expression in water's recurrent cyclical transformations. What is constructed is a complex system with its singular energy-scapes and embedded generative interactions. It is not reduced to a defensive architectural object that opposes the place where it dwells.⁷¹

The search for a persuasive and intricate relation of architectural form with environmental locus can evidently be related to age-old architectural themes formulated in another time-frame. It can be seen as a re-interpretation implemented with both new and existing understandings of material processes for which many expressive examples can be found in architecture's rich history. Although Rahm's and Sambuichi have distinct attitudes towards these issues, they both address a similar concern, namely the necessity to integrate matter's vibrancy into architecture and the ways in which we apprehend its construction. Rahm and Sambuichi demonstrate that the dynamics of intensive processes can deliberately be part, or become part again, of architecture's material means. They also show that the dominance of the static, the immutable, the permanent is not inevitable but a choice that can be questioned. Moreover, there also seems to be a shift of position, from a defensive attitude against problem generating conditions, towards one that is more open and inclusive of the dynamic generative capacities of intensive processes in an environment. In short, a possibility to do it otherwise exists.

70_ Sambuichi 2016, p.9

71_ See also part 3_Territories, section 'Encounters', chapters 'Paradox of Language 1 - Nouns and Verbs / Objects and (Inter-)Actions' and 'Paradox of Language 2 - Modes of Articulation / Suspicion and Generosity'.

CAPACITIES

Wholes and parts and their interrelations are pervasive and inescapable subjects in the domain of construction and architecture in general. The reference used throughout this work for understanding part-whole mutuality is Manuel DeLanda's interpretation of Gilles Deleuze and Félix Guattari's concept of 'assemblage'.

De Landa describes an assemblage as a whole constituted out of parts that has properties of its own, emerging from the interaction of the parts with each other. An assemblage is therefore irreducible to the properties of the parts individually. Besides, the parts must interact and in those interactions they must exercise (some of) their specific capacities. This means that their capacities must be actual in the relationships and cannot remain virtual. It is the particular combination of these interacting capacities of parts and the type of relations they have that generates the specific emergent properties of the whole. Without the interactions and the capacities being exercised, the emergent properties of the whole would not exist or disappear. Without emergent properties, a whole is not an assemblage but a mere collection of non-interacting parts.⁷²

The concept 'assemblage' involves a noteworthy distinction between properties and capacities. Any given entity has a number of properties that are always actual such as dimensions, colour, strength, density, weight, sharpness etc., i.e. present at any moment as a matter of fact. In addition to properties, things also have capacities. This means for instance that a chair has a capacity to be seated upon. Capacities can either be actual or virtual, depending on them being exercised or not. The term virtual signifies immanent or inherent potentialities, regardless whether the thing or object actually performs them in action. In the case of the chair the capacity is always present, even when the chair is not used by someone to actually sit, but it remains virtual unless it is made actual by using the chair as an object for sitting. However, sitting is only one of the capacities of a chair. It can also support other interpretations and ensuing actions, like hanging clothes, standing upon, piling up books, being used to hit someone or something, or as firewood. In other words, the capacities of a certain thing is the space of possibilities associated with that particular thing: *'While its properties are given and may be denumerable as a closed list, its capacities are not given. They may go un-*

72. De Landa 2012, lecture. This is only a part of the definition of the concept assemblage that has additional characteristics. I reduce it to this part for the sake of the distinction between properties and capacities, without overload of other aspects that are not directly instrumental for clarifying that distinction.

exercised if no entity suitable for interaction is around, and they form a potentially open list, since there is no way to tell in advance in what way a given entity may affect or be affected by innumerable other entities. In this ... view, being part of a whole involves the exercise of a part's capacities but it is not a constitutive property of it'.⁷³ Note that up to this point, capacities seem akin to the concept of affordance coined by psychologist J.J. Gibson: 'The affordances of the environment are what it offers the animal [incl. the human], what it provides or furnishes ... It implies [the] complementarity ...'.⁷⁴ 'what we perceive when we look at objects are their affordances, not their qualities. To perceive an affordance is not to classify an object. The fact that a stone is a missile does not imply that it cannot be other things as well. It can be a paperweight, a bookend, a hammer, or a pendulum bob. It can be piled on another rock to make a cairn or a stone wall'.⁷⁵

Properties, like being hard or made out of wood, are always actual and enduring or in other words states. Capacities are virtual and can become actual, and when they do, it is always as an event, never as a state. Sitting is an event, and as event it is always double: to sit and to be seated upon. Likewise, Gibson argues that an affordance points both ways, to the environment and to the observer [user/dweller/inhabitant] and so does the information to specify an affordance.⁷⁶ You can never sit on something without that thing being seated upon at the same time, as part of the same event. This implies that capacities are always expressed within a process, and also have to be understood within that specific context. Paraphrasing Philosopher Nicholas Rescher, they can be said to exist only through their concrete historical manifestations. Capacities have similar performative traits as processes do: '*For processes, to be is to be exemplified. This means that a process must exist in time. ... As long as it is not concretely realized, we have only a possible and not an actual process*'.⁷⁷

The capacity to affect [capacity to sit] needs to be [and can only be] exercised with something that has the capacity to be affected [f.ex. the chair that has capacity to be seated upon]. Capacities are therefore always relational and open up an entirely different space than properties do. Properties can be listed and are limited, capacities are unlimited because interactions can be set-up with all kinds of things. What emerges is dependent on the specific relational configuration or combination in between

73_ De Landa 2006, p.10

74_ Gibson 1986, p.127

75_ ibid. Gibson 1986, p.134

76_ ibid. Gibson 1986, p.129 and p.141. See also next chapter 'Construction IS: Objects, Relations and Mediation'

77_ Rescher 2000, p.25

capacities to affect and capacities to be affected.⁷⁸ Using the notion of capacities is another way of articulating what certain entities are capable of doing within a specific relational context, i.e. in interaction.

A necessary accessory to the argument is provided by David Pye's critique on the misguided use of the concept function as a legitimisation for shaping and organising architectural form. According to Pye, function is commonly understood as something objective that belongs to a thing or object as a matter of fact.⁷⁹ In other words, function defined in this way amounts to a property. This is confirmed by the dictionary that defines function as the activity proper to a thing, the mode by which it fulfils its purpose. Pye makes a distinction on two levels; first between result and purpose, and second between intended and unintended results. The function of a thing is actually a result that corresponds to the intended outcome, i.e. what a thing is supposed to do or be used for. In this case a result is equivalent to a property because it is a predefined and supposedly built-in characteristic that is considered permanent. If it is likened to a capacity anyway, it can only be as one single and specific capacity that sits amongst many others. The purpose on the other hand is much broader because it can be whatever is assigned to an object as meaning, use or value, and for this reason it is more susceptible to change.⁸⁰ Pye also emphasises that intended results are only part of the story because alongside of them, unintended, unanticipated and often undesired results are generated too. In other words, the routinely used interpretation of the term function narrows down the field of emerging implications to those that are desired or aimed at, and leaves the others out of view and consideration.

Pye's critique on how the term function is used, directly connects with the distinction between fixed properties and contextual capacities that emerge from events/ processes. His comments can be seen as an invitation to take a closer look at widely used but unquestioned (architectural) concepts, because they can be less benign than presumed and expected.

78_ De Landa 2012, lecture.

79_ Pye 1978/2007, p.11

80_ For the specific example that Pye uses to clarify what this implies, see Pye 1978/2007, pp.15-16.

MAKING / **motif M.3** POTENTIALITY OF BECOMING

The third motif for the concept-cluster make/making directly connects with the previous one, and more specifically to the concept of capacities. To a certain extent it can be regarded as an extension of it, since '*potentiality/potential*' is defined as the '*capacity*' of something or someone to develop into something in the future; an (actual) process of development, change or transformation into... ; an evolution towards. The explicit reference to development and evolution requires a more specific elaboration.

Processes of construction consist of progressive and discontinuous cycles of transformation that lead from certain states or conditions to others. They are discontinuous because occurring in separate increments or stages at successive moments in time: *'If any event is to depend upon some characteristic of a multiple sample of some others species of event, time must elapse for the accumulation of that sample, and this elapsed time will punctuate the dependent event to produce a discontinuity. ... A world of sense, organisation, and communication is not conceivable without discontinuity, without threshold'*.⁸¹

The transformational processes of construction can be interpreted as either *replication* or *evolution*. In the latter case, the ongoing processes of change need the workings of the random, the plethora of uncommitted alternatives that are necessary to produce new information and new outcomes: *'The essence of evolution, is exploration and change; and replication or the process of predictable repetition consists in reproducing or making duplicates'*.⁸² However, in an architectural context construction is conceptualised as replication because this is more consistent with an interpretation of construction as an instrumental process of production that follows a model, and that is organised as supposedly predictable sequences of technical operations. The aim is to reproduce something designed and described earlier into a built material object. Constructors are asked to perform this replicating transformation, and technology is expected to make this possible: *'the singular virtue of technique, ... a form of knowledge that enables a practice to be assured of its results'*.⁸³ Evolution appears incompatible with this, since it introduces unpredictability and chance in a domain where predictable outcomes, repeatable methods and procedures; detailed prescriptions and instructions; controllable processes and avoiding risks are at the top of the priority list.

81_ Bateson 1979, pp.218-219. Note the analogy with the concepts 'repetition with and without difference' mentioned before in the part addressing intensive and extensive properties (motif M.2) on p.68.

82_ Bateson 1979, pp.57-58

83_ Leatherbarrow 2000, p.99

But although repeatability is indeed a requisite when it comes to building, it is also challenged by the contingencies inherent in architectural and construction practices, and the connected need for adjustments, modifications and alterations. This is amplified by the fact that activities of building are bound to place and time, and thus inevitably influenced by the particular characteristics of sites, climates and environments. The abilities, habits, and skills of builders, as well as the capacities of other contributors can also affect both prediction and the degree of control in the realisation of a desired end.⁸⁴ Finally, one must take the drive towards improvement into account as factors inducing speculation, change and uncertainty. All these aspects represent risks for prediction and repeatability, and for this reason there is a tendency to resist and inhibit them. One needs to be aware though that the risk-inducing aspects are also intrinsic to architectural construction and to a certain extent unavoidable, for the reason that *'In architecture ... the knowledge is being transferred from the apparent security and stability of the self-defined domain of the profession into a much less stable and predictable set of conditions. Bringing the paradigm of certainty to the world of uncertainty is foredoomed'* (Till 2009, p.162).⁸⁵ When this is actually taken into consideration, it becomes clear that framing construction as a process of replication in contrast to a process of evolution, is necessary nor helpful.

Construction has characteristics of both, and as such the following reflection from Gregory Bateson is pertinent and applicable, even more so because architecture and technology are products of culture: *'In the transmission of human culture, people always attempt to replicate, to pass on to the next generation the skills and values of the parents; but the attempt always and inevitably fails because cultural transmission is geared to learning, not to DNA. The process of transmission of culture is a sort of hybrid or mix-up of the two realms'*.⁸⁶

Processes of construction always have a certain degree of openness and indeterminacy which makes them susceptible to external information. Philosopher Gilbert Simondon maintains that this sensibility for information and the margin of indetermination necessary for it, is the actual measure of perfection of a technical entity and by extension its process of becoming. It is by means of this that the human gains his/her role as permanent organiser, coordinator, inventor and living *interpreter*

84_ Leatherbarrow 2000, p.97

85_ Till 2009, p.162

86_ Bateson 1979, p.58

of the technical around him or her.⁸⁷ What resides in the technical is a human reality, human gestures fixed and crystallised in functioning structures. These structures need to be sustained during their functioning, and the greatest perfection coincides with the greatest openness, with the greatest liberty of functioning.⁸⁸ Note that the previous description suggests an already existing technological object that is put in use, operation or practice within the temporal space in front of the work, i.e. its future.

But Simondon does not reduce the identity of a technical entity to its end-state and subsequent use. He extends it towards the process of becoming, that is, the space behind the work, meaning the generative processes happening before. He posits that one must seek to define the technological object by its genesis, or the process of concretisation that gives it specific or definite form at the end of '*a process of evolution*'.⁸⁹ Simondon names this '*the principle of individuation*', that is, a process of becoming that evolves from a state of potentiality or virtuality to a state of actuality^{2,48}: '*An individual technological object is not this or that thing, given hic et nunc, but that of which there is a genesis. The specific modalities of this genesis must be distinguished from a static specificity that we can establish after the genesis by means of its apparent character... The genesis of a technological object is part of its being. It is not that which is anterior to its becoming, but is present in every stage of its becoming*' (ibid. p.22).⁹⁰ To realise this change of perspective Simondon re-interprets the classical hylomorphic premise—that places matter and form in an asymmetrical and hierarchical relation in which both matter and the conditions in which form is given are thought of as either not contributing or subservient—because he deems it inadequate. He argues that it does not account for the actual complexity of material formative processes, and gives a wrong impression of the role of the human in the technical operation.

The physical entity or individuated object comes into being through a technical process in which distinct series of preliminary operations institute mediations between matter and form that makes them converge into something common. The term 'common' is used here in the sense of belonging to more than one, i.e. something that is immanent in a relation between two or more things. Simondon explains that in a technical operation that gives rise to an object having form and matter –a clay

87_ Note the connection with 'Construction motif C.3- Interpretation'.

88_ Simondon 1958/2012, pp.12-13

89_ Simondon 1958/2012, pp.16-17

90_ Simondon 1958/2012, p.22. see also 'Making motif M.2-Qualities / Properties and Capacities'.

brick for instance— the real dynamism of the operation is very far from the simplifying generalisation implied by Aristotle's matter-form couple, because in that model form and matter are abstract. The definite being that one can see emerging from the process and later hold in the hand —this one specific brick— does not result from the union of an unspecified abstract matter and an arbitrary form. For it to exist as a tangible individual entity, it is necessary that an '*effective technical operation*' institutes a mediation between concrete matter —a given clay mass— and a concrete form, i.e. a mould.⁹¹ This mediation needs to be anticipated upon: in the case of the brick, the first chain ends with prepared clay, and the second with a manufactured mould. The preparation of clay and the construction of the mould are in themselves already an active mediation between rough clay and the impossible geometrical form. Matter is matter because it receives a positive property —in this case malleability— which enables it to be modelled. To be modelled does not mean to undergo arbitrary displacements, but to order its plasticity according to definite forces that stabilise the deformation and establish solidity. The mould modulates by limiting and stabilising, rather than only imposing a form; it gives the end of the deformation of the plastic clay and achieves it by stopping it according to a definite contour.⁹²

Simondon asserts that it is precisely the mediations themselves, and the relations and transformations they establish, that we should consider when attempting to understand the formative process and the individual nature of technical objects. These mediations are active, meaning, part of processes of transformation that are also processes of individuation that bring individual entities into existence that are things in themselves, distinct from others.⁹³ They are neither their matter nor their form, but integrated/intricate matter-form couples brought into being by means of technical processes and technical operations. These processes are processes of becoming that are common or shared and imply relations and mutuality. They pre-suppose the existence of things with preliminary capacities that converge and together transform into something other. The 'other' is identifiable as a new individual, which cannot be disconnected from its productive past, nor from its future due to its capacities that are generative for that future. The individuated outcome is a state that has to be identified

91_ For the concept of mediation see next chapter 'Construction is Objects, Relations and Mediation.

92_ Simondon/Adkins 1964/2007

93_ It is important to note that this is exactly what a process of construction does or achieves, and therefore a reason why an enquiry into the implications of the concept process in architectural construction may be necessary as part of the endeavour to achieve a more adequate understanding of the concept construction.

as a phase among other phases before and after. The model Simondon proposes is one of dynamic influences and interactions based upon potentials or virtual capacities in which the relational exchanges make the convergence actual in an individuated technical entity, or in other words, are constitutive and formative for it.

Since architectural objects are also technical objects, they can also be conceptualised in terms of dynamics of becoming and operation, rather than in static and utilitarian terms. The label 'static' refers to an emphasis placed on static or fixed discrete things or objects that are disconnected from processes before and after. The label 'dynamics' refers to the awareness of temporal sequences or alternations between process and form, which acknowledges both past and future. The idea that matter is inert, passive or dead, minimises the role it can potentially fulfil in a technical process, and in turn the latter is then reduced to a mere unilateral imposition of form on matter from without, and not as a complex convergence of trajectories. The reciprocity and participation remains concealed by methodological and epistemological habits. One of these is a lack of participation in formative processes where relations and interactions can be experienced.

The evolutionary framing of the technical process proposed by Gilbert Simondon provides a conceptual possibility to move away from the reductive idea that construction amounts to replication, and offers a support for framing it more explicitly in terms of a contingent and generative evolutionary process.

This chapter aimed at increasing both the conceptual reach and plurality of the concept construction by associating it with the conceptual content of making. A set of distinctive motifs has been identified for both, and an explanatory account has been provided for each of those motifs in order to clarify what kind of subject matter they address, either actually or potentially. These descriptions provide an indication of the hidden complexity of seemingly simple or straightforward concepts, but they are nonetheless not exhaustive. Following conceptual domains distinguish construction from making: the pair 'concrete / abstract' (motif C.2) and 'interpretation' (motif C.3). Besides it also shares concepts with making, i.e. the pair 'process / form' (motif C.1) that applies to matters of 'formation', 'causation' and 'constitution or structure'. Making in turn adds three distinctive and meaningful concept-clusters to the partnership that remain unarticulated in the former, namely 'force' (motif M.1), 'qualities / properties-

capacities' (motif M.2), and 'potentiality of becoming' (motif M.3). In principle these would remain out of reach for the concept construction if it was not connected to the concept making. In view of the extent of conceptual territory that making's three motifs cover, it is rightful to affirm that their presence indeed substantially contributes to the concept construction and that the connection achieves what was intended, that is, 'more' (more richness, more depth, more possibilities, ...).

x

CONSTRUCTION IS ... OBJECTS, RELATIONS AND MEDIATION

'Let's forget the things and only pay attention to the relations between them'.⁹⁴

'Technology is the active human interface with the material world. ... Its technology is how a society copes with physical reality'.⁹⁵

In the previous part, more specifically making motif M.3 'Potentiality of Becoming' I referred to philosopher Gilbert Simondon and the idea that in order to adequately understand a technical formative process and the individual nature of technical objects, it is necessary to foreground the mediations between the partake in that process, and the relations and transformations they establish. This requirement presents us with a challenge though. Mediations are relational per se, and in order to get an epistemological hold on them, we need the proper conceptual toolbox.

The knowledge about construction-technology is almost entirely structured on the basis of individually designated entities with fixed properties and the object-categories to which these belong.⁹⁶ Most often, relations are not part of the game, and I believe that we are ill-equipped to deal with them. In order to clarify and explain the problem at hand, I depict an example below that is based on the use of hand-tools for woodworking. It came about as a consequence of a recursive experience with using these tools in the context of a series of design by building workshops with students organised in the context of an Erasmus Intensive Program called 'Tectonics in Building Culture', as well as within my own construction work.⁹⁷ The prevailing outlook with regard to hand-tools did not fit with the experience of using them in concrete and physical making activities.⁹⁸ To a certain extent the arguments developed in this part are a continuation of those developed in the previous part, as mentioned above. The intention is to explain that the non-fit or offset originates from the distinction between an object-based approach and a relation-based understanding of activities and

94_ Braque in Hertzberger 2010, p.284

95_ Ursula K. Le Guin 2005

97_ Some issues that emerged from them are dealt with in part 3, section 'Encounters', chapter 'Things We Do Not See'; and in part 4, section 4.II 'Constructing Things For Constructing Other Things'.

98_ For Tool-use, tool-making and the concept of apparatus see the dedicated part 4, section 4.II 'Constructing Things for Constructing other Things'.

events. The example is inspired by Gregory Bateson's cybernetic system of man-axe-tree (Bateson 1972/2000, p.464), and addresses a closely similar system composed of human, technological object and matter/material.⁹⁹

Tools are most often thought of as instruments that empower us, or that enable us to exercise or impose our will to form on matter. The maxim stating that '*the tool is an extension and specialisation of the hand that alters the hand's natural powers and capacities*', is emblematic for the predominant, but at the same time unilateral object-oriented and anthropocentric view on the material world.¹⁰⁰ It focusses on the tool as something that is directly determined by the performance of specific instrumental actions by us, and that adds strength, precision, sensitivity, sharpness, or whatever other additional functional feature to our hands and body. Jonathan Hale, in an article situated in the realm of tectonics, quotes a statement by Tim Ingold; that he refers to as one that appears to be a perfectly clear and succinct definition of the tool as a prosthetic extension of the body: '*A tool, in the most general sense, is an object that extends the capacity of an agent to operate within a given environment*'.¹⁰¹ What is added in comparison to Pallasmaa's definition, is something that should not be discarded, that is, an environment or scene in which actions are performed.

Psychologist J.J. Gibson, in turn, argues that the tool is an object that is either an independent part of an environment or something connected to the body of a human user: '*When in use, a tool is a sort of extension of the hand, almost an attachment to it or a part of the user's own body, and thus is no longer a part of the environment of the user. But when not in use, the tool is simply a detached object of the environment, ...*'.¹⁰²

When the information provided by all three statements is combined, and their logic is applied to a common activity like cutting a piece of wood with a saw—which actually is the activity in which the non-fit emerged and was experienced for the first time—it becomes fairly straightforward to recognise and identify the protagonists that manifest themselves as individual entities or discrete objects, i.e. the person *acting*, the substance or material *upon which* the action is performed, the tool-object that is taken in the hand and *with which* the action is performed by the person acting, i.e. the saw that by being taken in the hand becomes part of the body, and finally the

99_ Bateson 1972/2000, p.464

100_ Pallasmaa 2009, p.48

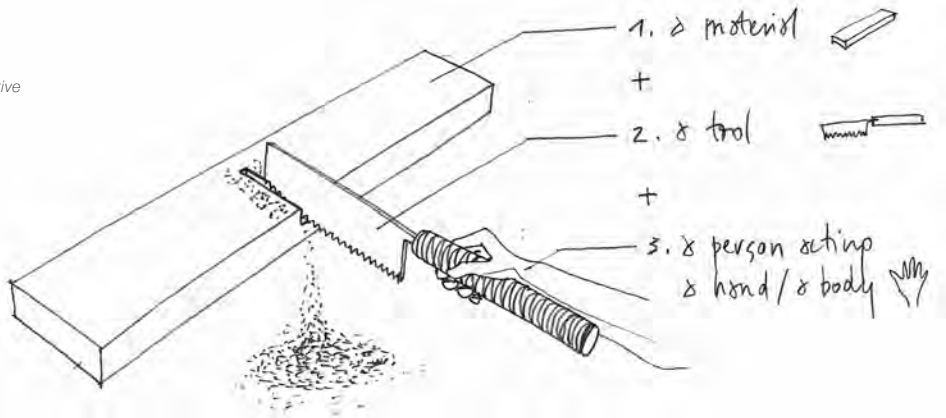
101_ Hale 2014, p.197.

102_ Gibson 1986, p.41

environment in which all others are situated. It is important to be mindful of the fact that the presence of the environment is most often implicit. In this case it is merely suggested by the sawdust falling on what appears to be a surface. Without this hint it would be invisible and probably remain unnoticed.

ill.2.1:
The object-based perspective

Drawing by author

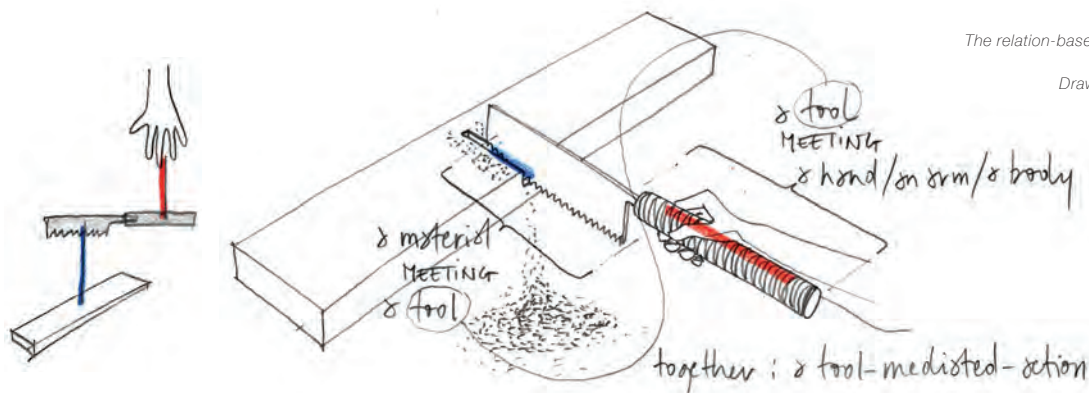


Each entity belongs to an object-category denoted by its name, which in turn refers to a shared conceptual space defined on the basis of a set of distinctive properties. They make it possible to unambiguously identify them and distinguish them from the others. On this basis we can affirm that a saw is not a beam, wood is not steel, a hand is not a saw, and by the same token, that substance is not form; theory is not practice; architecture is not engineering; design is not construction; technology is not science; and so forth. Categories are not autonomous entities though, but exist in relation to a context where there is always both belonging and not, both inclusion and exclusion. But due to the sharp focus on the object set apart from other objects, the connections and interactions recede from view if one does not deliberately pay attention to them.

In the activity of sawing, the tool is thought of as an integral part of the body of the person handling it, who in turn is the volitional subject who imposes his or her will on the material in a so-called unilateral way. By a sleight of hand we go from three separate entities to only two, being the material on one side and a kind of hybrid, i.e. a tooled human body, on the other. Describing the situation in these terms makes sense in view of Pallasmaa's, Ingold's and Gibson's statements mentioned above. It is nonetheless defective, or at least partial and therefore incomplete. At first because it is anthropocentric, and second because it veils what a tool is supposed to do, namely to mediate between actors engaged in a certain formative or productive activity. A tool is also a mediating device whose

position is in-between. It is not of the body, nor is it of the material, it is of both. Once integrated in a process of making, a tool becomes part of the *'interface between the object (material or artefact or organism) and an environment, which in the case of the artefact, critically includes its maker'*.¹⁰³

In this example, the saw is in-between (a system composed of) hand-arm-body and the wood shaped as a beam. That is why the saw must be considered first and foremost as a relational instrument. It does not just extend the body, but connects it with the material. The hand holds it, but at a certain moment the wood also holds it, as anyone who has ever performed this kind of activity will be able to confirm. At that moment, the action of sawing might bear more resemblance to a tug of war than to a uni-lateral technical operation. During the action of sawing our body is physically connected with the material by means of the tool, and through it the material fabric is made contiguous in such a way that we can feel it, its resistance and its strength affecting us as much as we affect it with our pushes and pulls that steadily make the incision grow. It is only by being incorporated in this reciprocal exchange mediated by the tool that the material can inform us and that we can in-form it in turn, i.e. shape it or give/impose a (geometrical) form on it.



ill.2.2:
The relation-based perspective

Drawing by author

The in-between position of the tool is also recognisable in its internal organisation with two interrelated component parts, a blade and a handle, each oriented towards another out-side, which is an indication that an affordance indeed points both ways and so does the information to specify it.¹⁰⁴ The former is made to meet the wood, and for this purpose has a made to measure interface that gives it the capacity to cut; the

103_ Ingold 2000/2011, p.345

104_ Gibson 1986, p.129 and p.141. See also chapter 'Construction IS Making', 'Making motif M.2 'Capacities'

latter part in turn, is shaped to meet the hand and gives the saw the capacity to transmit the power that drives the process to and from the body. Gilbert Simondon describes this as the necessary dichotomisation or division of a technical object, with one part that adapts to the exterior world, and the other to the user (*'L'objet technique doit se dichotomiser, diviser. Une part s'adapte au monde extérieur, l'autre à l'utilisateur'*).¹⁰⁵ Finally, there is a third interface; the one between the blade and the handle that solidarises the parts and in so doing realises the capacity for them to work together both internally and externally, that is, with the two other partners in the productive/ destructive tool-mediated-action. A tool —and by extension the apparatus of which it can be part— is an intermediary that modifies the conditions in which the work is performed. It brings about a qualitative change in the relationships between a material, ourselves as makers, the artefact that is under construction, the place in which the work is being executed, and others with whom the work is done together. Or in Tim Ingold's words, *'a tool induces a transformation in the system of relationships within which the artefact comes into being'*.¹⁰⁶ And since a tool is a technological object, it is fair to state by analogy that technological objects are mediators, for example a pencil mediating between us and a surface for inscription, or the envelope of a building between different climate zones in and outside. Paraphrasing Simondon, in order to understand a technical object we need to understand how it is constituted, but also how this constitution realises these internal and external connections and interfaces, and the mediations they capacitate.

In the essay *'Some Characteristics of a New Concept of Technology'*, Peter McCleary insists on the 'mediating capacity' of the technological artifice such as the built environment, and argues that the use of technical equipment (tools/technics), processes (techniques/methods) and theories (technology) gives rise to a special kind of knowledge. The challenge is to characterise this knowledge, namely the *'understanding of skills and knowledge of the dialectical and productive relationship between humans/builders and their environments (natural and built)'* (McCleary 1988/2007, p.326).¹⁰⁷ The conceptual frame that McCleary proposes revolves around the qualification of the mediating capacities of technology, and he does so by defining two complementary conceptual sets.

105_ Simondon in an interview with, accessed on YouTube

106_ Ingold 2000/2011, p.345

107_ McCleary 1988/2007, p.326. Note that the label technology used in the title of McCleary's essay denotes both the subject and the study of the knowledge domain.

The first one includes the above mentioned categories that correspond to three types of mediators: Technics or technical equipment (instruments or tools); Techniques or technical processes (apparatus and structured action in context); and Technology or technical theories (the level of abstract concepts and reflection). Each of them provides a distinct relational setting and explores, probes, organises or conceptualises a different aspect of the environment. The second and more substantive set identifies characteristics that correspond to three distinct modes of mediation that correspond to an extended range between two extremities: from Transparent to Opaque; from Amplification to Reduction; and from Appropriateness to Appropriation. Each of them can be associated with the former categories (technics, techniques and technology), and they determine the way in which perception, experience, understanding and action can be altered when engaging the world through the means provided in the first set, or in other words, when mediated by them. They signify the transformative capacities of the mediator. However, this presupposes a putting into practice or a use of the technics, techniques and technology in such a way that these participate in a process in and from which their capacities can emerge, and where they can be encountered and experienced.

A totally transparent situation corresponds to no mediation. The mediator (tool, technique or technology) entirely withdraws from the mediated experience of the world it probes, organises or describes. At the other end of the spectrum, the fully opaque situation indicates a totally mediated situation in which one encounters and experiences the instrument, rather than the place, thing or object with which the relation is intended and made to happen. As a result the latter (totally) recedes from experience, i.e. is opaque. It indicates that a mediator has the capacity to connect as much as it has the capacity to separate. Consequently, transparency and opacity are inversely proportional. McCleary provides following example: *'my grandfather cut grass with the short-handed sickle; my father reduced the stress in his back by using the long-handed scythe; I experienced the cutting of grass with a hand-driven lawn-mower; my daughter encounters the characteristics of grass with a fuel-powered (or self-propelled) hand-guided mower; her child will use a lawn-tractor where the experience is of driving and not of cutting; my great-grandchildren will, in all likelihood use, if anything, an automaton or mechanical goat'*.¹⁰⁸ Amplification, is the degree in which one specific aspect or sense is isolated and intensified, in turn provoking the collateral reduction of other aspects. Hence, amplification (extension, increased focus, ...) is

108_ McCleary 1988/2007, p.328

directly proportional to the reduction of some other aspect. *'In using the telescope, one encounters only the visual characteristics of the distant object. The activity or (object) cannot be heard, it can't be touched, smelled, tasted. Phenomenologically, the greatest loss is that the "sense of place" cannot be experienced. Thus, any technic (in the above case the telescope) in amplifying an isolated sense, or senses, brings with it the concomitant loss or reduction in total experience'*.¹⁰⁹

Paying attention to the mediating characteristics of tools, methods and theories is relevant for increasing the awareness of their influence on how we relate to the objects and places upon, with and within which we act. The examples given above refer directly to tools, but similar mechanisms are at work when it comes to technical processes (technique) and theories of technology. The separation between processes of building and design, and the division of labour it brings about, has made the building processes more opaque for architects. Conversely, it has made both the design process and the underlying agendas and motivations that direct the discipline of architecture more abstract and less transparent for the workers realising the work on site. The same can be said about the relationship between the specialised disciplines of engineering and the discipline of architecture. McCleary argues that similarly technology or technical theories take part in a loss in transparency and the reciprocal increase in opacity. *'Where an applied scientific [or engineering] theory exists, the reality of the built design must conform to that theory (albeit with a factor of safety to compensate for the lack of correlation between theory and practice). When no "true" engineering theory is available, the builder is controlled by regulations, such as standards [or norms], codes, etc. ... technical theories, too, have become opaque, and increasingly we can perceive the realm of building only through the filters of [or mediated by] applied science'*.¹¹⁰ These theories are then amplified and impose themselves at the expense of other concerns. I presume that this holds true for other (architectural) theories as well. Technical theories are by nature disembodied and remote from idiosyncratic event spaces where actions occur. When construction is predominantly thought and learned on this basis, the way in which one understands construction is entirely mediated by a predefined framework that supersedes its other manifestations, including the implications and ramifications the latter may have. I doubt whether construction can adequately be understood when theory is unilaterally amplified in this way. Echoing

109_ McCleary 1988/2007, p.330

110_ McCleary 1988/2007, p.329

McCleary, the dialectical and productive relationship between builders and their environments indeed needs new concepts and associated ways of thinking, in order to complement or overrule the existing unilateral and incomplete ones. But contrary to what McCleary suggests, I do not believe that the aim to formulate this new concept and way of thinking has been realised yet, and if it has, I did not find it.

To close this chapter, I wish to return to one of its opening quotes. In her witty '*A Rant About Technology*', Ursula Le Guinn voices that technology should be understood as the active human interface with the material world; an entity or place of both encounter and exchange that is (wilfully) inserted (or unknowingly inserts itself) as an intermediary in the above mentioned human/world relationships. She also argues that it is developed in order to cope with physical reality, which amounts to saying that it is instrumental and purposeful, and that its presence both aims at, and brings about a modification of some kind. Its presence alters the interactions, that is, enhances, capacitates, facilitates, magnifies, inhibits, extends, empowers, estheticises, improves, worsens and so forth, meaning that it is never neutral, always does something and has some kind of relational implication. This is the case regardless of the technology being labelled high or low, and irrespective of whether it concerns how people get and keep and cook food, how they clothe themselves, what their power sources are, their medicine, computers, jet bombers, linen, paper, ink, wheels, knives, clocks, chairs, aspirin pills, steel saucepans with copper bottoms, shoes and shoelaces, refrigerators, fish hooks, and of course, what people build and what they build with, or in short, also architectural artefacts fit in. All of these and others are not merely objects out there, but mediators or mediating devices that have according capacities and ensuing affects and effects. '*Technology is understood here as something integrated into the everyday activities of human (and non-human) bodies, and not as that which is outside or independent*'.¹¹¹ Le Guinn's explanations neatly harmonise with McCleary's attempts to get to grips with ways of conceptualising architecture and construction as domains of knowledge and practice that determine and realise this artificial mediating or interfacial infrastructure. When construction is framed as such, a more explicit consideration of generative interactions, their implications and the partners involved becomes possible too.

¹¹¹ Frichot 2019, p.25.

PATTERNS OF INTERACTION BETWEEN PROCESS AND FORM

THE DISSOCIATION BETWEEN PROCESS and FORM

‘ ... even if the arts cannot be separated from their technical means, the division frequently separates the product from the means of production. This creates a strong tension between the two, as each seeks to further its own ends and get the better of the other rather than entering into a dialogue’.¹

‘Dead things are easier to handle than live ones; they may not be so interesting but they are less troublesome’.²

In the essay ‘Things that Move’ Tim Anstey describes the condition of detachment between form (states of organisation) and process (acts of organising) in architecture as a dissociation between ‘*the art of placement (or art of arrangement)*’ on one side, and ‘*the art of placing*’ on the other.³ The idea behind this dualism is that the course of an architectural project is divided into ‘prior’ acts of thought, defining and prescribing ‘*the arrangement or placement (of parts) autonomously and in advance*’, and ‘subsequent’ physical acts of construction or the ‘*action of placing material stuff, of relocating it and reforming it from one state to another*’.⁴ According to Anstey this habit of thinking was imported from the tradition of oratory or rhetoric; in other words, transposed from the realm of language and discourse to the multiple processes involved in ordering and organising the built environment for human habitation.⁵ Anstey provides a well reasoned historic account for this state of affairs: ‘... *between the middle of the fifteenth and the end of the sixteenth centuries, [there has been] a steady tendency to lift the architectural project away from the actuality of building processes. ... In the treatises of Serlio and onwards through Palladio and Vignola, what is represented in increasing detail is the [intended] result, the full stop, the final effect of architectural intention in defining superficies. What is represented less and less is the action of arranging circumstances, such that the materials can be moved to the positions*

1_ Gregotti 2010, p.2

2_ Evans 1995/2000, p.xxvii

3_ Anstey 2012, p.48

4_ Anstey 2012, p.48

5_ Anstey 2012, *ibid.* p.49. For the transpositions from the realm of language to that of architecture, see also ‘Construction motif C.2- Concrete / Abstract, and Part 3 Territories, section 3.II Encounters, chapters ‘Paradox of Language 1 and 2’.

*defined by these drawings. Construction process ... Building, then, becomes read as a copy of intention and the process of copying is not considered, per se as, central to defining architectural virtue. ... one must most inevitably infer that a hierarchy is established between these two orders of activity [placement and placing]’.*⁶ During the sixteenth century, the architectural discipline created a virtual or abstract world in which buildings could exist without being materially constructed; and accordingly a hierarchy was set up between two orders of activity. The static compositions and codified representations, and the built work as a discrete object and tangible expression of the architect’s intentions and predictions; were gradually valued higher than the messy construction activities that realise the transition between both. In other words, ‘process gave way to artefact’.⁷

A comment is relevant here, because Anstey unfolds contemporary issues whilst dating them back almost five hundred years. He manages to narrate and explain them using historical material and the assorted classical terminology, which in turn frees the discourse from the load of present day sensibilities. At the same time it keeps those connections alive. By naming things in another way, a part of the semantic weight they bear is lifted, and more freedom of speech is gained. Moreover, by naming differently, additional interpretations and connections can be made. A number of questions emerge: What happens when we substitute both the notions of architectural design and architectural technology with ‘art of placement’?; Has the term ‘art of placement’ the capacity to encompass both architecture and engineering, and can it as a result enable us to narrow the divide that has grown between them?; Is it possible to bring long existing dualisms closer together by making them share a same semantic space? Answering these questions is not part of this work, but they are nonetheless worth considering.

In architecture this dissociation between the art of placement and the art of placing has become almost ontological and is fairly undisputed, even though it validates the disconnection between the physical, corporeal and practical knowledge-how of construction as activity and practice, and the disembodied, disengaged and abstract knowledge-about construction as theory. It also conditions the architect’s position and role in the generative processes through which architecture comes into being as a built reality, and defines the way in which architecture’s disciplinary knowledge is framed,

6_ Anstey 2012, p.50

7_ Anstey 2012, *ibid.* p.50

which in turn is expressed in how it is organised, acquired and put into practice. I believe that architectural education sustains the architectural emphasis on ‘placement’, which in itself is not surprising since it supposedly is one of the roles of education to both disseminate and safeguard the paradigms of a domain of knowledge. In the essay entitled ‘Architecture Is Its Own Discipline’, David Leatherbarrow asserts that this is essential for delimiting and specifying what has to be learned by those who want to become part of the architectural community: *‘To begin to identify the skills of an architect, we must answer a question about what it is that an architect makes or produces? Architects do not make buildings these days, even less cities, not even rooms. All of these places result from the arts and crafts of building or construction. This distinction alone is sufficient to establish a clear difference between architecture and the other plastic or performing arts ... [in which] design and production are concurrent in their development and indistinguishable in their realisation, ... almost never is the artist not involved, almost always he or she “handles” the materials of the work, which architects rarely do because they are skilled in design not construction. Architects handle drawings and models, not bricks and boards’* (Leatherbarrow 2000, p.87).⁸

This issue cannot be lifted or done away with, and for a number of reasons it may not be appropriate nor beneficial to do so. But the split nonetheless impedes a comprehensive understanding of the role and functioning of construction in architecture, because the reciprocal relations and interdependence between placement and placing are veiled in mystery. In architectural education, learning about construction is primarily situated in the realm of the abstract, with a bias in favour of states of organisation, i.e. fixed and static form. But construction also amounts to complex (technical and social) activities and processes of (trans)formation. These remain out of reach and out of view when construction is not engaged as activity in one way or another. The rules and theories of construction provide no information concerning the implications of construction in terms of a contextual dynamic process. What is presented to architects as knowledge to acquire is cleaned, or rather purified, from the supposedly obfuscating influences of architecture’s concrete reality. This is as remarkable as it is disconcerting, especially when one considers Stan Allen’s assertion that architecture is *‘of necessity a discipline of circumstance and situation. Even in the most ideal careers, many decisions are made beyond the control of the individual*

8_ Leatherbarrow 2000, p.87

*architect. The process of design and construction is characterised by constant [tactical] “adjustments” made to the demands of clients, codes, consultants, budgets, builders and regulatory agencies, not to mention the complex logistics of construction itself’.*⁹

Allen’s line of thought, which I follow based on my personal experience as a practicing architect, entails that situations for learning construction in which relational dynamics –implied in the term ‘adjustments’– recede from view or cease to exist, are impoverished because they cannot adequately account for the complexity that is always present when architecture comes into existence, is used and maintained. Moreover, the need for adjustments is not isolated but emerges within a context with its specific circumstances and interactions. These need to be consciously accounted for, or one inevitably loses track of them. Stan Allen adds that: *‘As creative subjects, architects react to these demands [see previous quote], inventing in response to the occasion of the commission, specifying and particularising a given set of abstract variables. The practice of architecture tends to be messy and inconsistent, precisely because it has to negotiate a reality that is itself messy and inconsistent’.*¹⁰ It should therefore not come as a surprise that after finalising education, architects often need years of architectural practice to acquire a sense of the vital connections between what is affirmed by the theoretical technical and scientific knowledge on the one hand, and the implications of dynamic practices and events in the field on the other, let alone to master them.

Adjustments –meaning both accommodation and modification– have to be performed, hence must be framed as activity. They presuppose an actual situation to which an active response has to be formulated, and the careful attention for a context, relationships between entities or agents involved within the situation at hand, and finally a (hi)story.¹¹ There is no void or a white and immaculate page but always something to refer to and interact with. Making adjustments demands flexibility to bring about the necessary changes in a situation that is considered problematic or deficient, which in turn requires a capacity to judge content, quality, possibilities and implications before, during and after the adaptations and modifications, in order to reach the necessary level of improvement. It also needs capacities to develop and exercise an adequate

9_ Allen 2009, p.xi. See also Jeremy Till for a similar line of argumentation.

10_ Allen 2009, *ibid.* p.xi

11_ Context is not limited to an environmental landscape, but primarily seen as an assemblage of objects, materials, people, and so forth, that together form the context (see also Way of Working - Making Connections).

degree of control over a situation. All this is inherent in construction when we think of it as activities to perform and processes to go through in order to bring an architectural work into existence (as a material entity), and to sustain its existence through time. The capacity to engage processes and creatively negotiate the events occurring within them is crucial in architectural practice. This implies that it must also be seen as one of the skills that architects need to learn. Whether construction can adequately be apprehended when participation in a trajectory of construction-events is avoided, and when one sticks to an abstract realm of texts, rules, formulas, graphs and diagrams, is questionable. Note that inclusion in construction's event-spaces is not interpreted here as practical exercises that prove, demonstrate or apply a theory given in advance, nor as two distinct tracks with theory classes on one side and practice, workshops or shop-classes on the other. It should rather be seen in terms of the creation of contexts for action that set conditions in which construction-dilemmas arise, and in which a diversified multi-modal inquiry into their resolution is necessary. These contexts must be conceptualised as operational spaces, in which dialectical and reciprocal interactions are at work between architecture's contingent, corporeal and situational realm of practices, and architecture's unifying and abstract realm of theories. In other words, between reflective distance and experiential involvement.¹²

Jean Lave's concept of a '*cognitive practice*' and the concept of '*a whole problem*' go in this direction by emphasising the importance of environments for learning in which the complexity of practice is articulated. In 'Cognition in Practice', Jean Lave emphasises that '*Knowledge is not primarily a factual commodity or compendium of facts, nor is an expert knower an encyclopedia. Instead knowledge takes on the character of a process of knowing*'.¹³ '*It is: the active engagement of consciousness in a reciprocal relation with the world and thus is constantly caught up in a simultaneous knowing and changing of the world*'.¹⁴ In '*Engineering and the Mind's Eye*', Eugene S. Ferguson describes the concept of '*a whole problem*' or '*complete design problem*', in contrast with '*single-answer problems*'.¹⁵ Whole problems are those that occur in practice, whereas single-answer problems are presumed dominant in education and research [of architectural engineering and technology]. Backed-up by extensive

12_ See part 5 'Process and Form'.

13_ Lave 1988, p.175

14_ Warren 1984, quoted in Lave 1988, p.175

15_ Ferguson 1994, p.168 and p.162

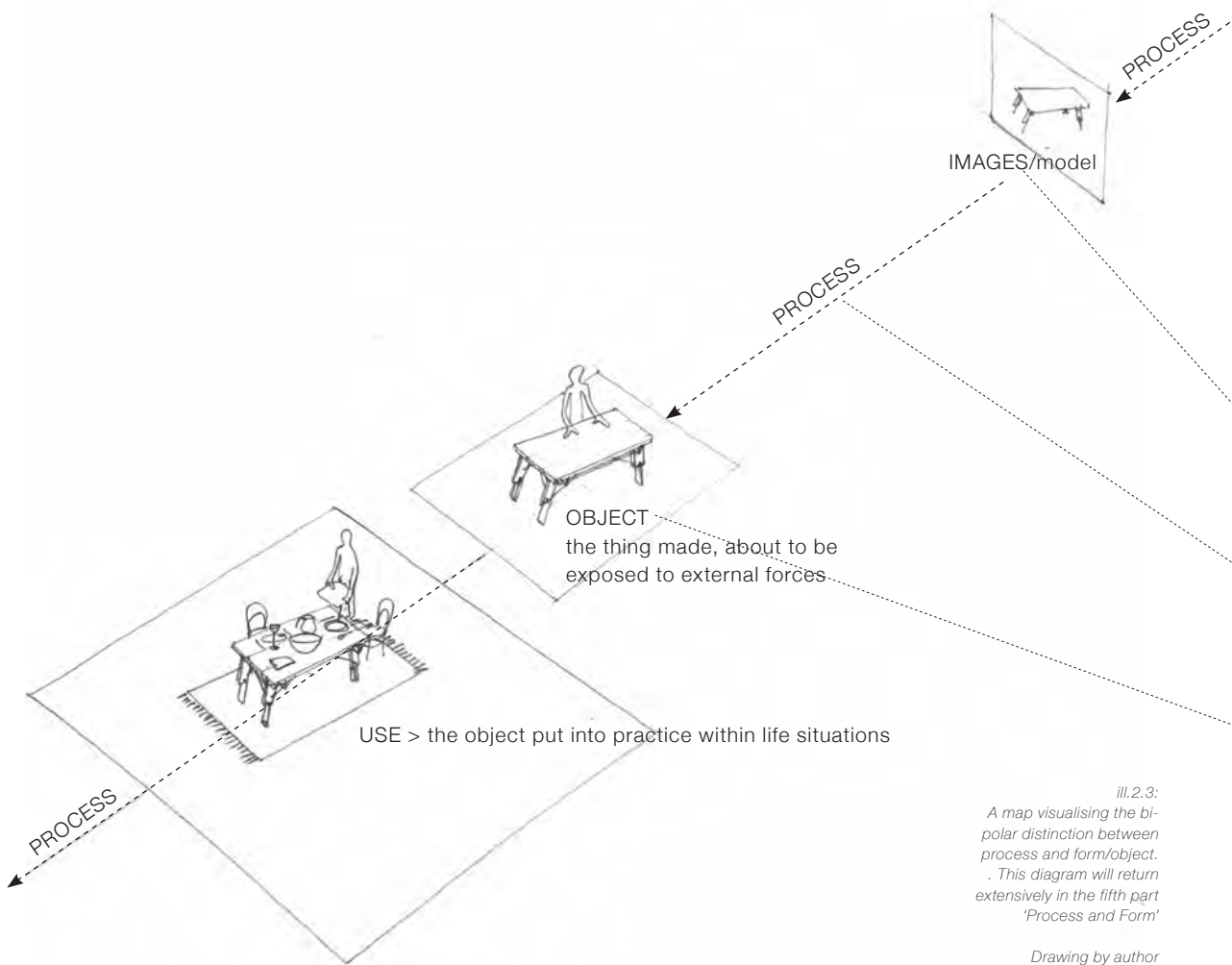
historic data, he argues that learning on the basis of single-answer problems, and by means of analytical and numerical methods, is problematic: *'There is no need to deal with incomplete or contradictory data; any ambiguity merely represents a mistake in stating the problem. One does not need [engineering] judgement to solve such problems. Scepticism and the questioning attitude are not encouraged, ...'*¹⁶ Incorporating the complexities of practice in a curriculum of architectural technology in one way or another is advisable, and preferably from the very beginning. It can help to avoid the widespread misunderstanding that things can be appropriately understood on the basis of their presumed autonomy and static properties, and by neglecting their dependence on the contexts and processes from which they emerge and in which they are applied. Learning construction in architecture should also be founded on the appreciation that construction is a dynamic field and way more than a rational abstract construct: *'Practice is not a static construct, but is defined precisely by its movements and trajectories'*.¹⁷

This requires a re-valuation of construction as activity to challenge the usually dominant view of construction as object and a re-calibration of the hierarchy that privileges theories of technology over technical practices in order to move towards a way of knowing that is more contextualised and that *'shift[s] the application of architectural attention from objects to agency. ... a situated knowledge that should not be applied as abstraction from the outside, but developed from within the context of the given situation. ... a developmental knowledge that adjusts to, and grows out of, the social-cultural surroundings in which it is situated'*.¹⁸

16_ Ferguson 1994, p.163

17_ Allen 2009, p.xiii

18_ Till 2009, pp.166-167



ill.2.3:
A map visualising the bi-
polar distinction between
process and form/object.
. This diagram will return
extensively in the fifth part
'Process and Form'

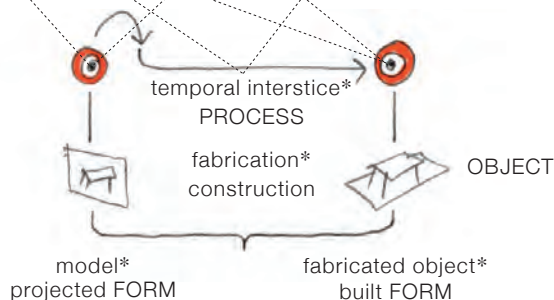
Drawing by author

THE BI-POLAR AND HERMENEUTIC RELATIONAL PATTERNS

In 'The Human Condition' Hannah Arendt writes: *'the actual work of fabrication is performed under the guidance of a model in accordance to which the object is constructed. This model can be an image beheld by the eye of the mind, or a blueprint in which the image has already found a tentative materialisation through work. In either case, what guides the work of fabrication is outside the fabricator and precedes the actual work process ... It is of great importance ... that the image or model whose shape guides the fabrication process not only precedes it, but does not disappear with the finished product, which it survives intact, present, as it were, to lend itself to an infinite continuation of fabrication. This potential multiplication ... in distinction from mere repetition, multiplies something that already possesses a relatively stable, relatively permanent existence in the world [i.e. form]'*.¹⁸ Arendt identifies a pattern that contains two structured entities, i.e. a model* and a fabricated object*, separated by and situated at both ends of a temporal interstice* in which a transformation of the first one (initial stage and input) into the other subsequent one (final stage and output) is effected by means of a process: *'To have a definite beginning and a definite, predictable end is the mark of fabrication, which through this characteristic alone distinguishes itself from all other human activities'*.¹⁹ The contrasting of model and object on the one hand, with process on the other, is based on a temporal scale where objects are framed in terms of their constancy with respect to certain cognitive actions, whereas the concept of a process represents an ongoing change.²⁰

ill.2.4:
A more abstract version of the same relation visible in the map on the left page, but focused on the process hemmed in between two static poles, and without the context of prior initiating processes and subsequent processes of activation

Drawing by author



18_ Arendt 1958/1998, pp.140-142.

19_ Arendt 1958/1998, p.143. A similar reference to temporal implications is also present in the concept of assemblage and the event-spaces associated with it: *'An assemblage thus not only has a distinctive history of formation but a finite lifespan'* (Bennett 2010, p.24). For concordant arguments see also Manuel De Landa's assemblage theory.

20_ See the definitions of the concept process in part 5 'Process and Form', end of section 'Contextualisation'.

The pattern described above is bi-polar and shows both start and end states, and the processes of making/construction fitting neatly in-between. In an architectural context the model that guides the construction of the object corresponds to that specific outcome of architectural work for which I use the label projected form.²¹ It is itself the result of a formative process, which in architecture is identified by the term design. It is articulated by means of elaborate collections of abstract codified information produced by architects and engineers. They describe the as yet unbuilt, with the aim of both guiding and controlling the actual construction process, and to accurately predict performances.²² The outcome or built form is situated on the opposite or downstream side of the process of making and alludes to the physical outcome, the final object in a presumably stable, inert and tangible material state.

The bi-polar model schematically depicts a way of framing construction in architecture in which (static) form is pre-eminent, and (dynamic) process is subservient. From this point of view, construction is a form to form process, and understood as both means and method at the service of the replication of one form or formal state into another; ideally with as little deviations as possible. The two types of form are related because part of one and the same architectural project, but distinct with regard to:

- their position in a (dis)continuous temporal sequence;
- their status;
- their modes of articulation;
- the way in which they come into being, affirmed by the distinction between

21_ When I use the term 'form', I keep referring to Suzanne K. Langer's definition of form, i.e. order, structure, internal connection, a state of organisation regardless whether abstract or tangible. See section 2.1 'What we talk about...', chapter 'Construction IS Con & Struere'.

22_ In this space, another complicating division exists, based upon a classification of the actions of the architect made by Vitruvius between 'lineaments' and 'structura', or between 'where' and 'what'. Tim Anstey explains that 'Lineaments' covers the predictions, descriptions and prescriptions of 'where' things should appropriately be placed. It refers to the skill of organising and composing form, i.e. predict correct placement. It is the presumed domain of creativity and intuition. Structura (materials/construction) concerns everything that has to be put there, the material stuff that must be moved to fill those places, ... and the knowledge and facility necessary to control those processes (Anstey 2012, pp.47-57). 'Structura' concerns the problematic of moving materials into the position in which they will be most effective. It can be associated with the prediction, prescription and organisation of matter or substance, or the control of the 'ordered and skilfull composition of various materials, ..., to form a solid and, as far as possible, integral and unified structure' (Alberti 1988, p.61). According to Anstey, for Vitruvius it resolved itself as a problem in physics, more precisely the principles of mechanics. Over time it has become the skill of predicting and controlling technical performance, and the actions that make the idea realisable in a particular place and time. At present it is the domain of construction-technology or architectural-technology, dominated by technical rationality. It is itself sub-divided in sub-domains occupied by engineers in accordance with a diversity of specialisms. Both 'lineaments' and 'structura' are predetermined in advance of 'construction', which in turn is reduced to building (see ill. 2.9 and 2.10 on p.113).

the processes of design and construction;

- the way in which they can be put into practice or operation;
- the actors involved in the distinct initiating processes: designers/constructors;
- their dependence on the conditions set by time and place.

A complementary reading of the bi-polarity is provided by Stewart Brand in 'How Buildings Learn': *'Instead of steady accumulation, the business of contemporary architecture is dominated by two instants in time. One is the go-ahead, when the architect's reputation and the beguiling qualities of the renderings and model of the building-to-be overwhelm the client's resistance. The other is the moment of hand-over, when the building shifts from the responsibility of the builders to the responsibility of the owner, and occupancy begins. These are necessary moments to make coordination possible, but they distort everything. Each instant is a barrier to learning.'*²³ Unfortunately he does not explain why this is the case, but I nonetheless agree with the statement. Brand suggests that the focus on these exemplary moments stimulates a drive towards what is perfect and final for each of those moments, and does not take evolution, mistakes, adjustments and modifications into account: *'The race for finality undermines the whole process. In reality finishing is never finished, but the building is designed and constructed with fiendish thoroughness to deny that. Landscape architects don't think that way. They know that what they design has its own life, and they plan accordingly.'*²⁴ The construction of an architectural artefact is a goal-oriented process, but it is not deterministic and linear. Its evolution is not merely dependent on the initial situation, but also on all kinds of events that happen on the many converging and diverging paths towards the goal. Processes cannot be fully anticipated upon or predicted, nor can they be reconstructed from the result. What happens during their course always has implications of some sort, and for architects it is important to learn to address this.

On the topic Brand also mentions a conversation with Christopher Alexander and one of his contractors. The former says: *'There is real misunderstanding about whether buildings are something dynamic or something static. ... Anything different from the idea that you make a set of drawings and someone else builds the thing is incredibly threatening'*. The contractor in turn affirms that *'architects think of building as a complete thing, while builders think of it and know it as a sequence ... The separation*

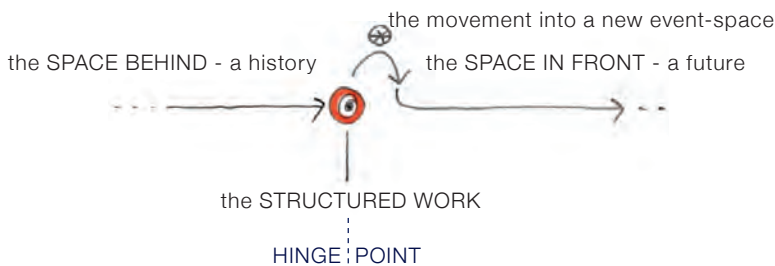
23_ Brand 1994, p.63

24_ Brand 1994, ibid. p.64

25_ Brand 1994, ibid. p.64

of design from making has resulted in a built environment that has no “flow” to it - you simply cannot design an improvisation or an adaptation’.²⁵ These statements date back to 1994 or before, but are still actual as far as my personal experience goes.

The bi-polar model fairly accurately depicts a pervasive background scheme for conceptualising construction in architecture. One example amongst others is a definition of the term construction (as a verb, i.e. to construct; in German: Konstruieren) in José Luis Moro’s ‘Baukonstruktion vom Prinzip zum Detail - Band 1 Grundlagen’: ‘When we talk about the construction of a building or edifice; Construction from lat. *constructio* “Zusammenschichtung”: stratifying, layering, stacking together”; this term is habitually interpreted in a specific way within the professional building practices (*Bauwesen*): it does not mean the actual progression of putting a construction together, i.e. the building process, but refers to both the ... endproduct, and the planning and preparation ...’ (Moro 2009, pp.2-3).²⁶ This particular interpretation is not limited to professional building practices, since the model is used in architectural education too. In this context it becomes even more radical because the construction processes that are part and parcel of architectural practice, are absent in education, for the simple reason that in the vast majority of cases there are no projects to be built.



ill.2.5:
The symmetric pattern of
relations between process
and form, using Paul
Ricoeur's terminology

Drawing by author

The terms projected form and built form refer to the two snapshots within the spatio-temporal process-movement of the architectural project, i.e. Brand's two instants in time that identify when one phase ends and another one begins. Within the time-lapse captured by the snapshot-moment the crystallised form moves from one action-space into another. This movement was mentioned before, but in other guises, that is, first as Karl Marx's concept of 'two complementary forms of creative experience, as maker and user'; second, as Marco Frascari's concept of 'symmetry between the

25_ Brand 1994, p.64

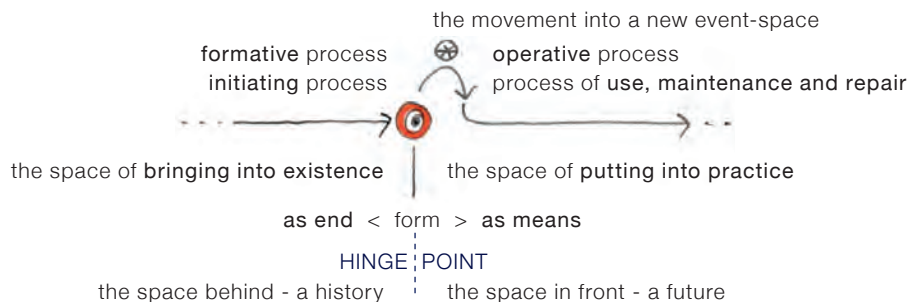
26_ Moro 2009, pp.2-3

process of constructing and both inhabiting and interpreting architecture’; and finally in Paul Ricoeur’s hermeneutics as the space behind the work and the space in front of the work’.²⁷ The basic scheme revolves around an individual instance of what Ricoeur refers to as a structured work and that functions as a hinge-point.

In his philosophical hermeneutics Ricoeur’s focus of attention is on language, discourse, and the written work, but he argues that the relational scheme is applicable to other domains because there exists a basic analogy between the operative concept or model of the text, theory of interpretation and meaningful action.²⁸ Architecture can also be conceived of as meaningful action, but in contrast to discourse and language, it has two distinct instances of structured work. They have been identified before as the two extremities of the bi-polar model, i.e. the projected and the built works. Both instances taken individually are hinge-points, and as such fit into the hermeneutic or symmetrical relational scheme. The two-sidedness that is characteristic for every structured work –with before or upstream a history of becoming or coming into existence, and afterwards or downstream a future of use or putting into practice or operation– needs consideration for the reason that form can be conceived as a (temporary) state in-between (or contextualised by) dynamic processes, as opposed to the bi-polar model where process is hemmed in by static form.

ill.2.6:
The same map of the
symmetric pattern of
relations between process
and form, based upon
Henri Bortoft’s and Carl
Mitcham’s terminology

Drawing by author



The spaces on either side of the structured work coincide with distinct practices. The space behind the work (upstream) is a ‘*formative*’ one, and incorporates ‘*initiating processes (i.e. of making)*’, whereas the space in front of the work (downstream) is ‘*operative*’ and involves ‘*recursive processes of use (and maintenance/repair)*’.²⁸

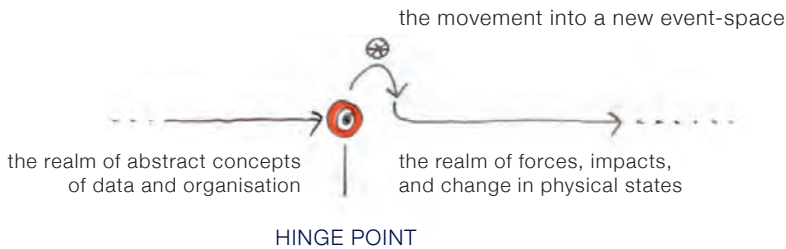
27_ See also Construction IS: Making motif C3 ‘Interpretation’, and part 3 ‘Territories’, section 2 ‘Encounters’, chapter ‘Tectonic re-Visions - Meaning and Interpretation’.

28_ Ricoeur 1981/2009, p.37 & p.129

29_ The source of the notions ‘formative and operative movements’ is Henri Bortoft’s ‘*The Wholeness of Nature*’ (Bortoft 1996, ptIII-chpt5). The notions ‘*initiating processes (of making)*’ and ‘*recursive processes of use (and maintenance)*’ are drawn from Carl Mitcham’s ‘*Thinking Through Technology*’ (Mitcham 1994, p.210).

Together with the movement from one realm to the other, i.e. from making to use, the status of the structured work (or form) changes from being an aim and outcome of one process towards an instrument or means that is put into operation or practice, and therefore used up, within (an)other process(es).

For architecture's projected works, the territory upstream (before) is occupied by a practice of projection and codified inscriptions that produces images and other descriptions for architectural situations and artefacts. The practice on the downstream side of the projected work (after) is the domain of constructors who mobilise the images made by the first practice, or put them into operation. They do this in order to bring the projected work into existence as a built work. Customarily this is understood as the domain of construction. Stan Allen refers to this structured work as '*a hinge point between abstract concepts of data and organisation on the one hand, and physicality –forces, impacts or change in physical state– on the other*' (Allen 2009, p.172).



ill.2.7:
One more version of the map showing the symmetric pattern of relations between process and form, based upon Stan Allen's terminology

Drawing by author

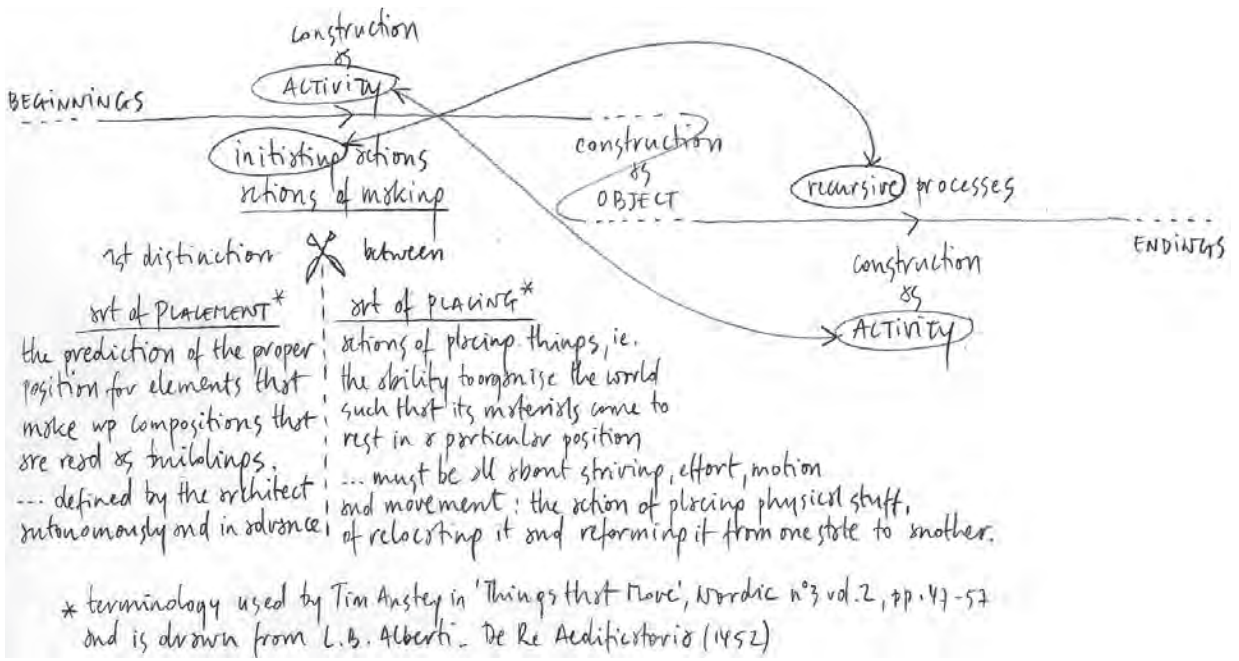
Conversely, for the built work a similar two-sided description applies. On the upstream side the domain of constructors is situated, and on the downstream side that of users who inhabit the built work and in so doing put it to use. This practice needs to be interpreted in the broad sense, that is, functional, economical, cultural, symbolic, political, etc. It is the ultimate domain within which the multitude of practices of habitation, appropriation and occupation, and the associated practices of housework, cleaning, maintenance, and repair are exercised, and which are recursive by nature.

The evolutionary pattern that applies for both instances of structured work is the movement from one mode of practice to another. It makes manifest that on top of the temporal movement there is a change of status and context too. The end and outcome of the first practice of architectural design is '*a proposed or projected world*'.³⁰ It subsequently becomes both a point of departure and a means for the following

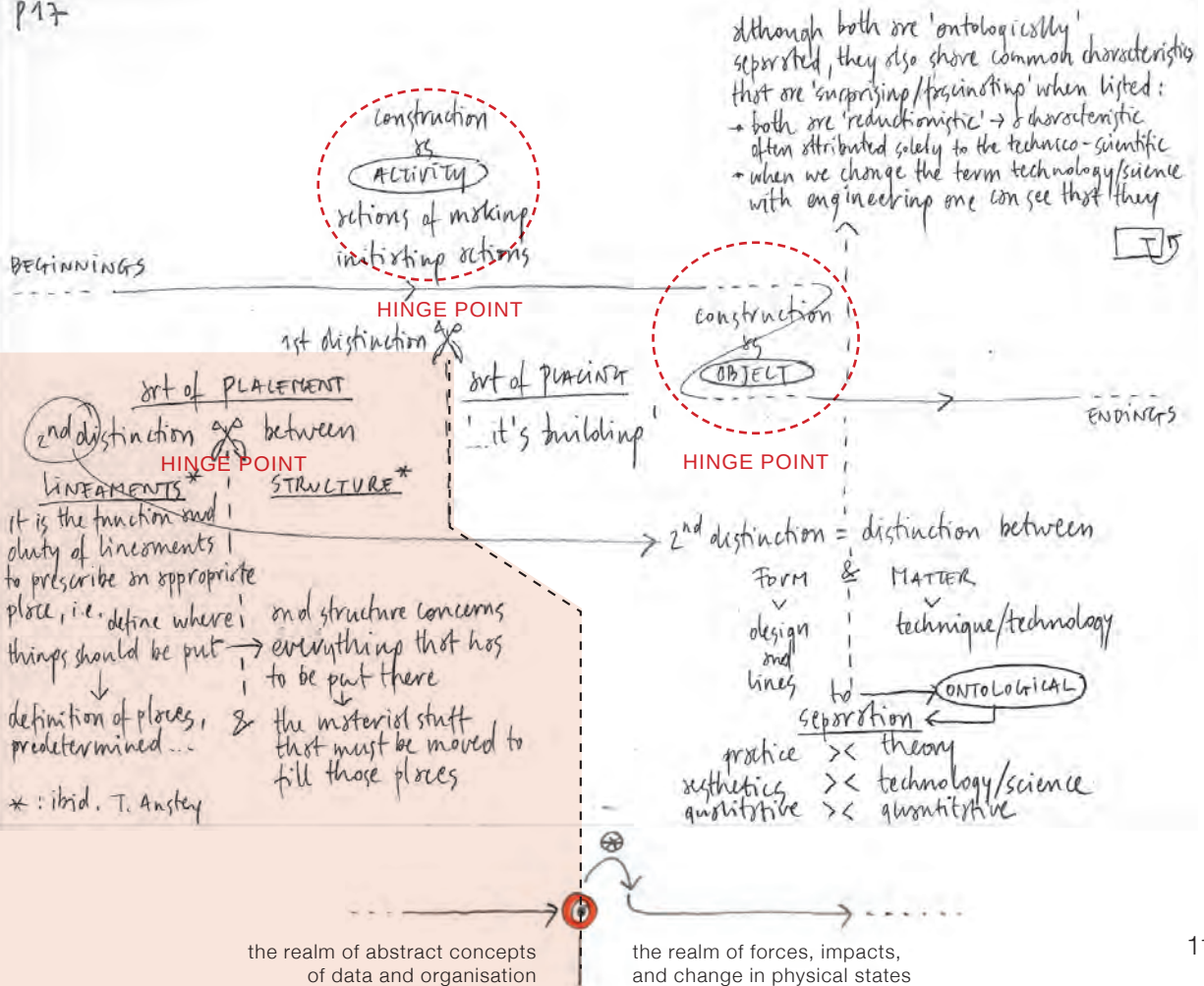
ill.2.8 & 2.9:
Two complementary versions of the map showing the symmetric relational pattern using Carl Mitcham's terminology in combination with Tim Anstey's description of the Albertian distinction between the processes of architectural design and building practice, and between those of architectural design and technological determination

Drawings by author

30_ Ricoeur 1981/2009, p.124

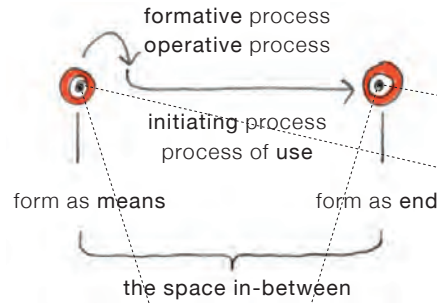


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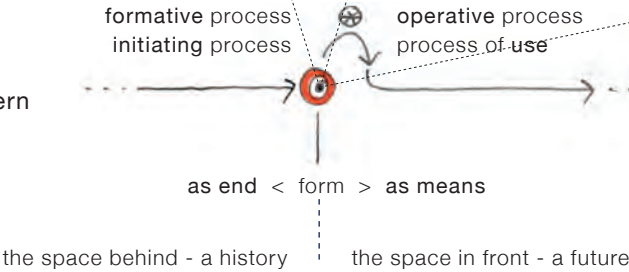


practice of construction. This principle applies for every structured work regardless of its subject and form. In all cases the structured work corresponds with a hinge-point between a formative and an operative domain. This distinction is not clear-cut, because certain processes can be seen as both operative and formative. Construction for instance puts means into operation or practice, and whilst doing so accomplishes a formative or initiating process.

the bi-polar pattern



the hermeneutic pattern



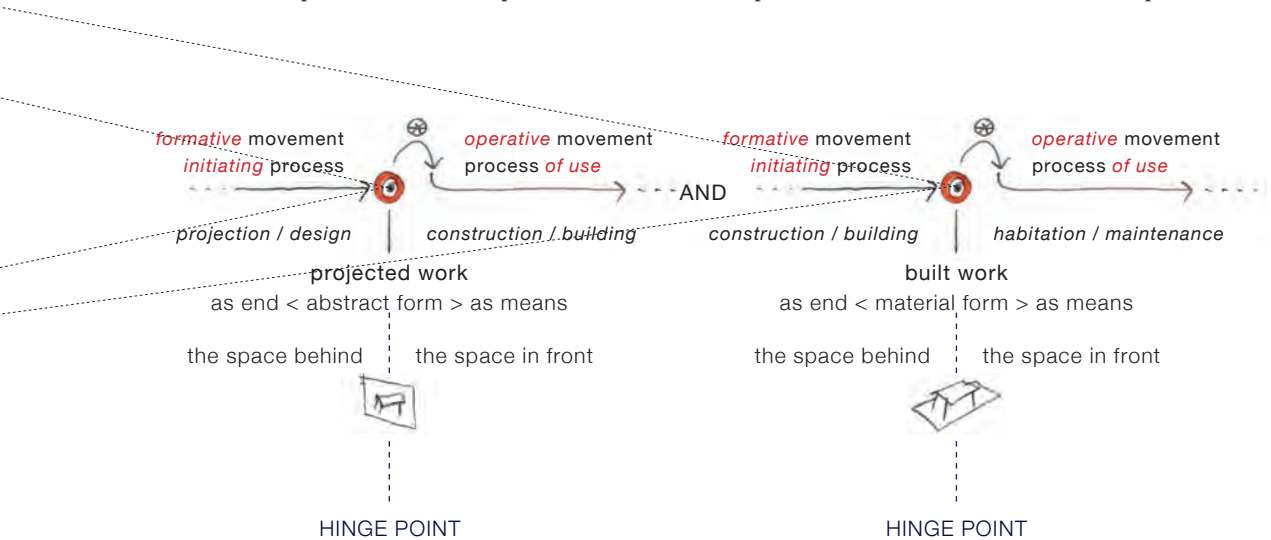
ill.2.10:
Both relational patterns combined, showing that both can be considered nested patterns alternating within a larger pattern, indicating that both are partial framings prioritising a view on a specific zone

Drawing by author

TIME-FORM

INTEGRATED PATTERNS OF INTERACTION BETWEEN PROCESS and FORM

Both previously described patterns of interaction between process and form also express a temporal order. When combined, a recursive trajectory through time becomes apparent. The red nodes stand for static and crystallised form, fixed in flight, taken outside the flow and the immediacy of experience and dynamic transformations. Lines and arrows symbolise overall direction and orientation of converging and diverging processes, ramifying, evolving and changing through time. They represent event-spaces in which evolutionary processes progressively unfold. The red node can show itself in many guises, as long as it has the character of something fixed in one way or another, not fleeting, and with properties that endure. For instance, it can be a physical object (both part and whole), an abstract concept, a drawing of a building, the building itself, a name, a category, a type, a brick, a wall, etc. It can be the end or outcome of formative or initiating processes (of making); but it can also be an instigator, a starting point, a means or an instrument that is incorporated and activated within operative actions of production or recursive processes of use, maintenance and repair.



The overall diagram shows an extended pattern of recursive and alternating interactions in-between the bi-polar and hermeneutic models. It represents a discontinuous evolutionary progression, from process to form to process to form, etc. Process and form are intrinsically connected, interrelated and cross-cutting, which also means that they are a context for each other. The former expresses temporal and changing

relations and sequences of interactions, and the latter spatial and geometric ones. But it is in the movements through time that changes and thus differences are manifested and information is produced. In an essay entitled 'Form and Cause in Goethe's Morphology', Ronald H. Brady writes: *'Form in space allows us to represent distinct loci in time, but these distinctions are those of "here" and "there", and the loci are outside one another and presented simultaneously. In succession we have to do with "before" and "after" rather than "here" and "there". The positions of a succession exclude one another by a distinction in time rather than space'*.³¹

In other words, form shows how a thing is structured spatially, and process shows how it is situated and transforms temporally. The combination of both is a time-form or dynamic form. It complements the customary focus on the 'thing or object made' with a consideration of a generative field of things 'in the making' in which movement becomes 'a form-making principle'. It enables one to conceive of a thing coming from and passing to, and as such it becomes more than a static individual, separated from time (frozen, arrested). *'Since time-form can only manifest in sensible conditions [i.e. in actions and events] through [dis-]continuous change, it cannot appear as an object but only as a quality of objects - or a type of form'*.³² Gregory Bateson identifies this as 'context', that is, in his own words *'a pattern through time'* which tells *'the story that connects', ... 'and records the how of pattern formation'*, i.e. the sequences of building up, of connecting, of ordering, and the sequences of interactions unfolding in process (both time and space). It is when, how, where and what together in a complex assemblage.³³

The notion of architecture as 'a moving project' incites an interpretation of architecture in terms of the dynamics of process, in order *'to capture it as a flow of transformations'*, modifications and adjustments.³⁴ According to Latour and Yaneva this is a necessary move, because: *'The problem with buildings is that they look desperately static. It seems almost impossible to grasp them as movement, as flight, as a series of transformations. Everybody knows ... that a building is not a static object but a moving project, and that even once it has been built, it ages, it is transformed by its users, modified by all of what happens inside and outside, and that it will pass or be renovated, adulterated and transformed beyond recognition. We know this, but the problem is that*

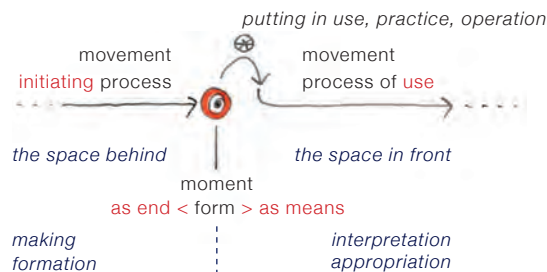
31_ Brady 1982, p.19

32_ Brady 1982, ibid. p.17

33_ Bateson 1979, p.23

34_ Latour and Yaneva 2008, p.80 & p.85





ways of seeing process in the context of form

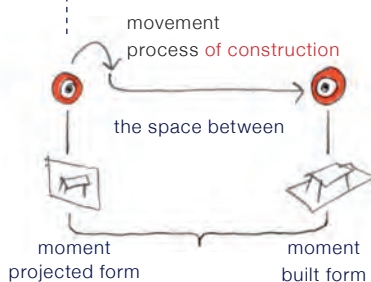
1. as an initiating process or a process of becoming
the process is situated upstream of form
2. as a process of use
the process is situated downstream of form

ways of seeing form in the context of process

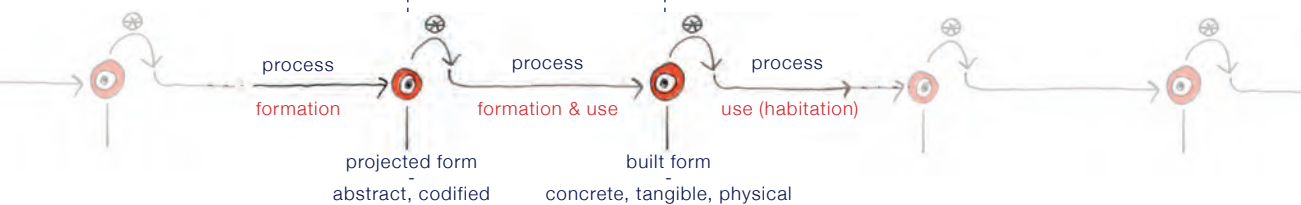
1. as outcome of process - an end.
form is situated downstream of process
formalised, cristalised, sedimented, fixed
2. as instrument put in practice within process
a means (tool, technic)
form is situated upstream of process

ill.2.11:
Another variation of
the map showing the
combination of patterns,
but this time extended
to visualise the recursive
nature of the alternation as
a pattern through time

Drawing by author



a 'moving' project - a pattern through time



TIME FORM

a project-process with moments and movements - i.e. a moving project - in which a 'pattern through time' can be identified. The formal regularity that it shows, corresponds with a recursive dialectic between process and form, or between event spaces in which formative forces are active and the structures that both come out of them, and are transformed, used, and interpreted within them.

... we are not able to picture it as one continuous movement, the project flow that makes up a building. ... we need an artificial device (a theory in this case) in order to be able to transform the static view of a building into one among many successive freeze-frames that could at last document the continuous flow that a building always is'.³⁵

The essay '*Give me a Gun and I will Make All Buildings Move: An ANT's View of Architecture*', from which this quote is taken, emphasises that it is necessary to change our ways of thinking. At the same time they also insist on the fact that we unfortunately do not have the means or instruments at our disposal to find a way out of this fundamental paradox. The development of the conceptual and practical tools that can help us address this pressing issue, is something they unfortunately make no propositions for, and ultimately it remains an open question, and a task for others to engage in. As far as I experienced, this is the case with most sociological and anthropological accounts of architecture or architectural situations and conditions, like for instance Tim Ingold's, Latour and Yaneva's, Richard Sennet's and others. The descriptions are extremely thorough and the description of problems often spot on, but proposals for attending to them or solving them in practice remain unarticulated. The question I ask myself is whether filling these gaps may be a suitable for architects?

3

TERRITORIES

GROWING ISLANDS

Where I am makes a difference to what I can know and what I can be

Rendell & Wells 2001, p.141

PRE-SCRIPT

‘... if you hike through the mountains for two or three days, you will see many different landscapes, but this is the sort of painting you’ll do on your return to relate in painting what you experienced and depict what you had observed with your eyes. That painting is the account of your journey, the different places seen at different moments in different spaces. ... Different universes, ... realities’.¹

Constructing architecture is tantamount to organising and arresting a small fragment of the world. Inside and around this constructed fragment, the world in which it is nested is constantly re-organised too, and not solely by human hands and forces. Creating independence from it within abstract descriptive and representational realms of theories and design practices is necessary, but the situatedness of architecture’s built manifestations is both vital and inescapable as well, and therefore has to be taken as a grounding premise too. I believe that a sense or feel of the entanglements should remain present in our ways of addressing construction in architecture, also when our modes of engagement are highly abstract and remote. This means that the influences of situation, place and time must remain in the picture in one way or another, otherwise they are too easily forgotten. Inversely, being situated in one place at one moment in time excludes other places and moments, and makes the possible connections in-between them less visible. This is where other modes of articulation come into play, like in the story *Growing Islands* that follows.

The essay ‘*Growing Islands*’ intends to exemplify this work as a whole, and its presence is necessary as a demonstration of how a territory or domain can be engaged, read, interpreted and described, even though its content diverges from and for that reason may seem unrelated to architecture and construction. It has to be seen as a complement to the chapter on method ‘Way of Working - Making Connections’, and informs on attendant matters: levels of questioning; the diversity of positions occupied in a territory; the associated stances; the multi-directional exploratory movements or wanderings in it, etc. Themes are addressed indirectly in order to evoke rather than to demonstrate. Issues and concerns are not explicitly identified nor situated in relation to

1_ Wang Shu 2013, p.34

architecture and construction, but they are nonetheless intrinsic to both, be it perhaps in other guises. The issues are related to the manner in which we attend to the world in which we dwell, how we describe it, and how we attempt to think and understand it. The story is the result of a direct physical engagement with a site and a reflection at a distance from it, both before and after the voyage it narrates. It is an account of a week long stay on Utö in the Stockholm archipelago, and a result of a doctoral writing course named 'Transversal Writing', organised by Hélène Frichot and Catharina Gabriellsson from KTH School of Architecture. The core of the assignment is captured by the notion of site-writing, which has been interpreted in terms of making a work in and with the place, and by using multiple means of expression to emulate a place's multiplicity.

The narrative mode is that of the parable, i.e. '*a succinct, didactic story, in prose or verse, which illustrates one or more instructive lessons or principles*'.² It is intentionally written in the first person singular to acknowledge the fact that it is based upon personal action, experience and reflection. For this I followed the guidance of physicist and Nobel Prize winner Percy W. Bridgman who wrote: '*The resolution to use the first person was one of the outcomes of the attempt to see things in terms of activities. A spoken or a written word was spoken or written by someone, and part of the recognition of the word as activity is a recognition of who it was that said or wrote it. When I make a statement, even as coldly and impersonal a statement as a proposition of Euclid, it is I that am making the statement, and the fact that it is I that am making the statement is part of the picture of the activity ... Attention to activities and the first person emphasises the insight that we never get away from ourselves*'.³

To anticipate on the predictable judgement of self-indulgence and solipsism, I need to emphasise that I am aware of the fact that there is always a history and a context that make me look and act in a certain way. This complex of influences is not neglected, but used and referred to as much as possible within the text. At the same time many of them remain implicit or absent because unknown to me. In the words of Michel de Certeau: '*The course of an analysis inscribes its steps, steady or meandering, in soil inhabited since a long time. Only some of those presences are known to me. Many of them, possibly more decisive, remain implicit - postulates or stratified achievements in a landscape of memories and palimpsest*'.⁴

2_ Wikipedia, accessed 18 December 2021

3_ Bridgman 1959, pp.3-5.

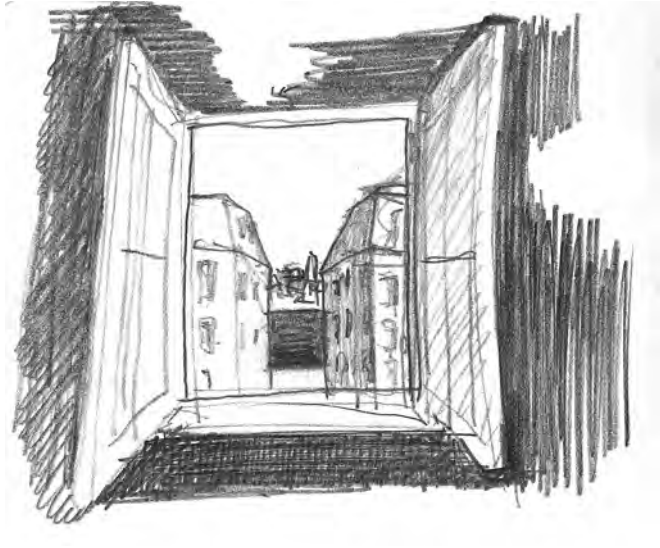
4_ de Certeau 1979/1990, p.xxxiii. Translation from original French version to English by author.

GROWING ISLANDS - A PARABLE

'In the lives of emperors there is a moment which follows pride in the boundless extension of the territories we have conquered, and the melancholy and relief of knowing we shall soon give up any thought of knowing and understanding them'.
(Italo Calvino, 1997, p.5)

day 1, Sunday 21 June 2015	The Imageneric Island
day 2, Monday 22 June 2015	Above and Between and On
day 3, Tuesday 23 June 2015	Suspended Inside
day 4, Wednesday 24 June 2015	Writing Always Means Hiding Something In Such a Way That It Then Is Discovered
day 5, Thursday 25 June 2015	There are Lines and Limits Growing Organisms
day 6, Friday 26 June 2015	The Constellation Project
day 7, Saturday 27 June 2015	The Grounding Island
the following days	...

the 1st day
Sunday the 21st of June



ill.3.1:
Drawing by author

THE IMAGENERIC ISLAND

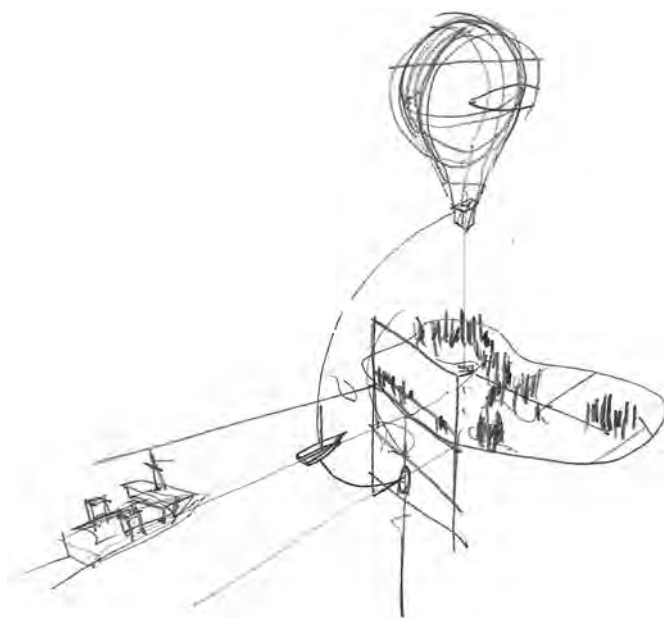
— My expectations of tomorrow's destination are reflected in the glistening surface of the Baltic Sea in front of me. The water framed by the city is part of the same body that holds the island I am going to in a tight embrace. I have never been to it before and it is unknown territory to me. The view that I have of it is indirect and revealed by mediation of something else that takes a position in between me and her.

My knowledge is like a white and empty space that needs to be filled with all there is to know about the island. But this metaphor is inadequate and deceiving because my memory is not empty. I have seen the scattered coastline in which the island dwells before, and it is imprinted in my memory. It is a collection of innumerable patches of rock floating around on an expanse of water, some of them barren but most are covered with trees and shrubs. A shallow investigation made clear that our island is one of the bigger ones in the archipelago. Besides that I don't know much. It is not clearly defined and has no character of its own, at least not one that I can recognise as such, and that would enable me to distinguish it from others. Looking out through the window of my room towards the shiny surface of the sea, I realise that my mental picture of the island is generic and makes it look the same as any other. It is totally absorbed by a stereotype that merges them all into one non-specific abstraction.

The only thing I can come up with that makes the place unique is the fact that it is our destination. It's an uninspired argument for justifying why my attention is oriented towards it now and today, and will be for the days to come. The island is special because it has been chosen as the place where we will go and stay for a while; this very place and not another. This status transforms her into a prospect, something to look forward to. It feeds the tickling expectation of getting to know something as yet unknown, an inarticulate promise of a mystery that will be unfolded.

Meanwhile it has become the subject of my solicitude. This afternoon I have spent a considerable amount of time trying to imagine what the place will be like and what actually makes it what it is. I came up with all kinds of ideas, but eventually it will become clear that my thoughts deviated substantially from what the place actually is. It cannot be otherwise for the obvious reason that I am outside, somewhere else and not there with her to share her space. All I come up with for helping me to imagine and understand the island is extrinsic to it. The distance between my mental images and the real island is unbridgeable.

the 2nd day
Monday the 22nd of June



III.3.2:
Drawing by author

ABOVE and BETWEEN and ON

— We move. The water moved and is in-between the mainland and me. The land moved too; it is in our backs and already out of reach. Physical and mental distance are combined and increasing. I am standing outside the city, looking at it out there from the boat, from a floating mechanical island. The point of view changed and the world changed together with it.

The water is enclosed on two sides. It looks like the replica of a road, but liquid and bordered by solid terrestrial edges. The speed of the boat varies with the proximity of the enclosing sides and this relation sets the rhythm of the journey. When land finally recedes and the surface of water ahead broadens almost imperceptibly, our clearly defined guiding path gradually disappears. Ahead of us a wide open surface is revealed and the trail that we follow becomes invisible for my uninitiated eyes:

‘Des yeux qui ne voient pas’ (Le Corbusier 1923, p.65).

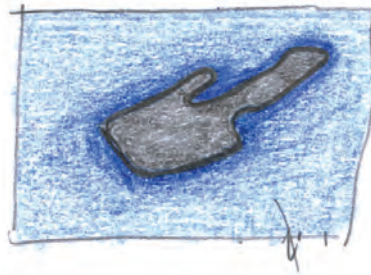
Alone, I would be lost in such a desolate landscape without pattern, devoid of marks and inscriptions that I can read and give meaning to. I imagine that navigating this continuous space without differences must be an experience that comes close to what is described by Roland Barthes in *The Empire of Signs*: *‘The unknown language, of which I nonetheless grasp the respiration, the emotive aeration, in a word the pure significance forms around me, as I move, ..., sweeping me into its artificial emptiness, ... I live in the interstice, delivered from any fulfilled meaning’* (Barthes 2007, p.9).

In open waters it appears that the only visible path is behind us, always originating in our backs and traced by the waves and the spume of the agitated waters in the wake of the boat. The path never appears in front of us to show us the way ahead and towards our destination. It only shows us the place where we were just before now. It visualises our immediate past, an ephemeral trace of history articulated through a turbulence that will become silent soon.

the 2nd day
Monday the 22nd of June

— The islands we encounter along the way are small enough for me to see that they somehow conform to the definition of island: ‘a piece of land surrounded by water’. It is one of those thrilling moments when the empiric observations concord with the theoretical assertions. The correspondence is not just verifiable due to the fact that the islands are small, but also and not in the least because I am on a moving boat. I realise that this must appear to be a very trivial observation, but the movement compensates for a significant change in my outlook on the world out there. Now I am standing next to the islands, so to speak, and looking at them sideways, from upon a surface that I share with them, approximately.

It is instructive to look at the pictures of islands that are used to illustrate and support the verbal descriptions of the category ‘island’. They invariably appear as aerial images where islands are viewed from above and in their entirety. It is the most common way to show islands just as it is a common way to show architectural projects, that is, from up there, through a hole in the clouds. From that point of view an island looks exactly like is asserted by the definition of the noun. But today my point of view has tilted downwards and the strong sense of overview has vanished.



*Ill.3.3:
Drawing by author*

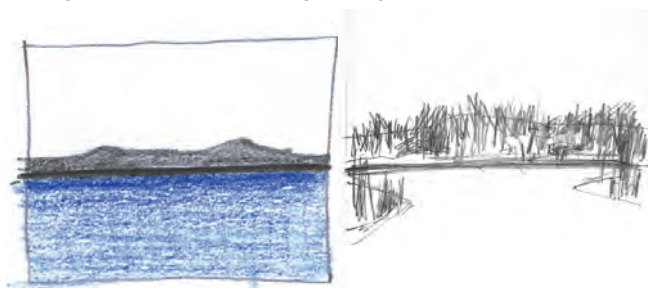
A moment of arrival is always exciting, especially by boat.

The moment is introduced from long before it really occurs and the tension of expectations builds up as land closes in. As soon as I realised that we were in our final approach towards our goal, I started looking out for evidence that could help me recognise the few general characteristics of islands I knew about. To my confusion and distress I could not identify any. The horizon was filled with one continuous strip of land from one side to the other. We were in the right place for sure, as I could read a little later from the huge board that faced the sea and welcomed us in serviceable terms. But as far as I could tell from the impressions at my disposal, there was no island

in sight, or to be more accurate, the image that I saw out there did not correspond with those that I saw before. There was water and there was land on top of it too, but besides them touching one another there was no indication that their relationship conformed to what it should have according to the essential properties that are considered common for islands.

Based on what I saw we might as well have arrived on the mainland, and I was far from convinced that the territory we were about to enter could claim that small addition of two letters that makes it an is-land. My unshakeable certainty about what an island is mutated into doubt: how do I recognise an island when I encounter one? What I knew appeared to be insufficient, and from that moment onwards I had two divergent versions of islands in my mind; two views that seemed impossible to reconcile.

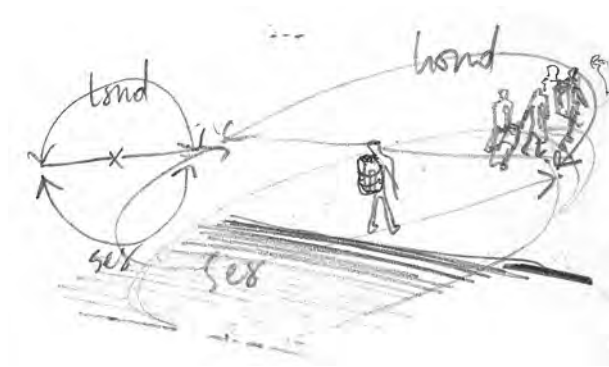
The world looks different when one looks at it from another place: yesterday I saw it from above on a printed page in an atlas. Now I face it from down here. The island was a spot on a map or a stain on a tablecloth, and it was surrounded by a blue surface and a black line. Today the island abruptly became a horizon, one that provokes 'land in sight', the exclamation signalling to those that look down that there is also something



ill.3.4:
Drawing by author

worthwhile to see out in front. The contour is always invisible from down here and one has to let go of the world to see the island in its grandiose totality. In contrast, the island disguised as horizon cannot be contained within the frame of one image. Completion and closure are unreachable ideals and fragmentation rules unchallenged in the world where my body is standing now. Slowly the horizon comes closer. Its presence becomes increasingly prominent, almost to the point that it can be felt. Finally it is there in front of us and we just have to take one step to bridge it and enter into the world of the island.

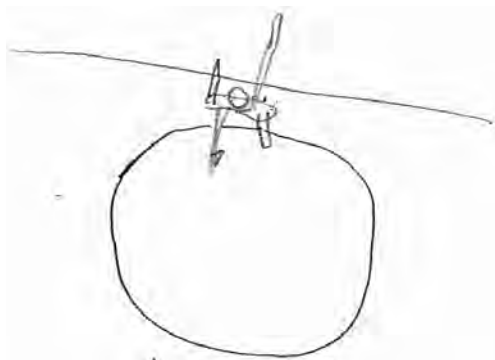
the 3rd day
Tuesday the 23rd of June



ill.3.5:
Drawing by author

SUSPENDED

ill.3.6:
Drawing by author.

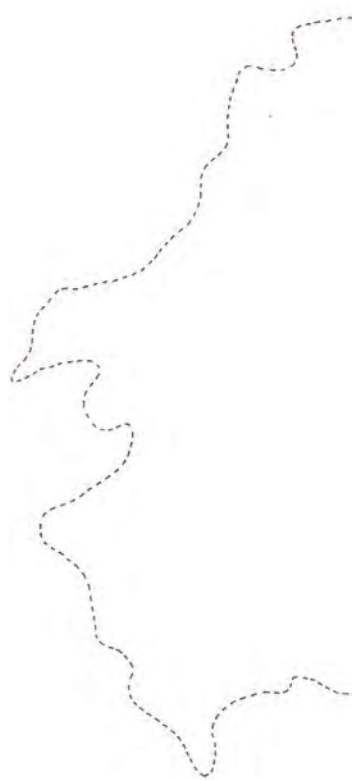
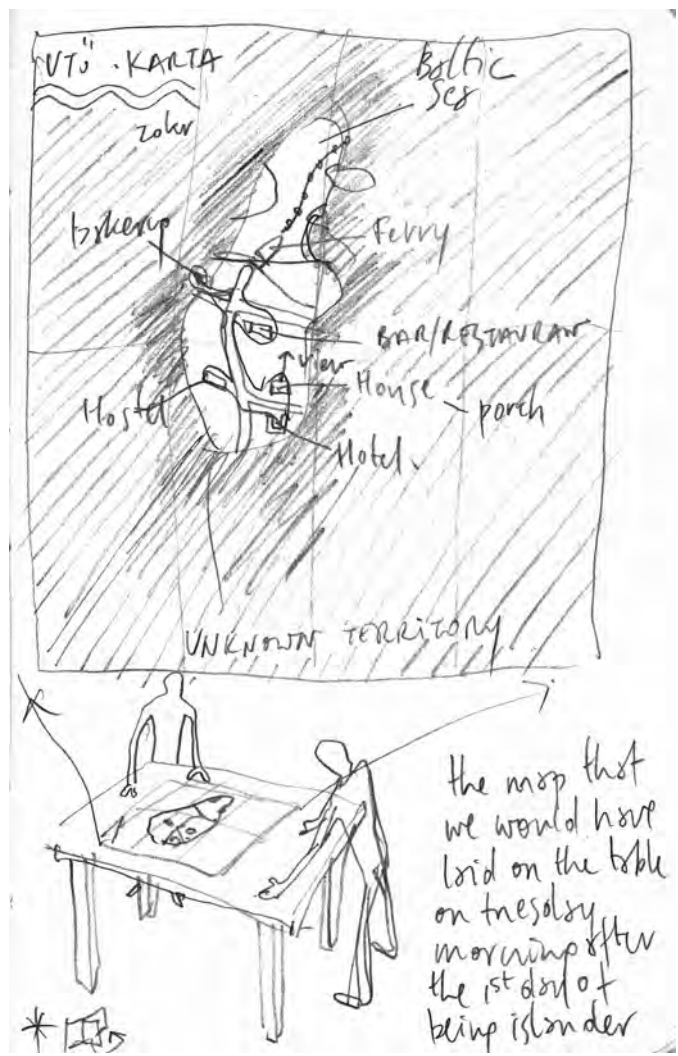


— I don't know why it happened and I don't even know if it really did in the way I remember it. As it appears to me now, with hindsight, we did not pay any attention to that unique instant when we stepped over the line. That very moment that coincided with getting off the boat and setting foot upon the surface of the island. An awfully short point in time when our attention was entirely focused on entering. It made us look towards the island's interior and not down, towards the threshold we were about to bridge. At that precise nanosecond when our body was on top of the sharp line that separates ground from water, we were inside and outside at the same time, suspended between the world of the sea and that of the island, but also between the world of abstract ideas about the island and the physical territory of the actual island in which we were about to be immersed.

Maybe I just imagine this because I cannot recall it, but there clearly was a before when we were on the boat, and an after when from the place on solid ground where I was standing, everybody seemed to be rushing up the hill, as if trying to get away from the shore as fast as possible. It looked like an attempt, or rather an irrepressible urge, to increase the distance between one's body and the line that marks the threshold between the solid stuff of the island and the amorphous liquid stuff of the sea. Without noticing it we were inside in no more than a split second, encircled, contained, ... insular on a piece of soil completely surrounded by water. Both the statement that one can read in the dictionary and the drawing in the atlas, finally seemed to coincide with the material world.

the 3rd day
Tuesday the 23rd of June

+



ill. 3.7 & 3.8:
Drawings by author

INSIDE

— The place where we arrived yesterday 'is' an island, and now, I am on it. I need to repeat this regularly and with insistence like a mantra, to keep myself convinced of a fact ceaselessly contradicted by what I see around me.

I hope,  that I can trust the people who brought me here and who say this really is an island. I learned to trust maps too, of which I bought a small foldable version the day before. Yesterday's question keeps chasing me: how do you recognise an island when you encounter one? The name printed on my new and geographical map corresponds with the name of our island. It is not much but at least it's a clue. Looking for clues in the form of correspondences between what I can read on that map and what I observe on the ground seems a plausible and accessible way to engage the discrepancies between the descriptive knowledge from books and my perceptions.

I started drawing my own map. I thought it might be useful to inscribe my findings in a similar symbolic language and use that as a basis for comparison and verification of the existing reality of the island. It was a thought set in motion by something *Italo Calvino* wrote in *'If on a Winter's Night a Traveller'*: *'it is only through the confining act of writing that the immensity of the nonwritten becomes legible'* (Calvino 1998, p.183). Writing is what I set out to do, not with words but with the graphic codes of cartography. The map I drew of my island turned out to deviate substantially from the foldable one I used as a reference. I did not expect that the sense of difference that I already felt would be articulated so clearly, but somehow it made sense. My map first took shape as a space. It was a kind of outside room with boundaries I perceived around me the day before, and that resulted from the movements of approaching the island from the sea, of getting off the boat, and of entering it and walking around on it. Afterwards it transformed into a planar image, a drawing that only shows a thin slice of space that is contiguous with the island's skin, ... a *Flatland*.

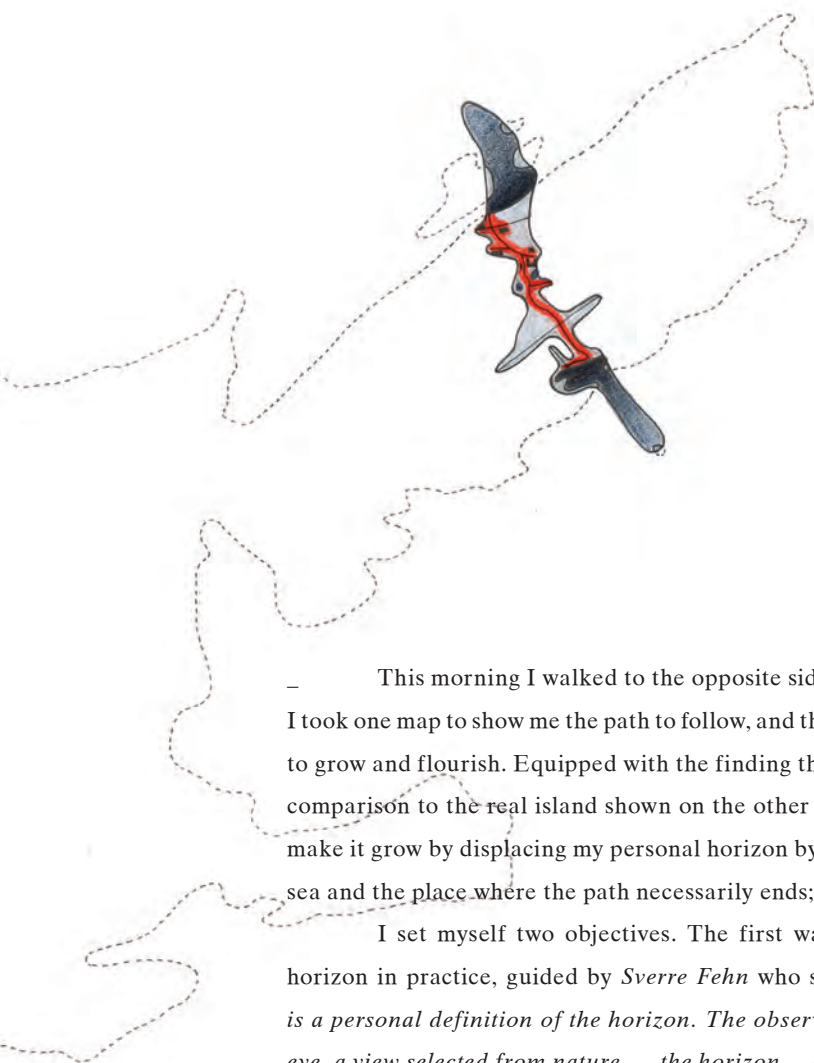
Now I have two maps. The first is the one I bought and implicitly claims to accurately show the true island, whatever that may be. The other map, my map, shows another version of the island, one that is shaped by my personal horizon at a set moment in time, and is arrested in a conventional planimetric arrangement.



the 3rd day
Tuesday the 23rd of June



ill.3.9:
Drawing by author



— This morning I walked to the opposite side of the island with my two maps. I took one map to show me the path to follow, and the second as my first shoot that needs to grow and flourish. Equipped with the finding that my personal island looked tiny in comparison to the real island shown on the other map, I anticipated the possibility to make it grow by displacing my personal horizon by walking around. I set out to see the sea and the place where the path necessarily ends; the edge of a micro world.

I set myself two objectives. The first was to start putting the dynamics of horizon in practice, guided by Sverre Fehn who said that *'(t)he distance one can see is a personal definition of the horizon. The observed landscape is an inflection of the eye, a view selected from nature. ... the horizon ... an instrument ... determining a large exterior room ... extending no further than the eye can see'* (Fehn 1983, p.32). I was determined to make my rooms inside the island grow bigger and I started making the maps to show this process and its stages. My second objective was to subject the foldable map to a reality check, a test of the correlations between codes and territory set against the background of my interpretations. I reckoned that this would provide a basis for my explorations of the island during the following days.

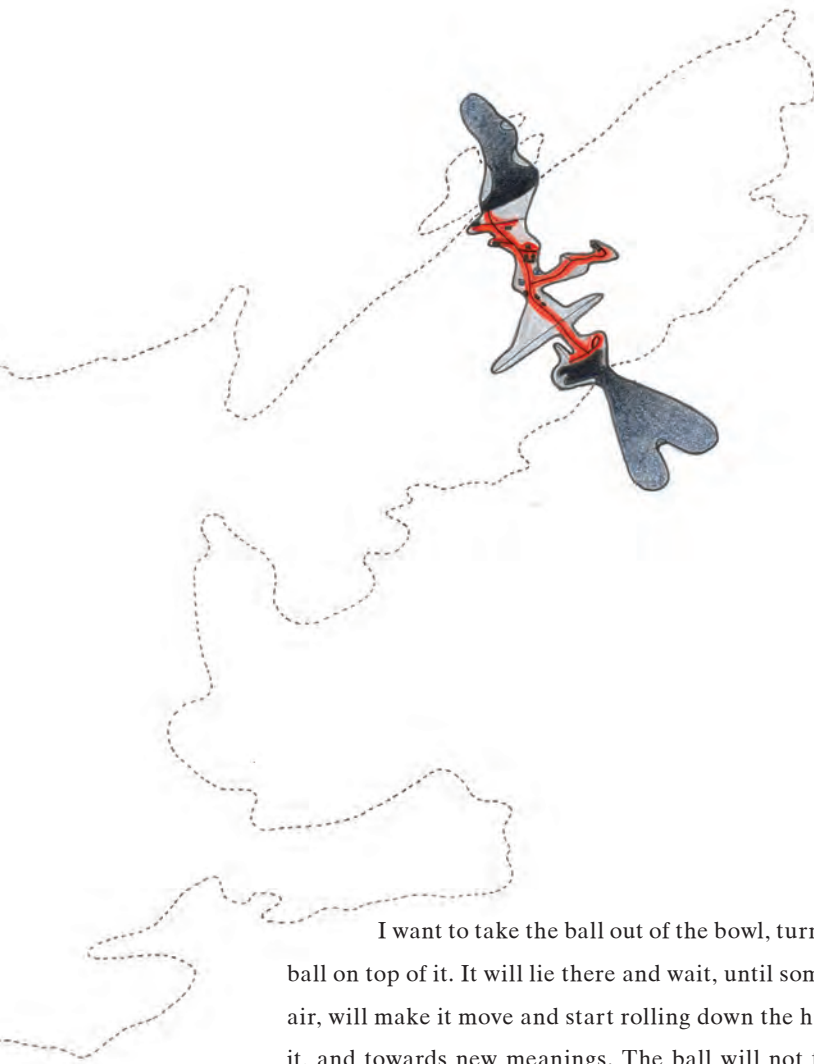
— The maps ‘of’ the island are semiotic landscapes of signs and symbols. I am drawn into them. It is impossible to resist the temptation to interpret them, of assigning meaning to them, of projecting images of the things that they designate, and of associating them with a possible character of a place. They trigger my imagination and I construct a fantasy island with them based on what I think they signify.

But what do they actually mean and how do I figure that out? One has to be cautious *Gregory Bateson* told us, because ‘*codes are conditional; that is, their meaning changes relative to context, and especially relative to the changing states of relationships between [actors in that context]*’ (Bateson 1979/1980, p.128). Does language need an environment to become intelligible? If so, what is the context of the maps that I am using? And what are the meanings that I draw from the relationships between the maps and the actual territory they describe, between the maps and me, and between the territory and me?

The map of exact truth -which is how I started calling my foldable map- hangs on the wall in front of me. I decided to make it unavoidable, in the face so to speak. When I raise my head it is there for me to look at. Every time I attempt to look at it as if I never saw a map before in my life, and pretend that I am unable to read the codes and signs with which it is written. It is an impossible task, and instead of seeing new things, I always return to the meanings I already know and that I have learned before. It is difficult to free myself from this endless repetition.

I am constrained by previously acquired language patterns and significations. They impose an abstract context on me for reading the map. Sometimes it feels like a burden to know what things stand for. It is like a static equilibrium: the ball always returns to the bottom of the bowl. And I, like the ball, always return to the same meanings, pulled back towards pre-given and pre-conceived significations. It seems impossible to liberate my thoughts from what I already know.

Writing always means hiding something in such a way
that it then is discovered (Calvino 1998, p.193)

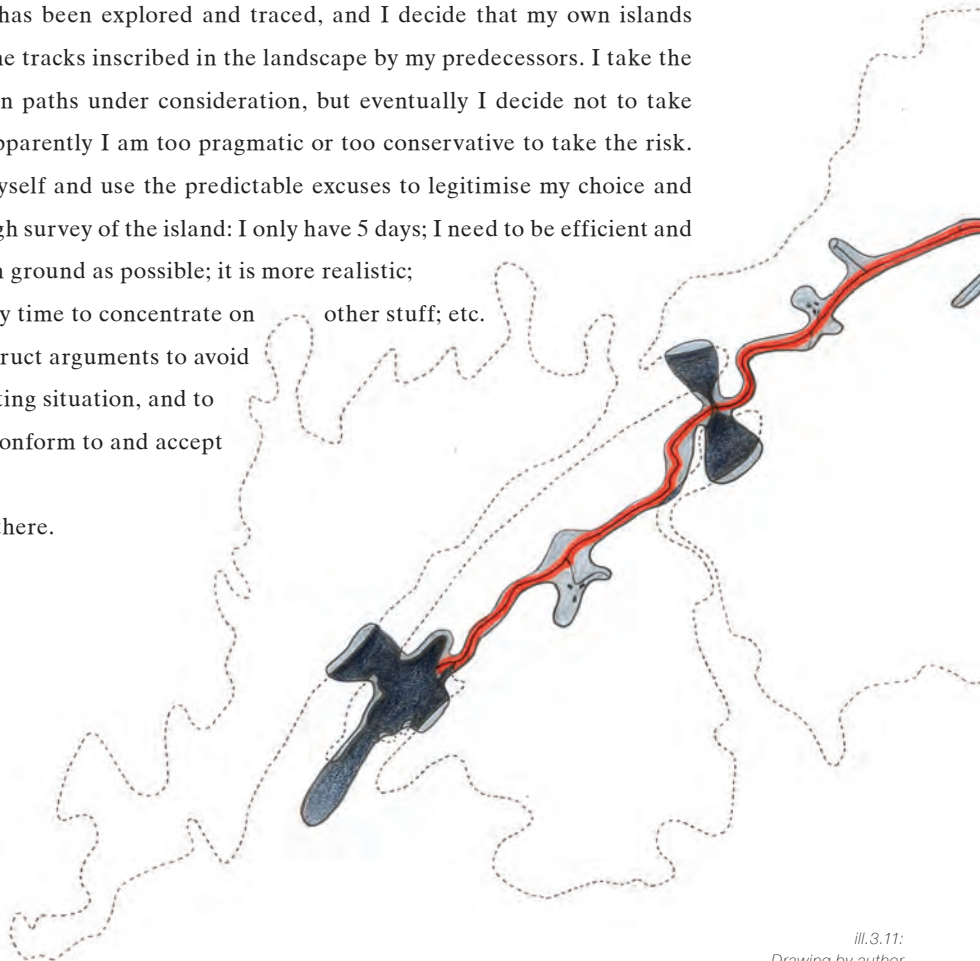


I want to take the ball out of the bowl, turn the bowl upside down and place the ball on top of it. It will lie there and wait, until something, a gentle touch or a breath of air, will make it move and start rolling down the hill into the landscape that surrounds it, and towards new meanings. The ball will not forget the path that it followed, nor where it came from. As a result it will know two places or more instead of one; the pathways that connect them; two meanings or more instead of one.

How can I make the ball move? How can I create the conditions in which there are some more chances that my knowledge will not be static, but will move to discover and grow instead? +

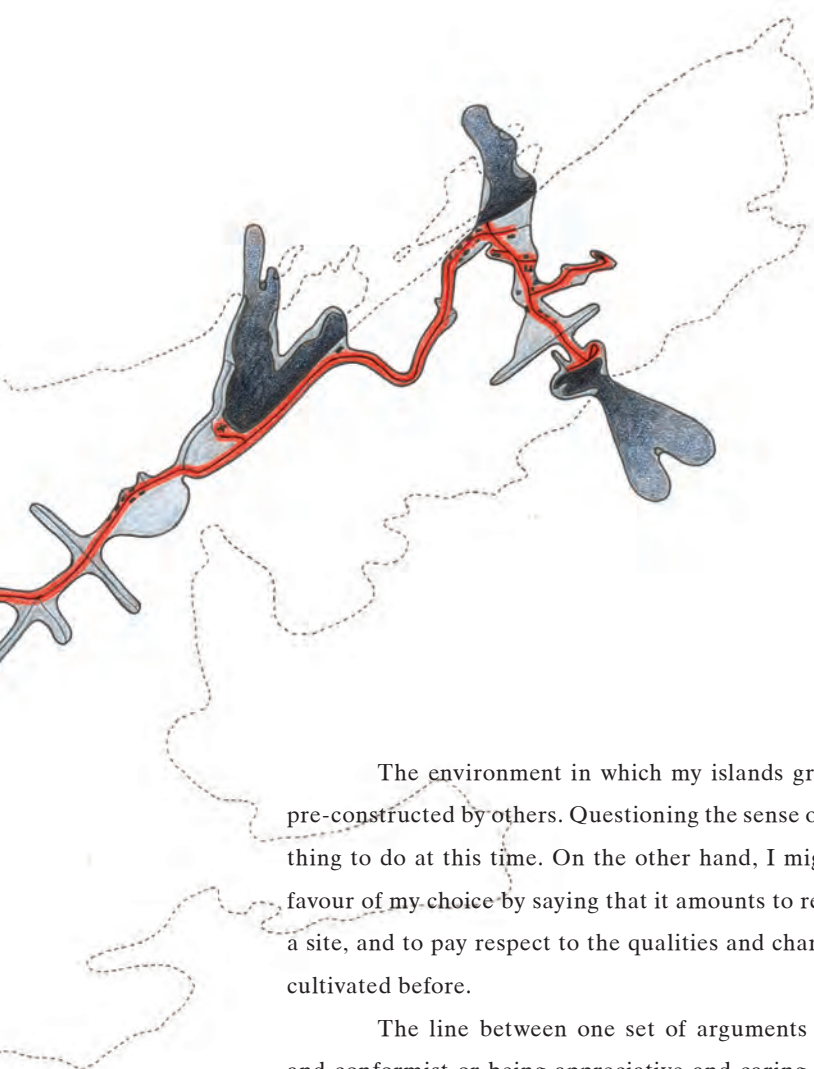
— I explore the island by following the paths traced and smoothed out by others. I assume that I am attracted by the unquestioned supposition -feeling more like an unquestionable truth- that they will lead me somewhere. It is supported, or maybe imposed by their very existence as both physical and symbolic entities, as both a linear material surface made out of tarmac or gravel in a territory, and a black line on a map. They implicitly contain a promise of a destination that is beyond doubt, and a possibility of return. A fact that has been proven countless times before. Why follow a new path that still has to be traced and made, if there is an already existing one that grants comfort and predictability, and has already been laid out for us?

The island has been explored and traced, and I decide that my own islands should grow along the tracks inscribed in the landscape by my predecessors. I take the idea to trace my own paths under consideration, but eventually I decide not to take on the challenge. Apparently I am too pragmatic or too conservative to take the risk. I make it easy on myself and use the predictable excuses to legitimise my choice and avoid a more thorough survey of the island: I only have 5 days; I need to be efficient and fast to cover as much ground as possible; it is more realistic; I can free some of my time to concentrate on other stuff; etc. I unknowingly construct arguments to avoid questioning the existing situation, and to convince myself to conform to and accept what already exists, simply because it is there.



Ill.3.11:
Drawing by author

THERE ARE LINES and LIMITS



The environment in which my islands grow and thrive is pre-conceived and pre-constructed by others. Questioning the sense of it does not seem the most adequate thing to do at this time. On the other hand, I might as well argue more forcefully in favour of my choice by saying that it amounts to recognising the existing properties of a site, and to pay respect to the qualities and character that have been developed and cultivated before.

The line between one set of arguments or the other, either be non-critical and conformist or being appreciative and caring, feels very thin. To a certain extent it makes sense to acknowledge that the existing paths will be new to me anyway, and that going along with them will bring me into, for me, unknown territory. The existing pattern of paths on the island enables me to go to places where I have never been before, and teaches me both new and already known things, expanding my knowledge, both confirming and contradicting my presuppositions. At the same time this choice inevitably obstructs the passage towards really unknown places.

the 5th day
Thursday the 25th of June



ill.3.12:
Photo by author

— My bike rolls over the tarmac surface of the road. The road is the thing that a continuous and double parallel black line stands in for on the map. During the trip to the south-west end of the island, I am joined by a fellow traveller.

I met her before, on Tuesday to be more precise, our third day on the island. She is a playful line who comes and goes as she pleases, and seems to have the capacity to show herself in many guises. Today she appears as a line of shadow on the road, and it looks like she decided to keep me company for a while on my journey along one of the longest roads that snakes towards the sea on the island's skin.

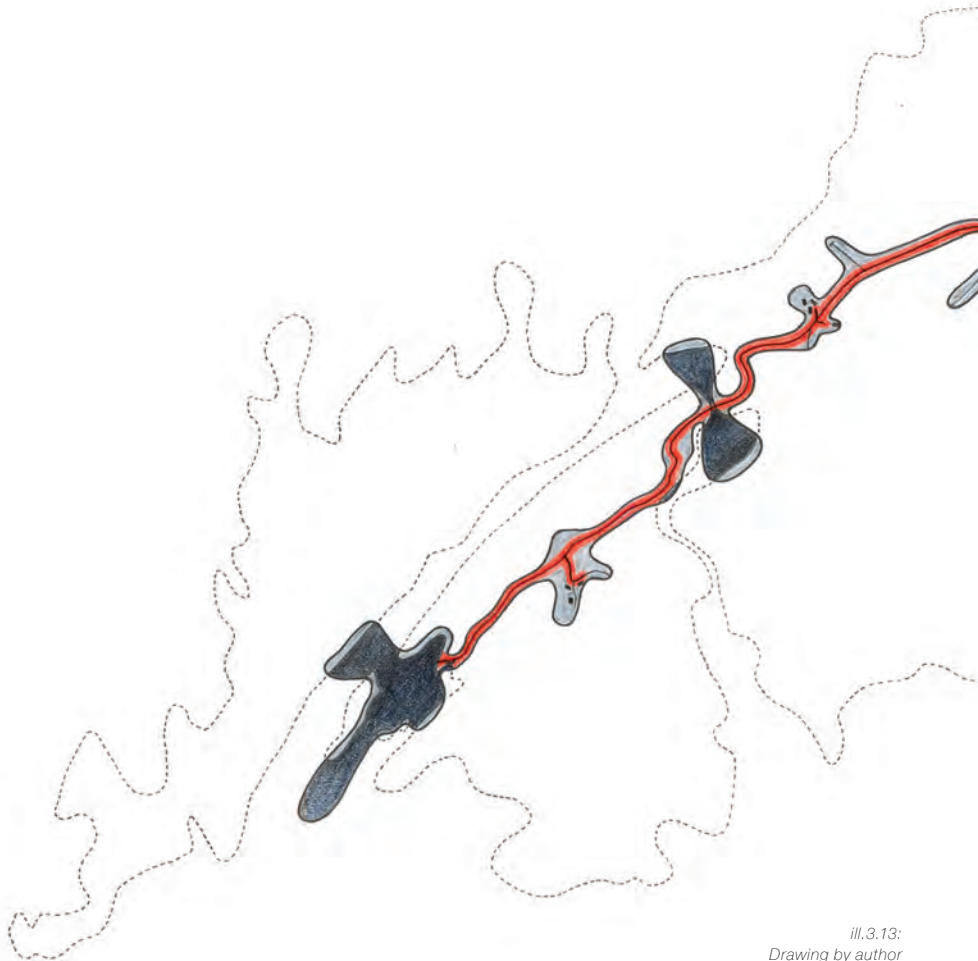
She banters with me and with the front wheel of my bike. I try to follow her but she is more versatile than I am. She runs in curves and in angular waves; she gently follows the edges of the road and then suddenly jumps over it, through the gravel and into the grassy borders where she stays for a short while; then she jumps out again a little further down the road, crosses it abruptly and disappears into the trees. She keeps repeating those tricks on and on, and it is impossible for me to follow her. I have to let go of her regularly, but she keeps coming back, although only when she decides to.

And then it stops, suddenly, as does the road. That is something roads do on islands. They stop abruptly in front of a wide expanse of water. The shadow line met a wire a few meters from where I stand, and together they dived into a fissure in the rocks and then into the sea. I keep standing there, immobile, because I cannot follow, ... once more.

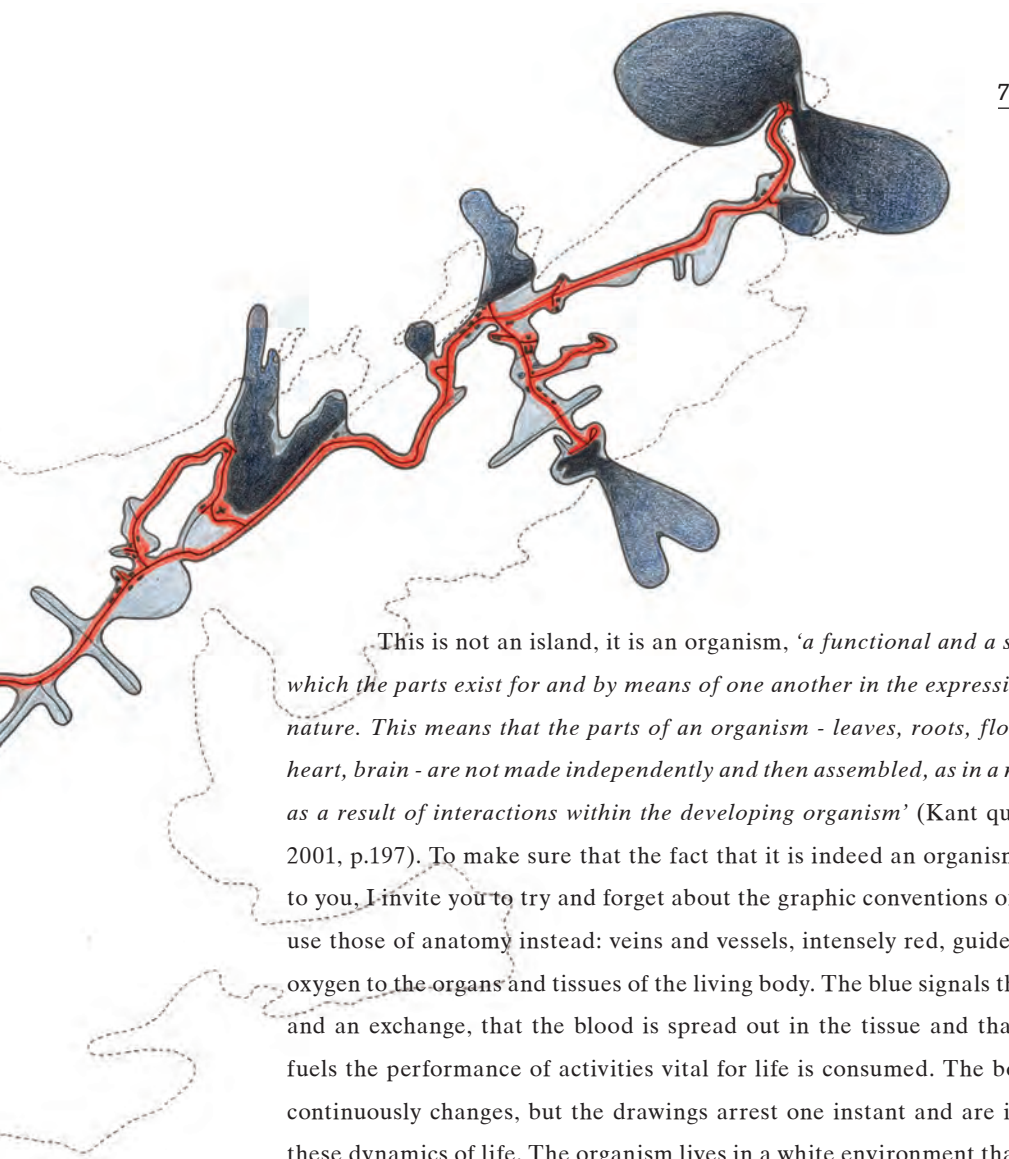
But now it is different than those other times when I had to stay behind. I have to come to a full stop due to that other line, the boundary between land and sea. It blocks the road forward and keeps me inside, enclosed, imprisoned. I reached a limit that I cannot cross. I should have seen it coming but I am astonished. I had completely forgotten about this line that embodies that so-called essential property, and it is the first time that I intensely sense what it is like to be on island.

the 5th day
Thursday the 25th of June

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ill. 3.13:
Drawing by author



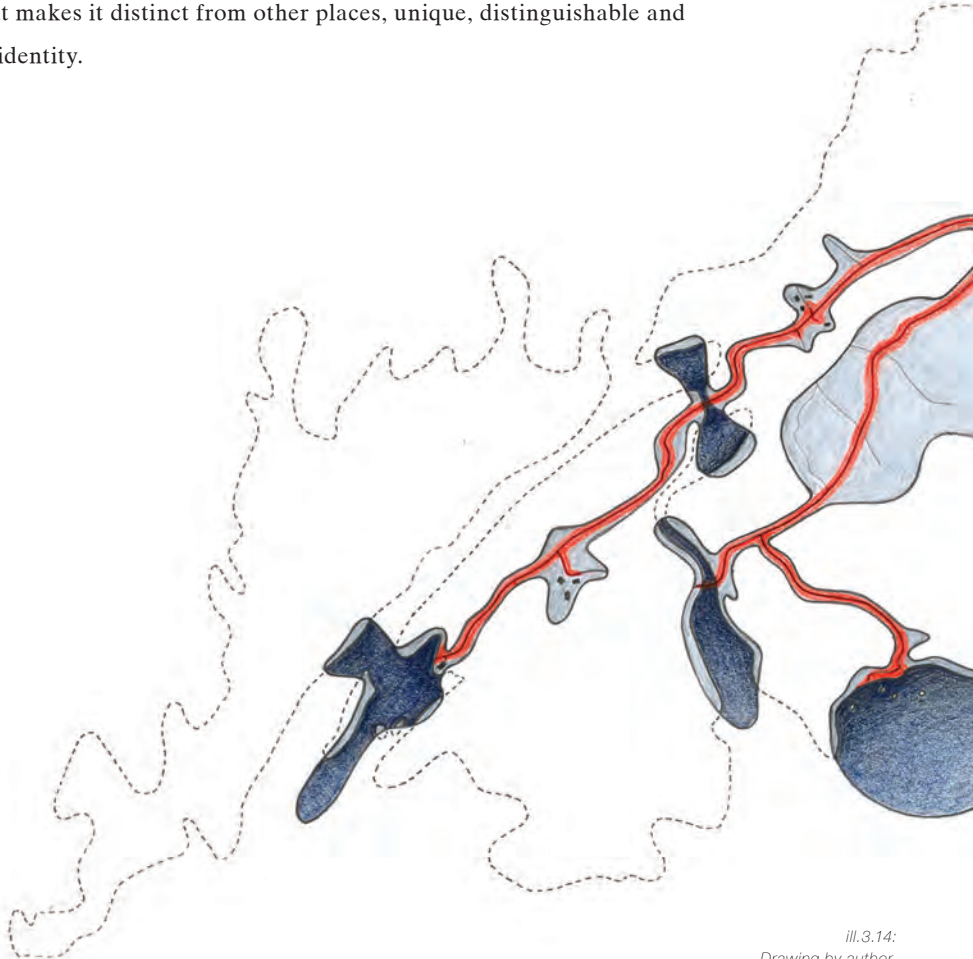
This is not an island, it is an organism, *'a functional and a structural unity in which the parts exist for and by means of one another in the expression of a particular nature. This means that the parts of an organism - leaves, roots, flowers, limbs, eyes, heart, brain - are not made independently and then assembled, as in a machine, but arise as a result of interactions within the developing organism'* (Kant quoted in Goodwin 2001, p.197). To make sure that the fact that it is indeed an organism becomes visible to you, I invite you to try and forget about the graphic conventions of cartography and use those of anatomy instead: veins and vessels, intensely red, guide the blood rich in oxygen to the organs and tissues of the living body. The blue signals that there is a cycle and an exchange, that the blood is spread out in the tissue and that the oxygen that fuels the performance of activities vital for life is consumed. The body's morphology continuously changes, but the drawings arrest one instant and are incapable to show these dynamics of life. The organism lives in a white environment that is empty only in appearance, and it is totally interdependent, intricately enmeshed with it.

The drama of the drawing is that it shows the organism as an isolated island, traced and formed by a line that forcefully states the contrast -almost an antagonism- between the body of the organism and the world in which it dwells. The sharp line continuously affirms an autonomy that actually does not exist. How can I avoid to misread and misunderstand when I write in such a language?

the 6th day
Friday the 26th of June

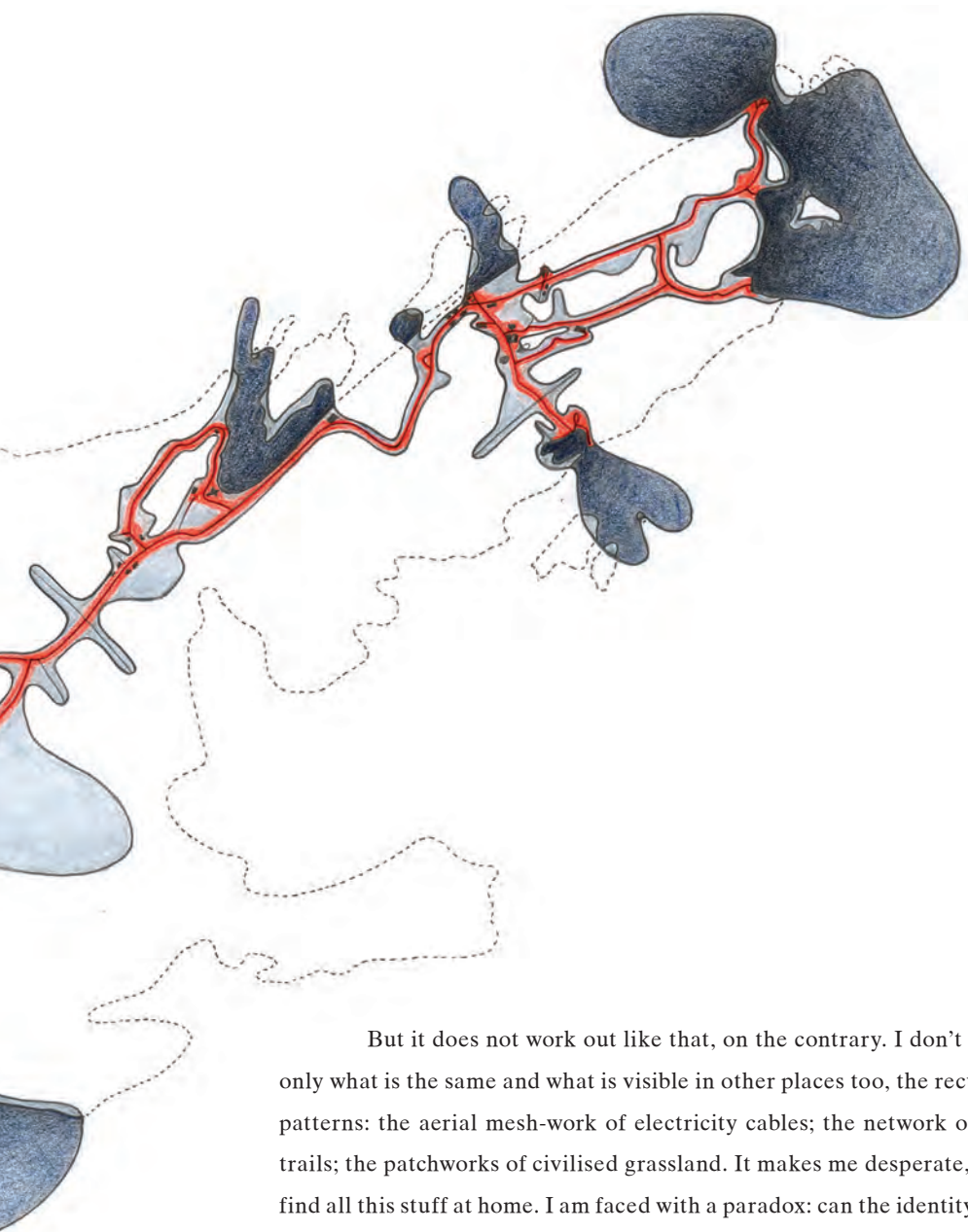
— Why are we here? *'To look for a relation with a site and its particularity, on and in ...'* (Frichot, 28 may 2015), *'to interact with a place and coexist with it (the object of study); to practice with concepts and site'* (Gabrielsson, 28 may 2015); *'To learn with a world and to write in the world'* (Frichot, 28 may 2015)

How do we deal with a place? *'A place is not given as such'* (ibid.) so you have to look, to investigate, to register, to smell, to taste and touch, collect and walk, listen to and sleep in it. But there is so much stuff to see, find and be moved by, and there is this awful stressing thought that I have to be on the look-out for what is different, peculiar, surprising, out-of-the-ordinary, special, ... the things and situations that mark out this place, this island, that makes it distinct from other places, unique, distinguishable and with a very personal identity.



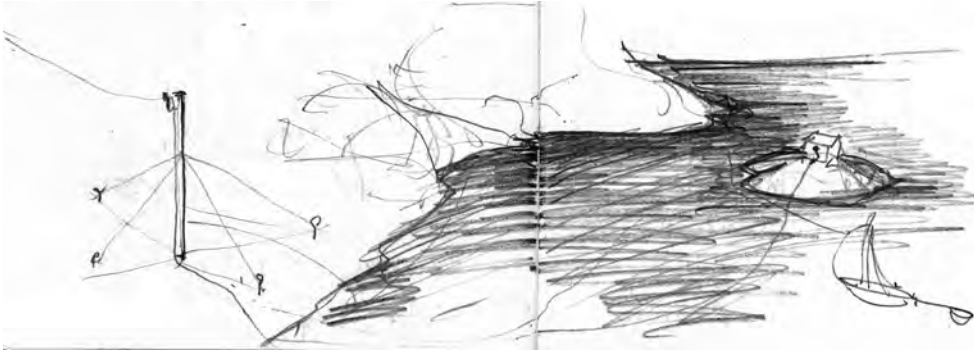
ill.3.14:
Drawing by author.

THE CONSTELLATION PROJECT



But it does not work out like that, on the contrary. I don't see differences but only what is the same and what is visible in other places too, the recurring or repeating patterns: the aerial mesh-work of electricity cables; the network of roads, tracks and trails; the patchworks of civilised grassland. It makes me desperate, because I can also find all this stuff at home. I am faced with a paradox: can the identity of a place, the one that I am desperately chasing, be found in what it has in common with other places? Is this identity inherent in a place, as some kind of essential property that is there to be discovered and subsequently reproduced, shared and recognised? Or is it something that has to be made, or imagined, ... dreamed of?

the 6th day
Friday the 26th of June



— Islands are wired to the world, ...
connected with and covered by a fabric of threads, a network that links home to home and islands to (is)lands. Connections that power up places and light up darkness. It is called *infra*-structure, etymologically speaking a structure underneath, below, sub-. But here on this island it is floating over the landscape and it is only when it arrives close to the sea that it dives down into it and disappears. To draw a map of it, I would have to lie down in the grass and look up to the sky. Then I would see the black lines that connect, thin and precise, just like the roads on the foldable map of exact truth, but in another space, up there and not down here. Would it make sense to have an inverted version of this map too? The combination of both would show the change that occurs when night sets in and the day retreats. From black lines on a blue sky towards a field of sparkling light bulbs, a meadow filled with flowers disguised as illuminated places.



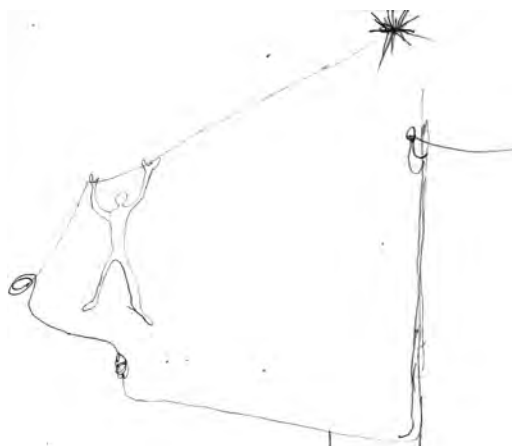
projected upon and projected
back into the darkness

III.3.15 to 3.17:
Drawings by author

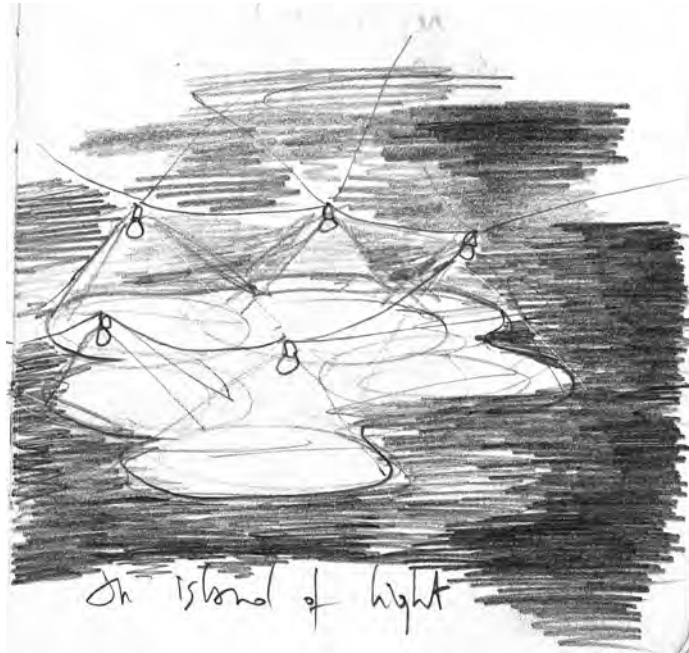
It would look like the American Artist John Baldessari's *'Throwing Three Balls in the Air to Get a Straight Line'* but much more elaborate of course. Both maps combined, the one with lines and the other with dots, balls and light-bulbs would give us a fascinating third one, that astronomers would call a constellation map, providing that it concerned the stars of course, and not *infra*-structure. Today I was told this strange story that sounded far-fetched, about a secret project that also has a history on this island. I will tell it briefly here because it sheds another light on *infra*-structure, its name, its concept and its presence.

During the first half of the twentieth century a secret international society was founded. It was present in several countries around the globe and was called 'The Constellation Project'. This mysterious group developed a plan of enormous scale, and it is a mystery to me how they could keep it a secret. What they planned to do is create a constellation of artificial stars closer to earth, slightly below the area where the satellites are flying around now I guess. The constellation would be a kind of scale model of the real constellation in the distant cosmos, mimicking the locations of the stars as well as the patterns of lines that we connect them with to create some order amongst them. This new constellation would illuminate the earth and the dark cold space around it. Earth would become visible from very far away and for us the stars would be within arm's reach, like fruit ready to be picked.

The military area on this island was one of the sites where several experiments were conducted to raise artificial stars into the sky and form ordered systems with clusters of them, like the figures of the zodiac. The stars were attached to specially



the 6th day
Friday the 26th of June



ill.3.18:
Drawing by author

developed wires and taken up into the air like kites. Eventually this attempt to get stars airborne and the figurative groupings were abandoned. Not because they were defective or unreliable as component of the system, but because the system that was assembled with them appeared to be fundamentally flawed. Instead of being static as the theoretical models had predicted it would be, and as the cosmological background got to be represented too, it was utterly dynamic and very responsive to the environment in which it was placed, that is, the atmosphere. The geometry of patterns of the small test-constellations that were created above this island and the rest of the archipelago never stopped changing their shape. In the end the necessary fixity of the patterns proved impossible to achieve. On paper, in the abstract graphic models and in the calculations everything worked perfectly fine, but in practice, once placed in the physical world with its dynamic environment things started to go totally wrong.

Looking back, it appears that the complexity of the relationships between the artificial stars and the place they were located in had been reduced and simplified up to a Newtonian level. The dynamics of the new counterfeited constellations was impossible to describe and define precisely. Proving its effectiveness by testing, to draw maps of it and use it as a basis for orientation and navigation proved equally problematic. There was no way to predict and control behaviour and performance. It definitely wasn't a result that those who run scientific and technological projects like to be confronted with.

The problems were beyond measure, and everybody was set to work to find a solution. Eventually an enormously far-reaching, but at the same time very simple, very effective and very shrewd solution was found. Rather than stick to a system that is responsive, interacts and adapts to its environment, the choice was made to turn the most serious deficiency of the system into its main quality: 'The Constellation Project' would be made static, and to achieve this it was pulled down, so to speak, to the surface of the Earth, and solidly anchored there, in, underneath and on.

Not just the concept was changed but also a new name was given: infra-structure. It may sound trivial, but this was an essential modification too, because without this re-branding the new situation would have led to much confusion. The new name referred to the imaginary move of the constellation -dots/balls and connecting threads together- from the sky down to the surface of the earth where it was attached so it could not move and transform out of its own accord. In conformity to the initial ambition it eventually evolved into a global network that envelops the world. Gradually it would be considered a substantial progress that everyone was supposed to benefit from.

the 7th day
Saturday the 27th of June



ill.3.19:
Drawing by author

THE GROUNDING ISLAND

— Seven days separate me from the reflections of the imageneric islands in the water of the Baltic Sea. Since then my mental images of islands were thoroughly transformed, fuelled by experiences of being within one. I have to let go now, step out and take what is generally considered the necessary distance to understand things and be critical about them. The island that used to exist only in my thoughts as a generic and imaginary entity does not exist anymore. It has been replaced by innumerable impressions and experiences inseparably connected to a real place. I cannot detach them now, but the distance will increase and force me to, both mentally and physically.

The island will become a place where I was, and not where I am. I will have to recall her world by other means, with words, drawings or whatever else. They will be composed with the few components that stick to my memories. They will become a history, reconstructed and presented from the bits and pieces I took with me from the actual place. What will those tell me in the end? It will definitely be a challenge not to see all islands in terms of this one: a challenge not to make it *'morphogenetic; that is, ... a determinant for the shape of...'* the other islands out there. My own way of seeing islands will be *'shaped (literally in-formed) by an analogy'* with this particular island. *'The analogy is partly exact and partly fanciful and partly made real - validated - by actions that the fantasy dictates'* (Bateson 1979/1980, p.154). It is almost certain, that I will extrapolate, compare, and endlessly reproduce this island until another comes along with which I can recompose things and make new ones.

We have set sail and are out at sea again. I am caught in between two horizons. One of them lies behind me, connected to me with an agitated trail and an imaginary thread. The other horizon looks me in the eyes. I don't know how far out it is and at this moment it seems unreachable. I will need a lot of determination and luck to find my way towards it. Before leaving I connected the island to my body with a strong rope. An enormous pile of it lies waiting on the backside deck of the ship and is being pulled out slowly into the sea as the boat moves out into open water. I hope it will be long and strong enough to keep me and the island connected to one another. I hope that it will not snap under influence of the incessant strains exerted by separation and oblivion, and that, if it does, there will be someone or something that will seize the two separating ends, pull them back together again, and make a strong knot to repair the connection and secure the bond between us.

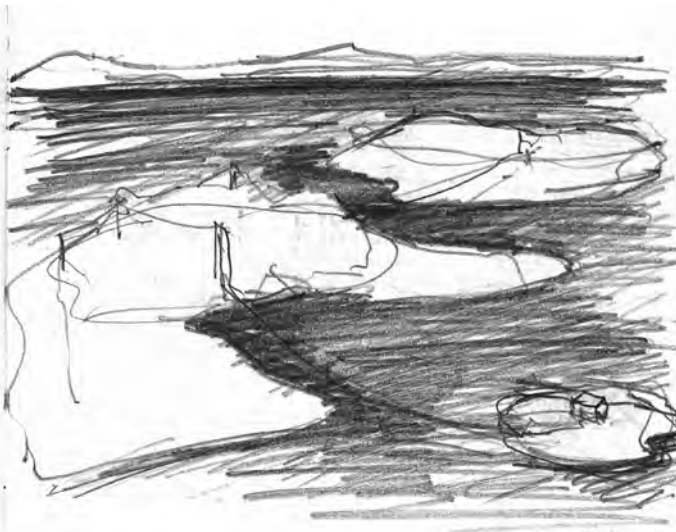
the following days

This is an ode to an island, grass, wires, stars and a line.

and also to the Oxford and Cambridge English Dictionaries and Roget's Thesaurus, treasure rooms filled with words that helped me find those I needed. One of them granted me access to a world and helped me to construct another:

grow |grōl|

- . **increase**, get bigger, expand, spread, widen, ...
- . **emerge**, sprout, develop, germinate, shoot up, bloom, ...
- . **cultivate**, produce, propagate, bring on, nurture, ...
- . **flourish**, thrive, prosper, ...
- . **expand**, improve, advance, progress, make headway, ...
- . **originate**, stem, spring, arise, have its origin, issue, evolve, metamorphose, ...
- . **become**, come to be, ... start to feel, ...



ill.3.20:
Drawing by author

SCRIPTING - MAKING CONNECTIONS AND COLLECTIVES

'When we create narratives we unite fact with fantasy. The element of fiction which exists in all knowledge opens at the same time the path to enable us to think beyond the factual and to think of the possible. The narrative "opens a world before the text".⁵

'A story is a little knot or complex of that species of connectedness which we call relevance. ... I would assume that any A is relevant to any B if both A and B are parts or components of the same "story". ... [Again] we face connectedness at more than one level: First, connection between A and B by virtue of their being components in the same story. And then connectedness between people in that all think in terms of stories'.⁶

Growing Islands is both real and imaginary. It reports a sequence of events of which some actually occurred and others not, but might have. As Martha Nussbaum argues, it is not possible to relate well to the complex world around us by factual knowledge and logic alone. We need another ability too, which she calls narrative imagination. According to her, it is necessary for the cultivation and learning of both a capacity to see the world through other than one's own eyes, and an ability to imagine what the experience of another might be like.⁷ We need empathy and generosity, and one of the means for working in that direction are stories, because '*... stories engage listeners. Listeners may become a collective, the coordination system of which is shaped via the story*'.⁸ Attention for the social aspect of the story is Nussbaum's focus, and a concern for me too, since processes of construction in architecture are social per se. They imply the necessity to work together with others as a collective, with shared dependence and responsibility for achieving the ends towards which a work is oriented.⁹ Within the narrative one can evoke and presence matter and material processes in

5_ Gustavsson 2002, p.13

6_ Bateson 1979, pp.22-23.

7_ de Nussbaum 2010, pp.95-97

8_ de Zeeuw 2008, p.30

9_ See also part 2, section Encounters, chapter 'Things We Do Not See', 'Queer Bricks' and 'Washing Windows'; part 3, section 'Constructing Things For Constructing Other Things'; and part 5, 'Process and Form'.

other modes, and let them contribute as characters in the story. Constructing stories can be a specific *modus operandi* for articulating relations and generative interactions, the influence and implications of processes, dynamics of events situated in time and place, movements and itineraries in a territory, etc. *'It is suggested that stories help build up collectives ... If this is the case, the stories themselves embody knowledge - knowledge that may be used to develop collectives, to achieve certain tasks, and thereby allow the knowledge to be tested and their achievements partitioned'*.¹⁰

The narrative has a capacity to reveal, and because of that it is an additional means for explanation and gaining understanding. Due to its capacity to disclose aspects that would otherwise remain unseen, it is complementary to other representational and descriptive media used in architecture, that also have similar revelatory qualities.¹¹ Its format facilitates exploration of and experimentation with what diverges from convention, norm or rule, in order to see beyond the limits they set for us. Things that are seemingly unrelated or that otherwise cannot be seen together in a shared space can be brought together. As such it enlarges a field of view, and makes alternative and complex perspectives possible, especially on relations and inter-actions situated in time and place. They express a view on architecture that associates with following statement: *'Not architecture alone, but architecture amongst other things. If we take the trouble to discriminate between things, it is not just to keep them apart but to see more easily how they relate to one another. Architecture can be made distinct, but it is not autonomous. It touches so much else, and across its borders there is continuous activity'*.¹²

By means of the story, attention can be oriented towards material interactions and processes, i.e. the capacities of assemblages, in order to shed a different light on architecture's material fabric within place and time, and the plethora of ways in which it can emerge and be made, read and known. Hélène Frichot managed to capture it more accurately: *'This is a story book concerning territories and how we might think with the places we encounter and occupy. ... While the place in all its particularities is not named, what was specific achieves an often compelling level of generality. It is an island in the Baltic, we are told, but no characteristics would enable the reader to identify which one. This is not a critique, but an observation that meditations on or in place*

10_ de Zeeuw 2009, pp. 25-31

11_ Leatherbarrow 2000, p.88-89

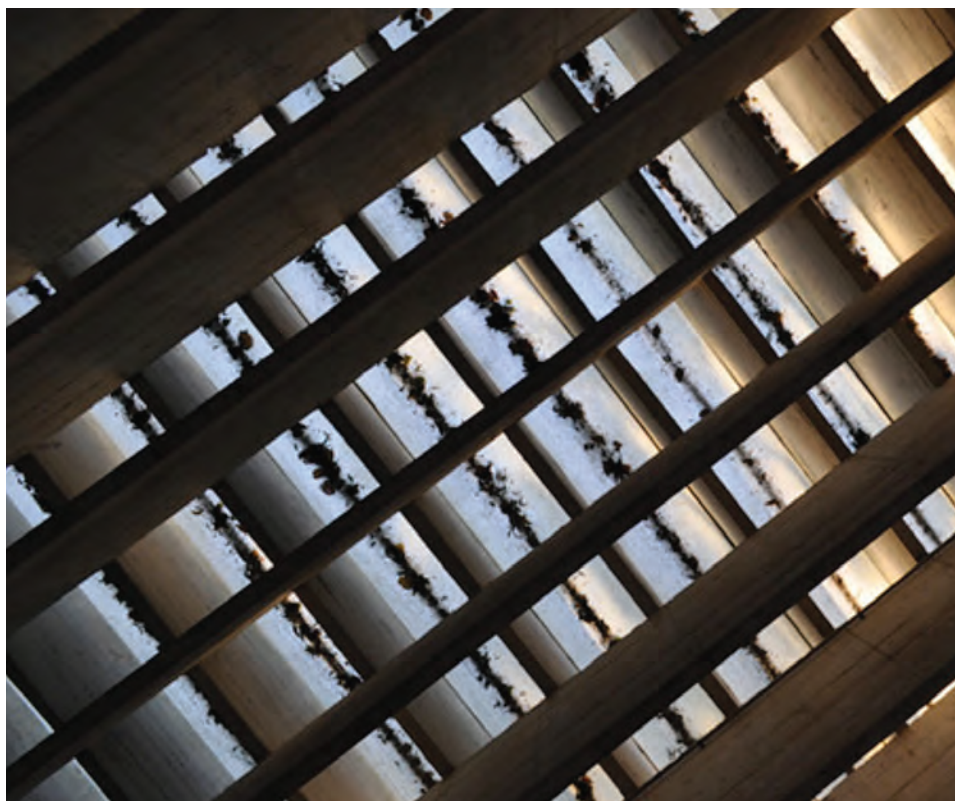
12_ Evans 1995/2000, p.xxxvi

*can reveal something that can be applied to many kinds of places. Here the island is the geography in the particular, and it is an island, as well as being any-island-whatever. 'One has to let go of the world to see the island in its totality': this is an observation that sums up well the disjunctive meeting place between theoretical knowledge and practical, material engagement'.¹³ The story is not neutral, objective or disconnected from particularity of place and personal engagement, but at the same time many of its characteristics are applicable to other places too. Within it various ways of looking, describing and coding are combined, which correspond to as many orientations and perspectives. The diversity of interpretations and modes of expression is imperative to grasp some of the complexity and dynamics of agency and relations inherent in all real, material configurations, places and events.¹⁴ I used it as an integral part of my methodology, as a way to look, gain insight, gradually unpack complex thematics and processes, to change the pace, cultivate patience and take the time to draw things out. In stories, the world, its processes and happenings *'acquire a different lighting. Remembering is not a passionate or dispassionate retelling of a reality that is no more, but a new birth of the past, when time goes in reverse. Above all it is creativity. As they narrate, people create, they write their life. Sometimes they also write up or rewrite'*.¹⁵*

13_ Frichot 2015

14_ At the end of part 5, in the section Process-Form Interactions, chapter 'Dialectical Relations Between Form and Process', ill.5.35 provides another example of such a combination of photographic images, diagrams, drawings and the web of interconnecting lines and arrows. It is part of sustained attempts to find complexifying rather than simplifying approaches for visualising, organising and understanding architectural construction and architectural technology. It is based on the combination of multiple modes of articulation and notation that provide access to different points of view, for instance those associated with specific disciplines or other categories of knowledge and practice. It relates diagrams, formulas, metric information and concise definitions with poetic ruminations; interconnects places, typologies and morphologies by using the multi-directional and both generalising and particularising capacities of abstraction.

15_ Alexievich 1985/2017, p.xvii



ill.3.21:

*A view upwards towards the roof of the Nordic
Pavillion in Venice, Italy*

*Photo by Burçin YILDIRIM
accessed on <https://www.flickr.com/photos/burciny/>*

GENERATIVE INTERACTIONS AND EMERGENCE

During autumn, when one looks up from inside the Nordic Pavilion in Venice, an expressive case of the relation between a building and the dynamic conditions of a place can be observed.¹ It is an example of the generative interactions that can emerge between a built work of architecture and the world in which it is nested, and of the possibility to positively capture, reveal and express those by means of an architecture that has been given the generous capacity to do so. It is an epitome of working together with rather than defending against, and therefore it should be a non starter to unilaterally attribute cause and effect to either one or the other. I owe the first example of this chapter to Jonathan Hill's *'Weather Architecture'*, and more specifically the chapter *'fog, glare and gloom'*.¹ It contains a number of micro-interpretations of Sverre Fehn's approach, suitably referred to as *'poetic stories'*, like for instance 'the story of the horizon', 'the story of the ruin', 'the story of construction', 'the story of the place', 'the story of light', 'the story of rain', 'the story of gaps'. For a reason that is not entirely clear to me now, I started making notes and drawings to accompany some of the depicted *'threads of thought'* concerning the Venice Pavillion. I speculate that I was triggered by some sentences (depicted below) and that suggest both a possibility to do something and a way to do so, or in other words, can be interpreted as methodological tropes and invitations to act. It is relevant to dwell on them a little, since it goes back to the early stages of this thesis project and the procedure was repeated. Its reach therefore extends beyond this actual case.

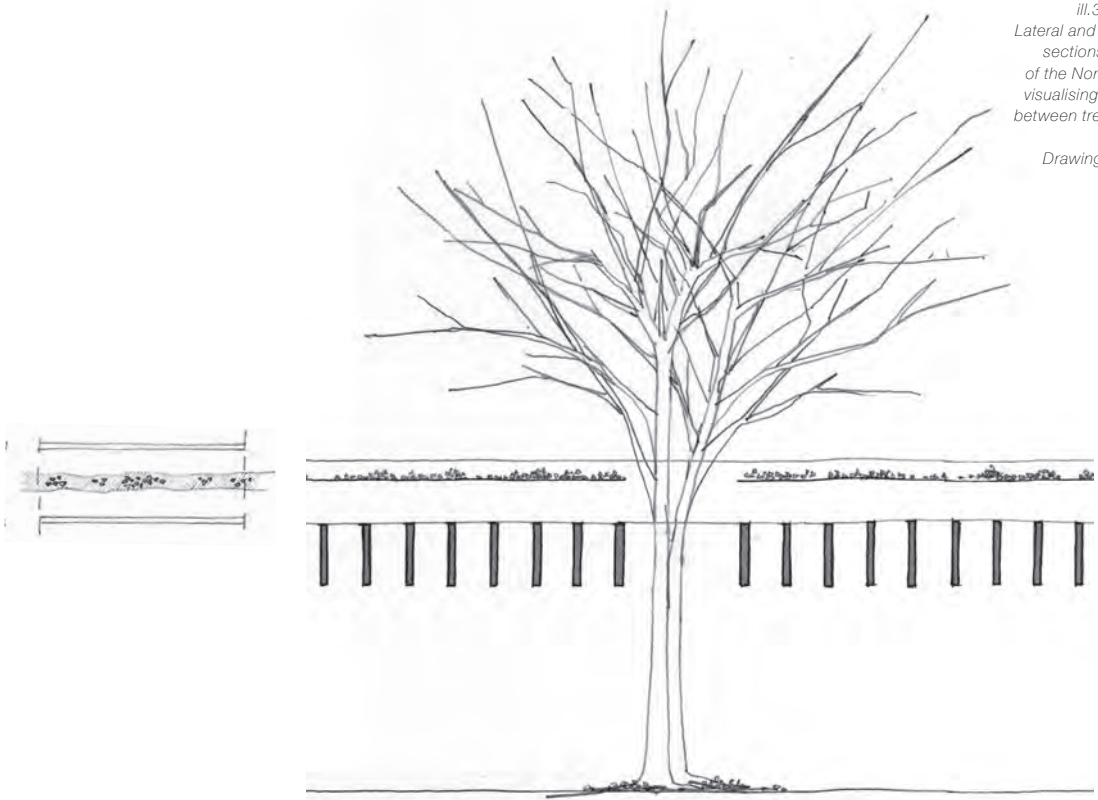
First, *'... the formulation of new meanings through the appropriation and dialectical juxtaposition of fragments in a new site ...'* indicates that something can be taken and meaningfully transformed in a re-combination with other things, that is, in a new construction that sheds a new light or opens alternative pathways.² Second, the presence of gaps in-between parts of a montage point to things *'unnoticed or hidden, absent or incomplete'* and therefore discoverable. The gaps can be filled imaginatively and with multiple alternative meanings and possibilities.³ Third, a decaying book, pulled from the shelves repeatedly induces the thought that *'the more it is used, the more its materiality and means of construction will become apparent'*. This suggests that

1_ Hill 2012. pp.271-286. It subsequently to me also became one of the first indications that the discourses on tectonics in architecture are flawed.

2_ Hill 2012. *ibid.* p.282

3_ Hill 2012. *ibid.* p.284

certain things can become more present, expressive or legible as time —le temps/the weather— changes, very much like a garden.⁴ Fourth and last but not least, there is the pivotal assertion that ‘*the evocation of a weather condition*’ can be made ‘*the purpose of a building*’, which I read as no less than a much needed extension of architecture’s (material) agenda, beyond human centered use and towards ascribing architectural worth to, and inclusion of, dynamic and lively intensive contextual processes.⁵ With hindsight, a number of things have been drawn from those sentences in relation to the actions I undertook in this thesis project from then onwards. Unknowingly it turned



ill.3.22 & 3.23:
Lateral and longitudinal
sections of the roof
of the Nordic Pavillion
visualising the relation
between trees and roof

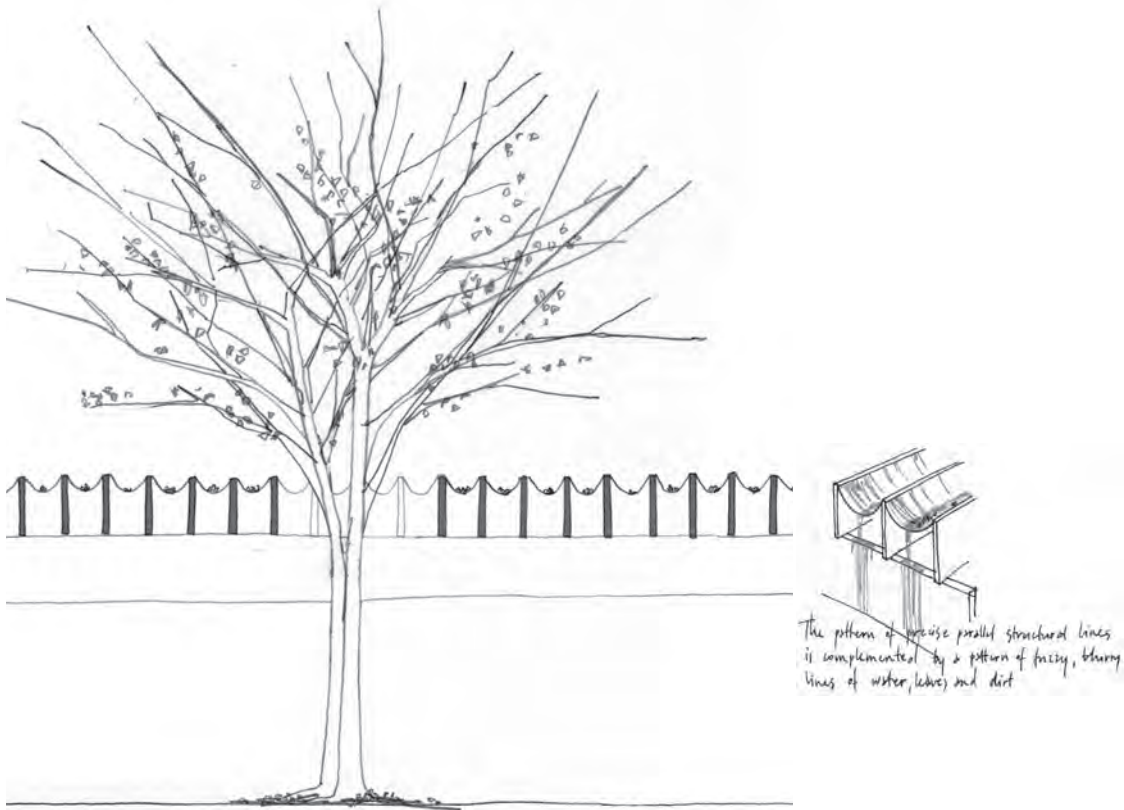
Drawings by author

out to be one of the places of departure for recursive experiments from which some methodological principles emerged that remained unacknowledged at the time but became increasingly prominent, that is: ‘Pay attention to what is already there, what happens or happened and who/what is accountable for it; Search for what is invisible (at

4_ Hill 2012, p.285

5_ Hill 2012, *ibid.* p.286

first sight), for more than what meets the eye, the small and almost trivial occurrences; Track the transformations as time flows by; combine and/or add different modes of expression to the mainly verbally articulated architectural theories and discourses; Do not consider these added articulations as merely illustrations to an existing text, but turn them into a way to figure things out, a method to extract what is going on, who is at play and what is at stake, to draw out, to explain (to yourself first) and to make some sense out of it'.



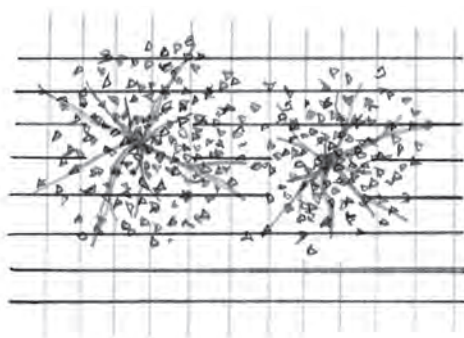
Let's return to the Nordic Pavilion. I did not add much to the content proposed in Jonathan Hill's text, apart from hand written notes that comment, explicatory drawings and additional detail in the narrative, mainly with regard to the multiplication of tracings made by an alliance of leaves and water. Thus, the Nordic Pavilion has two roofs. The first is man-made, with a precisely ordered orthogonal geometry. It is composed of two superimposed and perpendicular layers of parallel lines made with exceedingly slender and high beams in concrete. All of them are the same but also



ill. 3.24:
A view upwards towards the roof
of the Nordic Pavillion with clear(ed) channels.
Photo by Samuel Ludwig / Nordic Countries
Pavilion no.09
accessed on https://www.flickr.com/photos/st_ludwig/



the drawings of the filled tree crowns
and
the translucent constructed roof



III.3.25:
The leaf-filled tree crown

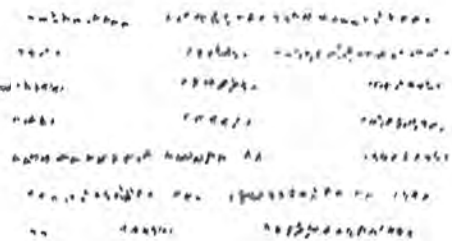
Drawings by author.



ill.3.26:

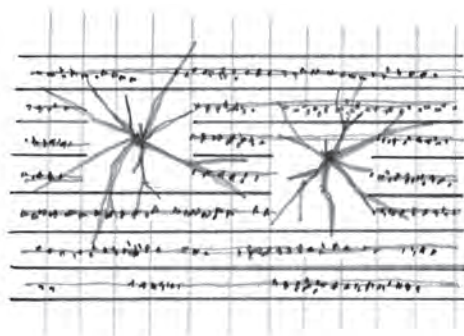
A view upwards towards the roof of the Nordic Pavilion with the channels containing a parallel linear pattern of fallen leaves

Photo by Burçin YILDIRIM
accessed on <https://www.flickr.com/photos/burciny/>



drawings of the order of the natural roof
and
the constructed & natural roof combined

a seasonal modification



ill.3.27:
The tree crown shedding
its leaves

Drawings by author.

different in subtle ways, in contrast to the drawings of the building that supposedly show them as identical. They have been arranged to leave space for the supports of the second roof that grows naturally in bundles of irregular lines that diverge sideways and skywards in multiple directions. Its density and capacity to cover changes in accordance with recursive seasonal cycles, year in, year out. Each roof has its own tempo of transformation. One is very slow and the other way less; one is rather inert and the other is alive. During a foreseeable but approximately set period of the year, the natural roof will gradually start shedding its leaves that in turn will be captured by the artificial one, which will reorder them in accordance with its own distinctive geometric pattern. The leaves are captured by transparent gutters installed in between the beams of the building's upper roof layer, and in the process an additional set of irregular lines is progressively traced in the axis of those channels. At irregular intervals, and in what appears as a concerted interaction between gutters and flowing rainwater, the leaves and the slurry in which they transformed, are carried towards the trees that in the process are nurtured with them to sustain their prosperity.

The roofs enhance each other's capacity to influence the atmosphere of the place. In the summer they create an island of cool air and soft light in a surrounding sea of warmth and high contrasts between sun and shadow. During winter the view upwards is opened up towards the sky, and more light is allowed to stream into the space under the roofs, compensating for the increased dimness of the light of winter. For the tree it means a change in feeding load and activity, and for the building the result is a modification in the degree of exposure to climatic conditions. The static images, both photographs and drawings, fail to portray the dynamic nature of the process because they kill the flow of time. But the actual and so-called static artificial roof of the building is a material interface that has a capacity to convey the temporal rhythms of the events in a specific place by capturing them in its fabric, even if it is only for a while. The relationship between building and trees is mutually beneficial. In the warmer period of the year the trees and beams together control climate, atmosphere, temperature and intensity of light underneath their protective cover.

The beams provide constancy, and the trees provide modulation following a seasonal rhythm. Both trees and beams together turn the location in a better place to dwell. Both rhythms converge in concerted dynamics. Minor occurrences like these can easily be labelled ordinary, but they also demonstrate that an architectural artefact does not become less interesting, less beautiful, less functional, less performing or less

photogenic when it is increasingly marked by its participation in the workings of place, time and weather. What is more, the building is not simply subjected to them but in this case reciprocates positively, and by the same token demonstrates its capacity to interact and share. Note also that Fehn's building is not hermetically sealed, that it does not shut out and that its boundaries are permeable. The environment is allowed to enter the building, and the water can flow from the roof down into the building's interior, be it concentrated in the places where the trees are standing and perforate the roof. This is an additional manifestation of controlled modulation, besides that involving light.



III.3.28:
Aerial view of the Münster pavilion showing the drawings made by water and building

Photo from Google Earth, accessed Friday, 20 April 2012 at 09:51.

Stefan Wewerka's Münster pavilion is another compelling example that expresses this generative reciprocity. The aerial photograph shows the building as a rectangular surface with four linear extensions protruding at the corners. At the tip of each of them, the rainwater caught by the roof flows out and carves irregularly shaped traces in the soil. Although the water is invisible in the picture, its presence and course of flow is legible in the marks of erosion that were left behind. Their shape, dimensions,



ill.3.29:
Münster pavilion,
Stefan Wewerka

Photo by author

proportions and directions give an indication of the water's velocity, the slopes of the terrain and its composition that makes it prone for weathering and erosion. Instead of hiding it in an invisible underground tubular network, the processes of flow have been given a material and expressive role. The reach of the building is extended outwards beyond the physical boundaries of the object itself. In principle this is always the case but that fact often remains unarticulated, is ignored, inhibited or made invisible. Adding to this, there is the strong correlation between the ephemeral presence of the (liquid) water and the reliable permanence of the building's load-resisting structure which in fact connects Münster and Venice without reducing them to what they have in common. It rather demonstrates the particular outcomes of generative interactions between actants that participate in a given context, and the building is only one of them: *'... an actant is a source of action that can be either human or non-human; it is that which has efficacy, can do things, has sufficient coherence to make a difference, produce effects, alter the course of events. It is "any entity that modifies another entity in a trial", something whose "competence is deduced from (its) performance" rather than posited in advance of the action'*.⁶

Both buildings demonstrate an orientation that goes beyond the internal order of the architectural object, and a willingness to work together with a dynamic material

6_ Bruno Latour quoted in Bennett 2010, p.viii



ill.3.30 & 3.31:
 Snapshots of the
 carved shape at the
 corner situated north of
 the building

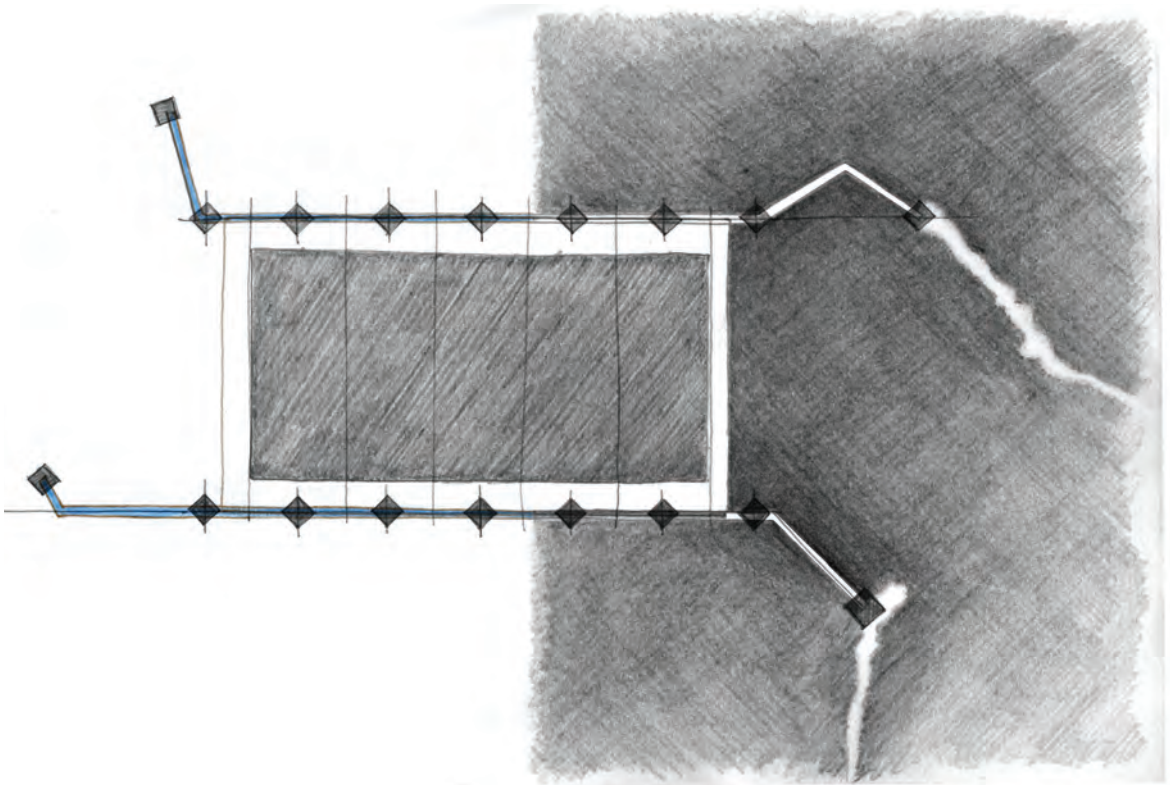
Photos by author

reality rather than against it. There is an outspoken attention for the combined relational order between an architectural object and its environment, showing that construction is indeed about connecting things to make them act together, and that it cannot be reduced to instrumental problem solving. In Fehn's and Wewerka's architecture water is granted an affirmative role as a lively and energetic environmental agent. The building plays a role in shaping its course and influencing some of its effects without forceful counteraction or dominance. The interactions between the buildings, water and the environmental capacities of the places are generative of something else, something new. In both cases water is not reduced to a cunning adversary, but involved as a constructive architectural partner. It is an ephemeral and moving material that modifies a building through time, and has a degree of independence from an architect's will to form. The Münster pavilion puts water's ambiguous nature as a damaging agent into operation, namely for the extraction and displacement of matter, i.e. erosion.

From a perspective of architectural technology where suspicion, resistance and inhibition pervade, the above ways of organising relationships is not that obvious, simply because they are identified according to their (very real) capacities for causing damage, dirtying and for affecting performance and time-resistance negatively.

Both projects are nonetheless eloquent demonstrations that other paths are can be taken. Paraphrasing Manuel De Landa, a constructive approach can be defined as one that makes meaningful connections and combinations within a field of matter, energy, processes, forces and constraints, and that affords for a variety of things to emerge from coexistences and interactions.⁷ In other words, a perspective on construction that honours '*matter's inherent creativity*'.⁸

It is also in this sphere that the closely related notions of 'vibrancy of matter', 'congregational agency' and 'distributive agency', brought forward by Jane Bennett can be brought into the game. She makes a plea for acknowledging that matter is vibrant and vital; that it participates in, responds to, and exercises influence on material processes

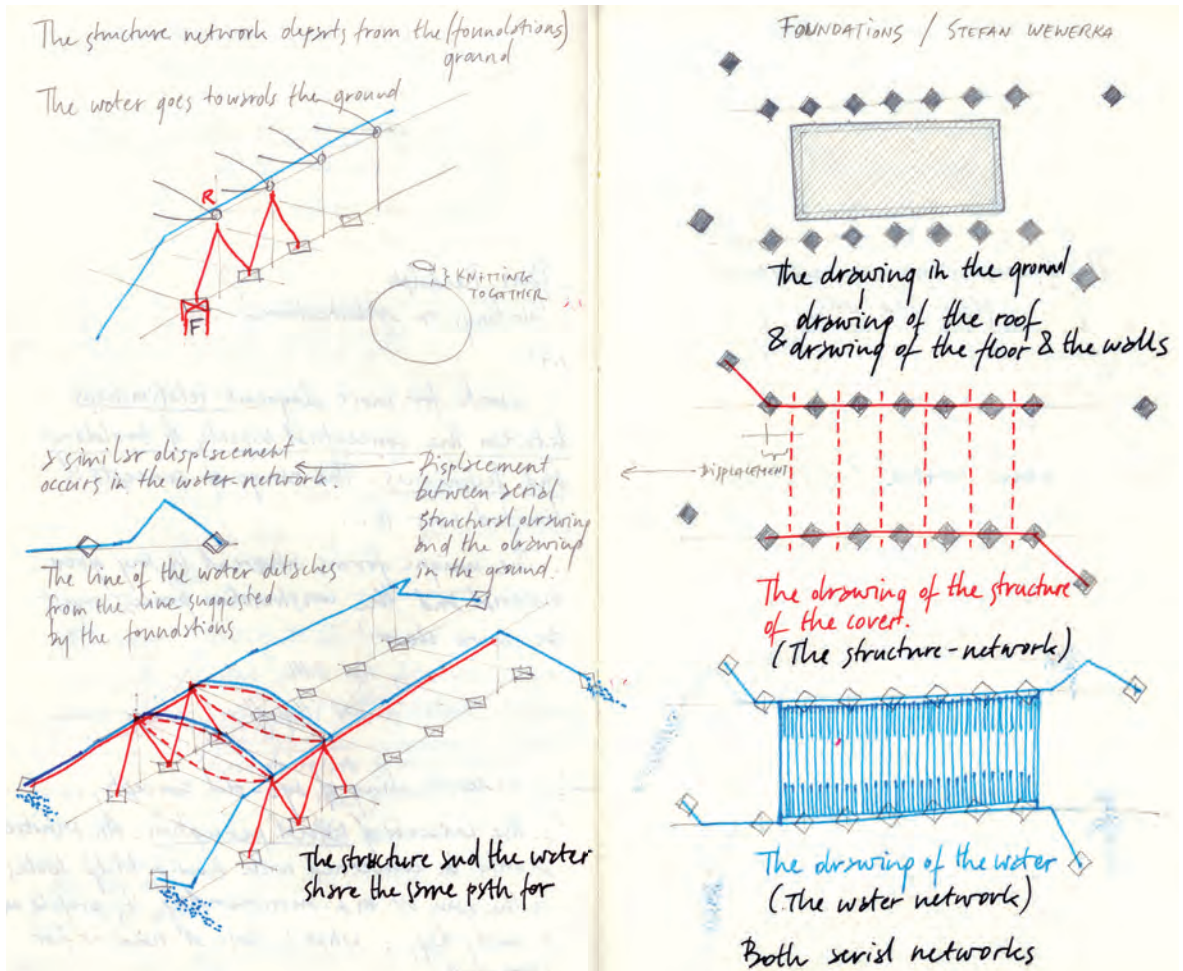


7_ De Landa 1997/2011, p.21

8_ De Landa 1997/2011, *ibid.* p.16

9_ Bennett 2010, p.xiv

and events. According to her, what is needed for this is 'a willingness to theorise events as encounters between ontologically diverse actants, some human, some not, though all thoroughly material', and 'a cultivated, patient, sensory attentiveness to non human forces operating inside and outside the human body'.⁹



ill. 3.31, 3.32 & 3.33:

A number of attempts to draw out the correlations between water, place and architectural hardware, and in doing so to make sense of the situation. Drawing water truthfully is near to impossible. A lively protean thing-process is killed, stopped, made immobile. In the drawing on the left page the water looks like that which is absent, or maybe it can be seen as being represented by the traces it creates in or on something else. On the two pages from one of my sketchbooks, its presence and trajectory are shown by thin lines and clouds of small dots, all cliché blue of course. Here again it is absent, merely indicated by what meets, guides and captures it. No wetness, no reflection, no mud, no flow. The gap between image and the worldly situation is unbridgeable. This is a real challenge. How can something be conveyed, understood, appreciated, taken care of, given a role that matters when it so hard to presence it by other means than itself.

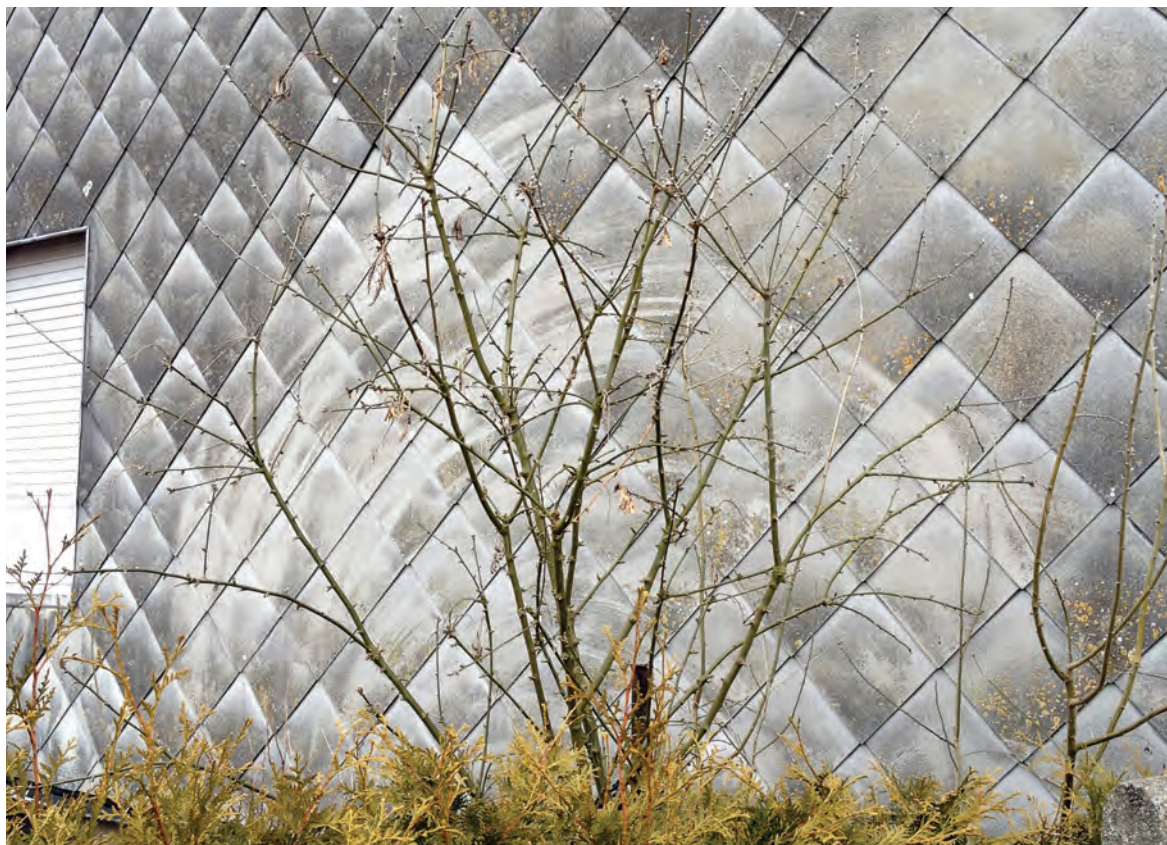
Drawings by author.

Together - Wall and Shrub - 3rd of March 2013

A shrub marked its presence. The wind helped its flexible branches to move back and forth and sideways, and the repetitive swing inscribed the movement as rough lines upon the sturdy wall's surface, superficially. The scrubbing pushed the dark deposits aside like a brush on a dusty floor. The wall responded by abrasing its own presence into bark and leaves. It is reciprocation on the invisible backside of the shrub's fine branches. I reckon the most common observation, annex judging comment must be that the shrub was planted too close to the wall. Shrub and wind can share the authorship of the drawing, but without the wall as a canvas, the recurring event would not be registered, physically nor visually. Thus it is a partnership of three. Those who built the house and planted the shrub are present too, as the immanent and invisible fourth and fifth authors. It is a congregation that created a fairly ordinary occurrence: a movement inscribed and arrested, a drawing made through repeated inscription on a surface and captured in an image; a fixed photographic instant. A moment that has ceased to exist, and a drawing that has since transformed into another variation of itself.

ill.3.34:
Shrub and wall and the wind and the depositing water, together ... complicit in the production of the circular drawing

Photo by author.



Severed - Wall and Shrub - 14th of April 2013

The productive sharing of place and action has been stopped. The wall's authority has been restored. It is an unambiguous statement, and a confirmation of architecture's claim of dominance over a place. The shrub is gone, and the generative interaction between wall and shrub together with it; literally cut away. A straightforward act with tangible consequences; a thin borderline easily crossed; ten to fifteen minutes of our time at most. The traces on the wall remain, inscriptions for us to read and recall a generative history of exchanges.

ill.3.35:
...or graffiti?

Photo by author





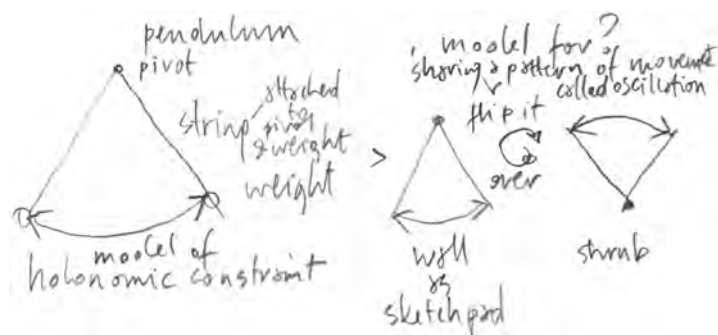
ill.3.36 & 3.37:
The defeat of generosity

Photos by author

Purified - between the 14th of April 2013 and the 16th of May 2016

The drawing is erased and the building cleansed, purified ... finally immaculate and the autonomy of the architectural object is restored. Is it the ultimate victory or a defeat?

Wall and Nail, Rope, Pencil and Page



ill.3.38:
Oscillation: a happening abstracted to a general principle

Drawing by author

A wall and writing; traces, tracings and an analogy in an abstract concept: oscillation, a rhythmical movement, a principle of physics; the world of forces and impacts with its definitions, instrumental formula and symbolic diagram-drawings.

Regardless of their specific country of residence, a shrub in Belgium and a kitchen scene in Denmark share an abstract space and have a specific pattern in common. It can make them belong to a same category of things: either of the materials used or the structural principle or the methods of fabrication or in this case the rhythmical and repetitive swinging movement from side to side. They also share the inscriptions of those movements on a surface; drawings that represent past events and/or the presence of people; traces left behind in the form of scratches on a weathered exterior wall and scribbles on a painted kitchen wall. The latter are the result of intentional situated actions: hands writing, a body passing by, cooking, playing and making a shopping list are some of the invisible actions that created it during a certain timespan of habitation.

In 'Lessons for Students in Architecture', Herman Hertzberger writes: *'Architecture can say something about certain phenomena such as time or water, which in turn make a statement about the architecture: they become mutually explanatory. By showing how things work, and so bringing them to the surface, the world around us*

ill.3.39:
Trivial kitchen scene in an
old farm house in Denmark

Photo by author.



can be read, can be decoded, as it were; ...'.¹⁰ Whether architecture must explain and unveil is food for discussion, but the imprints of flow, erosion, absorption, weathering, etc. are definitely manifestations of interactions between architectural artefacts and water, wind, permeability and porosity of materials, and so forth. Surfaces that are textured, scratched, soiled, eroded, contaminated, penetrated, grown over etc., are material expressions of past and presently unfolding processes and events. A sheet of paper, like any other surface, gets soiled as a result of writing and drawing, but it is the dirtying that occurs by means of an active convergence between hand, pencil, ink and paper that gives us something to read. The surfaces of buildings and their surroundings are not fundamentally different in this respect, and the outcome has the capacity to *'... remind us that others have gone before us, and still more will follow. In some cases, the traces even provide a clue as to the nature of the actions applied to create them. In this sense, the traces play a vital part in our ability to read our environment and, by extension, appreciate it'*.¹¹ Tim Ingold argues that it is by watching, listening and feeling —by paying attention to what the world has to tell us— that we learn.¹²

The trivial kitchen scene in an old farm house in Denmark is an epitome of the generosity needed to allow unpredicted or unplanned things to happen, and suppress the urge to control them. The bundle of white pages and the pencil hanging against the wall are a low-tech and self-made notepad. It is used for inscribing messages or things to remember and do. All the parts of the construction have been arranged together in such a way that they are both capable and ready to perform their apparently simple tasks. All the parts are necessary, and the location has been chosen for strategic reasons in the middle of the kitchen and at the centre of the actions of preparing food, cleaning, people talking, and at a crossing of passageways between kitchen, storage and outside. The portion of wall that supports both the frail construction, and the actions of writing for which that is intended, was unused before and became useful somehow. The paper's white and immaculate surface is ready for intentional tracing some time soon. Its sharp and straight edges define a zone where the actions of writing must take place. It is a framed domain situated in an environment that remains undocumented. The habitual approach of architectural technology considers the latter irrelevant anyhow for understanding the roles of the parts and the way in which they function, the

10_ Hertzberger 1991/2009, p.235

11_ Rotor 2010, p.17

12_ Ingold 2013, p.1

properties of materials and how they are applied, the organisation of the parts and the methods for assembling the whole. The abstract organisational pattern—a fixed point, a line, a load and constrained motion—is regarded as independent from the particular location in which it is situated. It could as well be realised somewhere else, in another kitchen and with other materials. To a certain extent this abstract take on things, freed from concrete instances makes sense exactly because it frees itself from them.

But many things and situations go beyond an abstract system and its internal logic. The unpredictable use by unpredictable users has spilled over the edges of the page into its immediate environment; from the surface of the page onto the surface of the wall. The architect and owner of the house told me that the kids took great pleasure in leaving their marks on what would normally be considered forbidden terrain. I speculate that the seemingly untidy construction may have helped a not too strict interpretation of the boundaries between the interior and exterior of the white page. As far as I was told there was no premeditation and the wall was drawn and written upon by now invisible small hands that acted on the basis of a reading of a given situation and what it affords, regardless of what was intended beforehand. After writing on or next to the white pages, the pencil was let loose and came to rest after a number of swings from left to right and back again and in its wake inscribing the diagram of an abstract concept on the wall like a tattoo: a rhythmical movement named ‘oscillation’.

Carpet Classroom

Whether the two previous examples are suitable and relevant for architecture may be a source for argument. Therefore the connection with another situation that fits by analogy and rescales upwards from a paper page to a woven carpet is meant

ill.3.40 & 3.41:
A carpet classroom

Photo by Noorullah Shirzada, AFP



to challenge this possibility. It also re-contextualises them as another domain for use and inscription, in this case a classroom that must do without a building. The classroom is outlined by the carpet, but the immediately surrounding territory, where the imprints of steps in the sand bear a resemblance to the jottings on the wall, is also part of it. Where lies the boundary between architecture and an environment? How to understand the mediation between the interior of the classroom and its exterior on the basis of the information provided by textbooks on architectural technology, that almost exclusively describe robust boundaries made with solid substances? Carpet classrooms don't fit into them, although those can teach us a lot about construction in terms of an environmentally situated understanding of material agency.

All the examples in this chapter express that architecture as a technological practice produces not merely objects but material interfaces instead, i.e. the devices that qualitatively modify the relational encounters between us humans and the natural and artificial environments that we inhabit. Such a re-framing gives us the possibility to think of architectural construction in terms of a search for the adequate material adjustments to a given problem of dwelling in context, rather than to think of it in terms of the production of buildings.

The highly uncomplicated classroom is emblematic for such a disposition with regard to the transformation of a contextual and relational spatial situation. On the one hand it may be architecture reduced to the bare bone essentials, and due to that prone to the critique that it is not representative for the complex practices we actually have to engage. But on the other hand it suggests a shrewd understanding of place and what is needed to modify, construct, and recursively re-construct it. Part of the architectural intelligence is situated in the fact that this interpretation of a classroom is not simply equated with a preconceived model of a classroom as an enclosed space in a building. It rather expresses a number of appropriate and suitable material interventions that organise activities in a particular manner, and that determine the relation between the dwellers or users and the specific conditions of place and circumstance. Paying attention to both visible and less visible traces of material relations provides alternative insights in the complex encounters between things and what emerges out of them.

When Jonathan Hill uses the metaphor '*the garden of architecture*', situations with qualities like the previous ones perfectly fit in.¹³ It is in this tangible worldly garden

13_ Hill 2012, p.109

that we can find *'the structure of the life situations that buildings accommodate and symbolise'* that David Leatherbarrow proposes as a basis for learning architecture.¹⁴ They can become a basis to learn construction too because of their rich profusion, the abundance, the diversity of forms and events, or in other words the *'full wealth of particular appearance'*.¹⁵ It is a world of wonder, a repository of structures, patterns, orderings, problems and questions, solutions and answers, that lies waiting to be mined and/or harvested. It can also increase awareness about the situational and embedded character of architecture. Buildings stand within a place, there is no way around that, and they always participate in it, be it positively or not. The place, the environment, the context, the garden, the world, or whatever name we give to it, acts on buildings and is being acted upon by buildings. The dialectal nature of this reciprocal relationship is always made visible somehow, thus pointing at the essential interdependence of architectural objects and their contexts.

It brings the dynamic and generative interplay of things, the *'vibrant field of formative forces'* to the fore.¹⁶ In Jane Bennet's terms, it shows *'the distinctive capacities or efficacious powers of particular material configurations'* and a more *'distributive agency'*.¹⁷ Moreover, it generates (architectural) meaning independently from the architect's intentions and demonstrates that authorship is inevitably shared.¹⁸ Architecture —as discipline, practice, process and product— is not autonomous, but entirely dependent on an external world: people, circumstances, events, ... that intervene within and upon it. Jeremy Till pointed this out in *'Architecture Depends': Architecture at every stage of its existence - from design through construction to occupation - is buffeted by external forces. ... These forces are, to a greater or lesser extent, beyond the direct control of the architect. ... Architecture is defined by its very contingency, by its very uncertainty in the face of these outside forces'*.¹⁹

14_ Leatherbarrow 2000, p.95. See also part 5 'Process and Form', section 5.1 'Context', chapter 'Life Situations and Typical Incidents'.

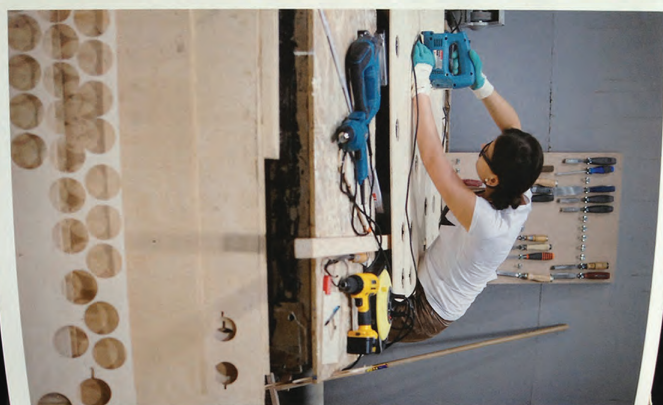
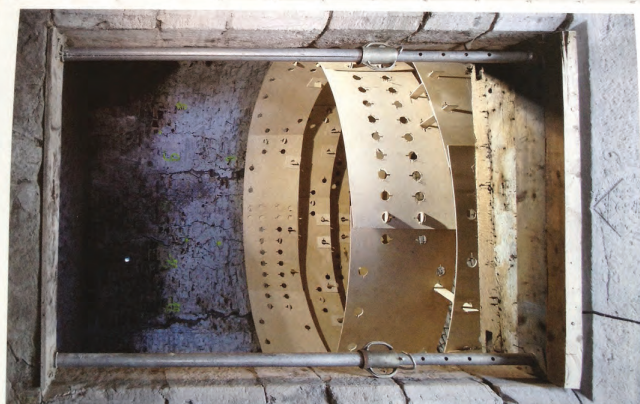
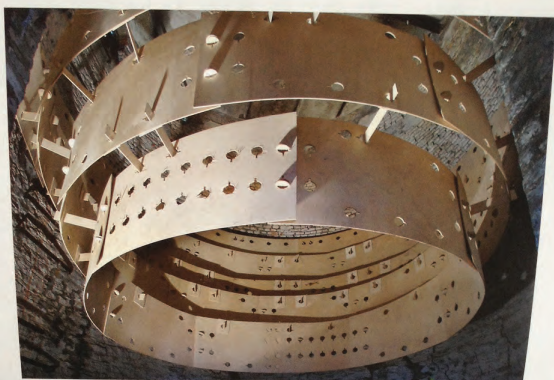
15_ Arnheim 1969/1997, p.300

16_ Goethe in Miller 2009, p.xix

17_ Bennett 2010, p.ix

18_ See also part 2 'Territories', section 'Encounters', chapter 'Tectonic Re-Visions'

19_ Till 2009, p.1



ill. 3.42:
Two spreads from the
book published after the
EIP workshop 'Structures
in Building Culture' in
Belgium. The book
contains essays reflecting
on activities and outcomes
and were written by some
of the teachers of the
participating architecture
schools involved.

Photos by F. Dujardin

THINGS WE DO NOT SEE

For five consecutive years, from 2010 to 2014, I participated as a tutor in the Erasmus Intensive Program (EIP); initially entitled '*Tectonics in Building Culture*' and subsequently '*Structures in Building Culture*'. It became a formative experience with the subject of construction; both on an (inter-)personal level, and on the level of first hand experience with the capacities of construction in an educational practice of architecture. The program was initiated by Urs Meister and Carmen Rist from the University of Liechtenstein, and it was set up as a collaboration between architecture schools from different European countries: Liechtenstein, the Netherlands, Spain, Norway, Denmark, Ireland, Poland, Scotland and Belgium.

The basic principles guiding both the 'Tectonics' and 'Structures' series were the same: the location and the type of materials used changed every year; either massive and heavy for the tectonics workshop series, and light-weight for the structures series. I organised both content and program of the 2011 edition in Belgium, together with colleagues from KULeuven Faculty of Architecture. Following text includes a description of the organisational concept and a reflection on some of my personal experiences during and after the event. The original text was entitled 'Making is More', which eventually became the main title for this thesis. Initially the text was also valuable for the finding that things can be concealed, are not directly legible, latent or entirely disappear from the field of visibility for one reason or another. What gradually became clear is that there is a relation between the eclipse of certain things and the appraisal of their worth or lack thereof. Invisible almost automatically implies cognitively not present and consequently unattended to and/or undervalued.

The Building Culture EIP workshops revolved around making things, using real materials and real tools to make something at a real scale. Not down-scaled models but big things at scale one:one. The intention was that they would be big enough to turn weight, dimensions and constructing into real physical issues to deal with in a particular and tangible place, and not just virtual ones. The materials were made available at the start, as were the place and some of the tools. All these had to be engaged with from the very beginning in order to make it happen. Figuring out what and how, was not limited to formulating a good idea or drawing projections on paper or in the computer as we are trained to do, and recursively exercise in the design studios. Making it happen means

going through all the steps needed to really materialise something, and participating in the processes of fabricating, assembling and shaping an object within a specific place. It involves conceiving and drawing of course, but also planning, organising, anticipating, deliberating and convincing. It implies being persistent, clever and working hard to create something tangible; getting your hands dirty and going into the action of making something. It means being architect, carpenter and constructor at once, and therefore lifting some of the century old boundaries between ideation and construction.²⁰

The overall aim of the workshops was to learn architecture from within practices of making in which one engages in both design and construction at real scale and with one specific type of material. The architectural projects had to be developed starting from the material itself, and from the direct physical engagements with it; in other words, from the actions of manipulation and transformation of the material itself. The technical operations of shaping, cutting, assembling, arranging, joining and so forth, had to become more than instrumental actions for the production of pre-conceived form. The requirement that follows from this, is that these formative actions

*ill.3.42 & 3.43:
The making of
components for the site-
specific constructions
built during the second
phase of the workshop:
in plywood in the picture
on the left and OSB in the
one on the right side.*

*Photos by EIP workshop
participants.*



would also become actions of exploration and sources of inspiration and imagination. As a consequence, it was impossible to reduce the construction process to mere instrumental production, because it also had to become a creative design process that is not remote from the physical execution of the work, but integral to it.

Properties²¹ - Plywood / OSB

After three years of heavy weights –stone, brick, concrete– the emphasis shifted to something lighter. Wood seemed the obvious material to select and use for the Belgian edition. The name ‘wood’ covers an extensive array of possible materials. Different species stand for as many different types of wood with related variations in structure, colour, weight, density, hardness and other properties. Besides, every tree is different because it grows in another way in another place. Every piece–beam or plank– that comes out of each singular tree is different from the others to some extent, depending on its position in the trunk, the direction of the cut, the moisture content, the presence of knots and so forth. A substantial part of the carpenter’s knowledge and craft reside in evaluating and dealing with these divergent properties and the intrinsically connected capacities of the once living material massive wood. However, technology and the industry that serves it (or vice versa) also provide an array of engineered wood, by means of which the variations and unpredictability of the natural material are supposedly overcome through recombination and reassembly, creating a new material that is artificially perfected. Every produced piece is intended to be as identical as possible to the others, and both properties and performance are meant to be predictable, repeatable and controllable.

For the workshop we used two types of engineered wood: plywood (6mm) and OSB-chipboard (18mm). Although both plywood and OSB are provided in panels and share a planar geometry, both are substantially unlike. The chipboard is stiff and brittle whereas the plywood is bendable and tenacious. The plywood’s layered order and structural directions are legible in the laminated sequence of wood-veneer; the chipboard looks like a compacted mess of wood-flakes and glue, compressed with force into a flat and rectangular geometry. The deliberate limitation of the choice in materials, combined with the requirement to make site-specific objects at full scale,

21_ See part 5 ‘Process and Form’.

22_ See part 2 ‘Construction IS’, section ‘What We Talk About ...’, chapter Construction IS Making’.

Building-grade veneer plywood (BFU)

The term veneer plywood covers boards made from several veneer plies glued together (fig. B 6.18c), but with five plies or more and thicknesses exceeding 12 mm the term multiplex is often used. Owing to their high strength, such boards are ideal for loadbearing components. If cross-banded beech veneer is used instead of softwood (grade BU), this produces a very high quality, stable board suitable for internal fitting-out and furniture (fig. B 6.18d).



Oriented strand board (OSB)

Chips (approx. 75 mm long) aligned parallel with the surface of the board give oriented strand board its characteristic appearance (fig. B 6.18f), which can remain visible as a vigorously textured surface under thin coatings. The edges are vulnerable to damage and OSB is therefore not suitable for exposed areas. Owing to the alignment of the chips, OSB has a distinctly higher tensile bending strength in the longitudinal direction than in the transverse direction. This wood-based product is suitable for load-sharing and bracing planking as well as for loadbearing flooring beneath a floor covering.



B 6.18

Production sizes of wood-based boards	Abbreviation	min. material thickness [mm]	max. material thickness [mm]	max. width [mm]	max. length [mm]
Layered products					
Multi-ply board		12	75	3000	6000
Laminated veneer lumber	FSH	27	75	1820	23000
Veneer plywood	FU	8	25	1525	3000
Building-grade veneer plywood	BFU	10	40	1850	3050
Parallel strand lumber	PSL	44	280	483	20000
Particleboards					
Laminated strand lumber	LSL	32	89	2438	10700
Oriented strand board	OSB	6	40	2620	5000
Chipboard	P	2.9	38	2050	5300
Fibreboards					
Medium density fibreboard	MDF	8	24	1250	2500

B 6.16 Formats and material thicknesses of wood-based products (guide only)

B 6.16

Solid timber products and linear wood-based products	Density	Compress. strength parallel to grain	Tensile strength parallel to grain	Tensile bending strength	Swelling and shrinkage behaviour [% per 1% change in moisture]	Vapour diffusion resistance index
	[kg/m ³]	[N/mm ²]	[N/mm ²]	[N/mm ²]		[-]
Solid timber products (e.g. spruce)						
Sawn section: S10	420	8.5	7	10	0.24	40
Solid structural timber (KVH)	420	8.5	7	10	0.24	40
Four-piece beam	420-460	8.5-11	7-9	10-13	0.24	40
Duo-trio beam	420-460	8.5	7	10	0.24	40
Glued laminated timber	420-560	8.5-13	8.5-18	11-18	0.24	40
Linear wood-based products						
Laminated veneer lumber (grade S)	480-550	16	16	17-20	0.01/0.35 ¹	60/80
Parallel strand lumber (PSL)	600-700	20	18	19-21	0.01/0.32 ¹	50/100

¹ In the direction of the board parallel to the grain/perpendicular to the grain.

B 6.17 Physical parameters of solid timber products and linear wood-based products

B 6.17

Board-type wood-based product	Abbreviation	Density	Permissible bending stress perpendicular to plane of board ¹	Permissible compressive strength in plane of board ¹	Thermal conductivity	Shrinkage in plane of board	Vapour diffusion resistance index	Combustibility class ²
		[kg/m ³]	[N/mm ²]	[N/mm ²]	[W/mK]	[% per 1% change in moisture cont.]	[-]	
Layered products								
3-ply core plywood		400-500	4.4-22	5.5-11	0.14	0.02	50/400	D-s205
5-ply core plywood		400-500	3.5-13	7.5-11	0.14	0.02	50/400	D-s200
Laminated veneer lumber	FSH	400-600	13-21	8-19	0.15	0.02	50/400	D-s200
Building-grade veneer plywood	BFU	400-600	13	4-8	0.15	0.02	50/400	D-s200
Blockboard, laminboard	ST, STAE	450-600	n.a.	1-8	0.16	0.02	50/400	D-s200
Particleboards								
Chipboard	P	550-700	2-4.5	1.75-3	0.19	0.03	50/100	D-s210
Oriented strand board	OSB	600-660	2.5-8	1-4.2	0.13	0.03	50/100	D-s200
Laminated strand lumber	LSL	670-700	16-20	8-10	0.14	0.3-0.4	90/100	D-s210

ill. 3.44:
Excerpts from the book
'Construction Materials
Manual'; Birkhäuser and
Edition Detail (2006)
showing how formalised
technological knowledge
is apprehended, i.e. as
abstract, disembodied
and decontextualised
information

Scans by author

necessitates an inquiry into what materials are capable of. Which of both materials fits the aim best? How can its capacities be discovered and what these may lead towards? How can one piece be connected to the other? How can it be cut? How to go from plane to line and to a spatial artefact? How to shape? How to be precise? How to go from the dimension of the material to the bigger dimension of the construction? How does the material react under the actions of hands and tools? How does the material react when loaded? These and many other questions about making things needed at least as many different answers.

Capacities²³ Made Actual in Process

The workshop-activities were split up into two subsequent chapters. The first was hands on, repetitive and generic, whereas the second was site-specific and project-oriented. Chapter one of the workshop was itself subdivided into two parallel trajectories –different in method and nature– that consisted in a series of half-day exercises. No exercise was repeated twice, inciting everyone to share what she or he had learned with the others and in so doing create a common knowledge for the group as a whole by means of a collection of constructed artefacts.

The first trajectory started from a master/apprentice approach with two carpenters skilled in traditional woodworking. They transferred a part of their elaborate knowledge about wood-connections and -assemblies by showing ‘how to do it right’. It conforms to the traditional way to learn a skill by the ceaseless practice of the right moves. It aims at mastery by repeating the appropriate manipulations and operations over and over again, until perfection is approximated. The handling of tools and the capacity for transformation of the wood were explored through recognised techniques. The second and parallel trajectory had less constraints with regard to pedagogical methodology. No preliminary technique was taught and the investigation started from a limited range of themes that had to be explored with an open register. They enveloped textile techniques for making and assembling surfaces and shapes, like weaving, folding, surface and volumetric patterning, etc. The process explicitly articulated that internal coherence and consistency are necessary for making more complex systems with many parts. In both trajectories every exercise resulted in an object demonstrating a particular aspect of a method and/or technique. At the end of the first chapter the

23_ See part 2 ‘Construction IS’, section ‘What We Talk About ...’, chapter Construction IS Making’.

garden had turned into a blossoming field of small constructions that effectively demonstrated the multiplicity of possible paths to follow.

During the second chapter of the workshop the action was displaced from the interior of the wood workshop towards five building sites spread out on the beautiful domain of an old converted monastery where the workshop took place. Changing location introduced new challenges. Since most fabrication of parts occurred in the workshop and the subsequent assembly was executed in each place individually, logistics as well as coordination became issues of primary importance. Transport back and forth of components and tools, and communication between team-partners working at a distance from each other, had a substantial influence on the process. Aspects related to on-site construction work increased the complexity a little more: for instance, the protection of components and building site in order to prevent damage, the protection against the weather, the creation of safe and practical working conditions, and so forth. Changing location also gave rise to consequences of another nature, since the projects became site-specific and embedded in local conditions, instead of being responses

ill.3.43 & 3.44:
Photos by F. Dujardin



to generic questions of material and method. Project-specific interactions emerged between ideas, material, conditions of place and time, the people who elaborated and constructed the project, others who questioned and provided feed-back, etc. and ultimately all of these converged in a tangible architectural artefact.

Things We Do Not See

The process gave rise to the production and acquisition of knowledge about materials and construction, and the development of both personal and collective building culture. Architecture is physical, something you can see, touch and experience in its material state. We can value it based on the ingenuity and beauty of the construction; the cleverness of connections and details; the adequate choice and articulation of the materials; the relationship of the construction with its partner the site, and how both together create a place; the developed craft in making, etc. But as our Danish colleague Peter Sørensen brought forward during the final review, a great deal of the learning process is invisible in the final object, due to the largely private and inaccessible nature

*ill. 3.45 to 3.48 on both facing pages:
The four site-specific projects under construction, i.e. coming into existence through generative processes situated in tangible event-spaces*

Photos by F. Dujardin, except ill.3.45 below by EIP workshop participant.



ill.3.46: Photo by F. Dujardin.



of personal experiences: the experience of holding the material in the hand, feeling its roughness and weight, of holding the chisel, feeling the blow of the hammer and the resistance of the wood, hearing the sound of it cracking, the incessant noise of the saws going through the fibres of the wood, the sounds of people deliberating and sometimes screaming to exceed the noise of the workshop activities, the feel of the sawdust softening the hard concrete floor, the exchanges of opinions and feelings, the looks and touches, the witty remarks, cuts and bruises, and many other things.

When I went back the day after everybody left and the quiet had returned to the historic place of introspection and meditation, all the artefacts were still standing in full ornate, as they were the day before. The site had come to rest. The architectural process of becoming had ended, and the absence of all those that contributed in creating them felt astonishingly lifeless. Apart from the artefacts themselves, only traces of twelve days of frenetic action remained: piles of construction debris, a yellow rectangular mark in a green meadow where the kitchen used to stand, the stains of the dinners on the terrace's blue stone, flattened grass, eroded pathways, ...; traces wiped out by now, and memories that are lost in the folds of history.

The invisible aspects referred to above concerned personal and subjective aspects of each and everyone's experience, but they cannot be reduced or narrowed down to that. Other and no less important things have a strong tendency to fade into oblivion. What hit me in face then, was the forceful prominence of the static objects, i.e. fixed form, and the total eclipse of the processes by which these very forms had come into existence. I was most of all surprised by the fact that this finding was so self-evident. All our attention during the final review was focussed on the objects, the tangible and physical results of the processes of construction that remain with us for a while because of their relative durability. Processes are not quite like that; they are fleeting, ephemeral, a collection of passing instants, each one of them unique, and this regardless of the patterns that can be recognised across different processes.

One of the paradoxes is that the Erasmus Intensive Program was primarily about process. For each and every workshop, the unambiguously stated end that was both presented to and required of the students, was indeed the construction of architectural artefacts at full or real-life scale; or in other words, built works in context. But since the underlying goal was first and foremost learning, the initiating processes that lead towards those material ends are of the utmost importance. Therefore they are also ends in themselves. This includes the activities, the experiences, the handling and manipulations, the decisions, surprises, disappointments, failed and successful

attempts. It involves all the material and immaterial results that are produced during or emerge from the processes of making, as distinct from the architectural end-result as final object. The built artefact that closes off the process was an end for sure; but also an incentive to drive a process and keep it going; to give it a goal towards which to move; and to keep the actors who were immersed in the situated practice of making motivated and engaged. French philosopher Gilbert Simondon affirms that a technical object, like any architectural artefact, embodies its process of becoming, but this does not imply that it also narrates it, or makes it straightforwardly visible post factum.

Only traces of the processes remain and not the processes themselves, including all actions and happenings that were part of them. A process of making cannot be reduced to the object it creates, nor to the ways in which the object can be used or interpreted afterwards.

*ill.3.49 & 3.50:
The intense activity
of pre-assembly and
pre-fabrication of
components for the site-
specific constructions
built during the second
phase of the workshop*

*Photos by EIP workshop
participants*



Finally, the aim of the workshops was not to teach future architects a skill, like that of carpentry for instance, but rather to instigate first hand experience and reflection in action about the unlimited capacities of materials, places, designers and makers; all of them combined in specific collaborative assemblages. In other words, they aim at creating a learning environment that complements the habitual focus on properties

with conditions where immanent capacities can become actual. From this perspective hands-on construction-activities provide a crucial extension of the customary remote, abstract and representational curricula that focus on the static and formalised realms of technological theory. The theories inevitably emphasise properties and tend to veil capacities and their emerging implications. The reason is not necessarily that the former are valued higher by default, but mainly that the latter are not (easily) accessible in the formal(ised) realm that the theory of construction provides.



The pedagogic relevance of integrating complex formative and productive activities of making or construction in architectural learning practices, has to be situated within this broader context. It is one of the most straightforward ways to experience the inherent complexity of processes of becoming.²⁴ Within a process things are connected, related, reciprocal (not meaning equal or in balance), interacting, etc. This is also what the Latin root of the term complexity refers to. Like the term construction, 'complex' is a composite that joins 'con', meaning together, and 'plex', meaning interwoven, which in turn is a quality that construction also possesses.²⁵

24_ See part 5 'Process and Form'.

25_ See part 2 'Construction IS', section 'What We Talk About ...', chapter 'Construction IS Con and Struere'.

26_ Beim 2004, p.52

ill.3.51:
Another revealing perspective on the outcome of the process of making an architectural artefact: piles of left-over materials in front of the closed wood-workshop. The more or less orderly arrangement suggests a clean and easily controlled working environment and the future re-use of resources. This view is deceiving since the space is cleaned and the dirt, dust, debris, chaos and frenetic noisy activity that dominated the place until just before have been cleared away, outside the frame of view. The majority of the materials are waiting for the container to be disposed off and start their journey as waste

Photo by EIP workshop participant

TECTONIC RE-VISIONS - MEANING and INTERPRETATION

'Signification in construction or the tectonic dimension in architecture depend on how "the creator" (the architect), as well as "the spectator" (the user), perceive and interpret construction as well as what sort of meaning (or lack thereof) they transfer into the physical solutions of an architectural project'.²⁶

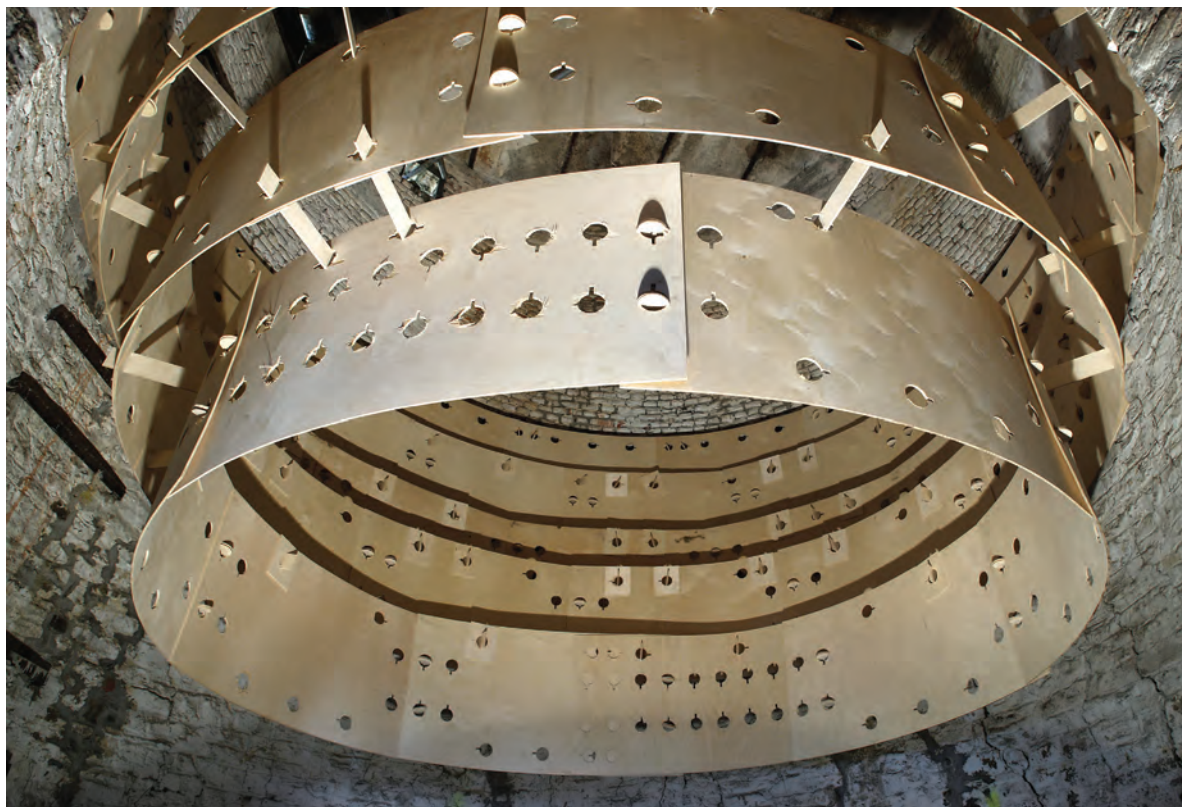
ill.3.52:

A high quality photograph made by a professional and specialised photographer of architecture, and a view on a beautiful object made to fit a specific place. It is a token of the dominance of object and the eclipse of the generative processes from which it emerged. The image is also a demonstration of the most common staging of architectural production. The artefact in full ornate, immediately after the closing stage of the building process and before being spoiled by time and environmental dynamics. Both the latter often considered shortcomings of reality (see next topic, p.177)

Architectural artefacts embody and articulate their processes of becoming, but they do this in partial, indirect, and at times invisible or unreadable ways, certainly for those who were not engaged in their conception and realisation. Once realised, the work gains autonomy from the formative intentions of its maker(s), and from the processes that brought it into existence. The process of becoming does not speak for itself by means of the architectural work that was produced by its means. In other words, it is not straightforward and obvious to consider the built work as explanatory or didactic of intentions, motivations and actions that were constitutive for it.

Nonetheless, this thought pervades the discourses on tectonics in architecture, in which

Photo by F. Dujardin



ill.3.53 & 3.54:

One of two site-specific works made during the EIP workshop 'Structures in Building Culture' in Belgium that is situated in an interior, and the only one made with the rigid OSB panels. The connection between the actual construction process and the so-called logic of the construction may be thought of as perceivable and interpretable, as the opening quote of this chapter (p.177) seems to suggest

But is that really the case?

What was the actual procedure to make it?

Why has this particular way of doing it been

chosen? Was it really made by only two

persons as the image on the left suggests?

How long did it all take? What kind of knowledge and experience was drawn from it?

Photo on the left by EIP workshop participant and photo right by F. Dujardin.



statements like *'the building tells the story of its own making'*.²⁷ Or, *'... the tectonic dimension of a work of architecture is the possibility for the perceiver to read and understand a conscious and intentional processing of the construction'* (Madsen 2014, p.100) are widespread.²⁸ In the latter quote, the terminology 'intentional processes' refers to what the author-architect intended and planned for in advance, or in other words, the meaning that she or he projected into the work.

In the introduction to 'Tectonic Visions', Anne Beim points at a key ambivalence in the framing of the concept of tectonics in architecture. She describes the tension between the creation and reification of the work on one side, and its materialised existence in place and time on the other: *'This presence of both ideality and reality in the building projects raises the question: can architecture fulfil the ideal when it has to be modified to the shortcomings of reality?'*²⁹ The statement underscores a (biased) view on hierarchy in the dialectal relation between intention and result, or between a so-called ideal projected work and the actual built work. This hierarchy is also applied to the relation between processes of design and processes of construction or building. The quote from British architect and architectural historian James Strike, that immediately follows the previous one in the essay is suggestive in this respect, and a token of architectural hubris and self-indulgence: *'The architectural design process raises building construction above the singularly physical solution to a higher mental level, which brings together the intellectual forces and aesthetic considerations with the physical requirements'*.³⁰

Others go in a similar direction, for instance: *'the architect pursues ... a visionary approach, based on new/transcending ideas'*.³¹ Another example is Frascari's binomials construction and construing, whereby the two dimensions –the actual and the formal– are brought together.³² Finally, amongst the many examples used, there are the unavoidable dualisms of Karl Bötticher's kernform and kunstform, depicting the basic relationship between material origins and idealised representations of material properties and structuring forces; and the reference to Gottfried Semper's definition

27_ Skodvin 2014, p.77

28_ Madsen 2014, p.100

29_ Beim 2004, p.19. Whether this is a rhetorical question or an expression of opinion remains unclear.

30_ Beim 2004, *ibid* p.19

31_ Beim 2004, *ibid* p.19

32_ Beim and Madsen 2014, p.22



of the tectonic, as a result of conscious artistic work: *'Following this argument tectonic design requires an artistic idea, which acts as an organising and structuring principle – an overall principle that forms materials and constructions into a coherent structure'*.²⁸ These assertions actually come closer to presumptions, speculations or wishes than facts. In each of those assumptions, the framing of the topic is very causal, metaphysical and grounded in the classical dualism between idea and matter. As mentioned before, a technical object, like any other artefact, embodies its process of becoming, but only certain traces of this remain and not the process itself, including all actions, decisions and motivations inherent in it. A process of becoming cannot be reduced to the object it creates, nor to the ways in which the object can subsequently be used or interpreted. Stating the opposite too easily grants the architect a primacy and exclusivity with regard to the meaningfulness of architecture. This clears the path towards the exclusion of the influence of other actants in the generative processes of architecture.

In order to be labelled tectonically valuable and relevant, a direct correspondence seems necessary between the meaning proposed –or rather imposed–

ill. 3.55 & 3.56:
Another site-specific
works made during the
EIP workshop 'Structures
in Building Culture' in
Belgium.
They show two moments
during its lifetime. One
during the construction
process, and even
though it is static and
not representative of the
actual dynamics of the
ongoing build-up, it does
provide an indication of
the multitude of things
converging on site.
In the adjoining image,
every suggestion of the
prior stages in a process
of gradual transformation
have disappeared, and
without the presence
of the partner image
they would disappear
altogether. However, here
the artefact has become
part of different but also
invisible processes.
Only the outcomes,
consequences and/or
impacts are visible

ill.3.53 (L) by F. Dujardin
and ill.3.54 (R) by author

28_ Beim and Madsen 2014, p.22

by the author/architect/artist, and the meaning that emerges from interpretative processes situated temporally both within and post-construction. Jeremy Till argues in 'Architecture Depends' that this is an illustration of a belief system that conflates architect as expert with architecture as profession with architecture as practice and with architecture as product, and it asserts that there is a direct and virtuous set of links along this hierarchical line.³³

But the movement from the realm of abstract proposition to the realm of tangible matter and physical objects is not possible without alterations and deviations from intentions, wishes and projected meanings. Robin Evans opens his essay 'Translations from Drawing to Building' with this cardinal rule: *'To translate is to convey. It is to move something without altering it. This is its original meaning and this is what happens in translatory motion. Such too, by analogy with translatory motion, the translation of languages. Yet the substratum across which the sense of words is translated from language to language does not appear to have the requisite evenness and continuity; things can get bent, broken or lost on the way. The assumption that there is a uniform space through which meaning may glide without modulation is more than just a naïve delusion, however'*.³⁴ This gliding or modification of meaning can be articulated and experienced when one actually moves from the realm of abstract representation into the event-spaces of realisation, where abstractions are interpreted and reified, and within which alternative meanings can emerge. As Gregory Bateson asserts, meaning is never totally fixed, because meaning is dependent on context.³⁵ When context changes, meaning will automatically follow the movement. The experiences with the several 'Tectonics/Structures in Building Culture'-workshops were a convincing demonstration of these dynamics of interpretation and according meanings.

The concept of the tectonic in architecture is diffuse and often biased, i.e. unilaterally oriented towards the author architect. Clarification or re-framing is necessary with regard to what is referred to as *'the logic of the construction of the building'* in for instance a sentence like *'the essence of a tectonic approach to architecture is that the logic of the construction of the building can be perceived and interpreted by the user of the building'*.³⁶ A possible way to go is Hermeneutics or the theory of interpretation. In the essay 'Cognitive Tectonics: From the Prehuman to

33_ Till 2009, pp.154-155.

34_ Evans 1997, p.154

35_ Bateson 1979, p.27

36_ Madsen in Beim and Madsen 2014, p.100

the Posthuman', published in the same book as previous quote '*Towards an Ecology of Tectonics*' Jonathan Hale makes this pertinent connection.³⁷ Jeremy Till makes a similar one in relation to a distinction between ways of thinking that are needed for working from within a context of particular issues, as opposed to those established on the basis of observations from without.³⁸ French philosopher Paul Ricoeur's '*model or paradigm of the text*' provides a framework to understand the relations between an (architectural) work, the constitutive procedures of becoming that are associated with it, and the subsequent processes of appropriation and use.³⁹ The similarity between an architectural and a written work is that there is also an order, rules of ordering, something that comes into being and goes beyond the instrumental acts of production, has a capacity to be interpreted, and that is a result of the transformation of fleeting meaningful actions and events into something that is fixed, objectified and enduring. Ricoeur refers to the latter as 'a structured work' that effects 'the projection of a world'.⁴⁰ Its relevance for the concept of tectonics stems from the manner in which Ricoeur describes the hermeneutical problem:

'If we can no longer define hermeneutics in terms of the search for the psychological intentions of another person which are concealed behind the text, and if we do not want to reduce interpretation to the dismantling of structures, then what remains to be interpreted? I shall say: to interpret is to explicate the type of being-in-the-world unfolded in front of the text. ... For what must be interpreted in a text is a proposed world which I could inhabit and wherein I could project one of my ownmost possibilities. That is what I call the world of the text, the world proper to this unique text'.⁴¹

By analogy, interpreting a constructed or built work in the temporal space situated both post-design and post-construction, should not be confounded with an attempt to extricate the supposedly ideal or desired meaning of the author(s). It is neither to be confused with trying to read transcendent meanings in signs or symbols that can be projected onto the way in which it is constructed. And finally, it should not be understood in terms of a dialogue or conversation, because the architectural object is not an interlocutor, and the relation is not inter-personal.

37_Hale in Madsen in Beim and Madsen 2014, pp.197-202

38_Till 2009, pp.163-164

39_Ricoeur 1981/2009, p.191

40_Ricoeur 1981/2009, *ibid.* p.132

41_Ricoeur 1981/2009, *ibid.* pp.141-142. See also part 2 'Construction IS', section 2.II 'Patterns of Interaction Between Process and Form'. The referents 'behind the text' and 'in front of the text' situate the work temporally and refer to either the work's past (upstream), or its future (downstream).

The architect may hold a discourse, but the building cannot, or in Robin Evan's words '*... a building does not speak*'.⁴² A closely related opinion is that of Stan Allen's, who writes that architecture is a material practice and not a discursive one. His arguments emphasise that architecture has never been particularly effective as a vehicle of criticism [and discourse] but that, on the contrary, it is insistently affirmative and instrumental. Material practices do not comment on the world but operate in and on it. They produce ideas and effects through the volatile medium of artefacts, short-circuiting the established pathways of theory and discourse. He affirms that the most interesting practitioners no longer ask what architecture is, or what it means, but rather what it can do; and that one would necessarily have to shift attention away from the architect as the producer of meaning, and instead pay closer attention to the life of buildings in the world: '*It might help to get us beyond the fiction that meaning is the result of something that happens in the course of the design process. Meaning is not something added to architecture, it is a much larger, and a slipperier momentary thing. It is not located in the architecture: it is what happens to and around architecture as part of a complex social exchange. It happens in the interval, as the result of an encounter between architecture and its public, in the field*'.⁴³

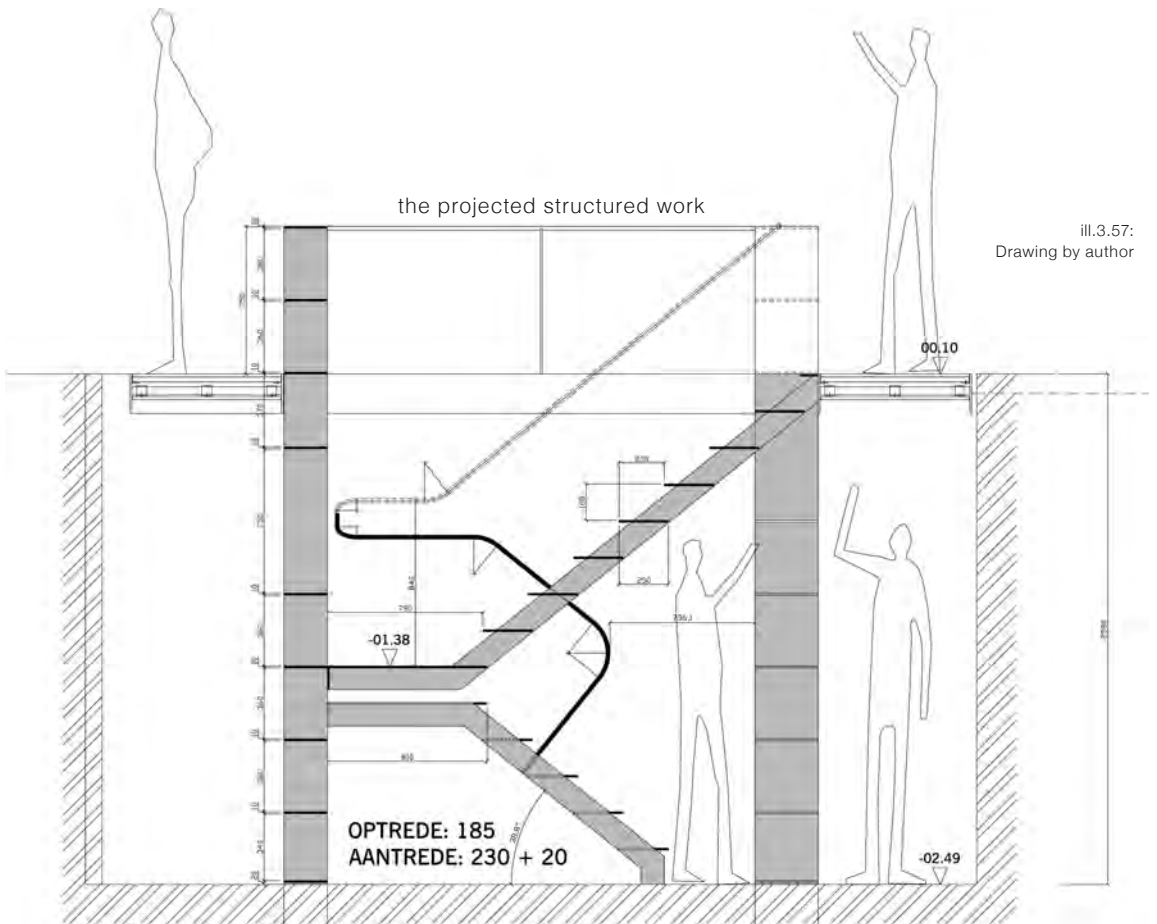
A comment is necessary here because if one argues that buildings cannot speak, it feels awkward that '*... architecture can do*'. Buildings are not active beings though, but the statement nonetheless seems to attribute a wilful capacity to act to architectural artefacts. This can be confusing and it is anthropomorphic. A description that goes in the direction of '*... what architecture can lead to, or generate, or permit in relationship to ...*', might be more appropriate and accurate. It would point more explicitly to architecture's (virtual) capacities that need to become actual in a relation or connection with something else.⁴⁴ Process-philosophy provides the following nuance, '*for all we can ever observe about a substance is what it does -what sorts of impacts (changes, effects) it produces in interaction with others- that is, the sorts of processes it engenders. The absolute (nondispositional) properties that we attribute to things are always the product of a theory-bound conjecture -features imputed to things to provide a causal explanation for their impacts upon others*'.⁴⁵

42_ Evans 1995/2000, p.xxxvi

43_ Allen 2009, p.xiv

44_ See also part 1 'Construction IS', section 'What We Talk About When We Talk About Construction', chapter 'Construction IS Making', Making motif M.2-.Qualities / Properties - Capacities.

45_ Rescher 2000, p.9.



ill. 3.58 & 3.59, and those on the following spreads (pp.184 to 187) show points of view on project CasaT (at the time my home under construction and subsequently inhabited). They provide an impression of different moments in 'the world of the work' and 'the world it opens up' (see text on facing page). The top image (ill.3.55) is part of the specialised and architecture-specific representations of a 'proposed world' (Ricoeur) and 'projected structured work'. It is also the model depicting the presumed outcome of the actual formative and initiating processes of making, visible in ill.3.56 on the left. ill. 3.57 & 3.58 on pp.184&185 show moments within the temporal interstice between projected and built works, when architects are entirely dependent on multiple others to achieve the tangible world they proposed in anticipatory abstract terms. Finally ill. 3.59 to 3.62 on pp.186&187 visualise the space of the operative processes (appropriation and use) occurring in an inhabited place and its potential for interpretations that are unintended, unplanned and maybe unwanted, but therefore not less real and important. (see also section 2.11, pp.83 to 100)

ill. 3.56:
Photo by author.

the built structured work

The step from Robin Evans and Stan Allen back to Ricoeur's arguments is small. Ricoeur explains that the model of the text is applicable more in general, and for this reason it is pertinent for architecture too, since the outcome is also a structured work that opens up a new world for others to appropriate and put into application in life's practices, which in turn amount to meaningful actions in event-spaces. In architecture the structured work comes in two appearances, that is, a projected work articulated in a virtual and representational mode, and a built work, that is an actualised and localised material object. The life's practices that I am referring to above can be practices of design and building, as much as they can be practices of use, maintenance or any other meaningful action deployed in relation with an architectural context. Interpretation is oriented towards the work's future and not its past –although it is influenced by it– and meaning emerges from the interactions with the work. Once realised, the work more or less sharply disconnects from its process of becoming, and acquires autonomy with regard to what came before.

Due to this disconnection, one has to be cautious with the presupposition that a built end result is an accurate and truthful signifier for the initiating intentions and events that came before but have disappeared since then. On the basis of personal experience with the construction workshops referred to above, as well as architectural practice and education, I can say with assurance that the transactions between form and process are more complex than what the object as final product is able to tell. Although a built work is indeed a wilful and durable outcome of an intentional process in a specific place, and is made by specific authors, one should resist the idea that its construction is descriptive and didactic for the intentions and actions of the author(s). They bear the imprint of them, or in other words, there is a connection, but they are not explanatory of them.

The confusion can be noticed in a sentence on the back of the flyer made for the symposium 'Towards an Ecology of Tectonics' in November 2012: *'Architecture based on tectonic principles tells us the stories of its making by exposing the meaning of both the separate unit and its connection to the overall building structure'*. Understanding the internal structure of parts that together compose a whole is undeniably important for all who make architectural artefacts, as it is for those that repair, maintain, modify and ultimately demolish them, but whether this specifically has to be understood as the meaning(s) of the architectural object, as is suggested in many statements on tectonics, is questionable.



Ill.3.60:
Photo by author

Paul Ricoeur explains that the text, and consequently all that can be understood following its conceptual model, proposes a world in a fixed, arrested form. For architecture, Suzanne K. Langer identifies this as a physically present human environment that expresses the characteristic functional patterns of a culture.⁴⁶ In general terms, this corresponds to what Ricoeur calls ‘*the world of the work*’, and ‘*the world it opens up*’. It is this particular world that meets the subjectivity of the reader and that is interpreted/appropriated by the reader, the user, the perceiver, or for architecture preferably the inhabitant or dweller: ‘*Ultimately, what I appropriate is a proposed world. The latter is not behind the text, as a hidden intention would be, but in front of it, as that which the work unfolds, discovers, reveals. Henceforth, to understand is to understand oneself in front of the text*’.⁴⁷ The space in front of the work, is also the temporal space in which it finds its ultimate worth, legitimation and *raison-d’être*. For architecture that is when, metaphorically speaking, the house is finally inhabited and

46_ Langer 1953, p.96

47_ Ricoeur 1981/2009, pp.142 and 143



ill.3.61:
Photo by author

the space behind the built work – is also the space in front of the projected work

becomes a home. The implications of the two temporal sides of a work of architecture is not sufficiently present in the discourses about tectonics in architecture, and this leads to bias and self-legitimation. As a consequence, these discourses are open for Jeremy Till's strident but rightful critique that tectonics amounts to a codification of the vagaries of construction.⁴⁸ This is regretful in view of construction's implications for architecture as a material practice, and I speculate that it might be the opposite of what is aimed at. The worth of introducing hermeneutics within the conceptual world of tectonics in particular (by Jonathan Hale), and architecture more in general (by Jeremy Till) needs to be situated in this context.

48_ Till 2009, p.155



ill.3.62 to 3.65:
Photos by author



the space in front of the built work - is also the open space for appropriation and (mis)-interpretation

The issues mentioned in this chapter, in particular the connections with Ricoeurs' hermeneutics, is also present in part 2, 'Construction IS', section 'Patterns of Interaction between Process and Form'.

Preliminary comment concerning the chapter Queer Bricks

In the text I use a discourse supporting arguments in favour of computer aided manufacturing and construction with robots. The choice to use this domain of activity is purely pragmatic and it might as well have been another if available and as revealing as this one. It is not intended as a critique on the subject area per se, but rather on the way in which an architectural discourse can be constructed and argued for. I use it because it is an excellent example that abounds in self-serving and self-indulgent arguments supporting a self-centered agenda. It is the latter that I want to place in the spotlight, and not the specialised discipline as such.



*ill.3.66:
All bricks are the same
whilst all being different*

Photo by author

QUEER BRICKS - A UNILATERAL CLAIM ON FREEDOM

Bricks are fragments of countless buildings in as many places. Bricks are common; bricks are familiar; and it feels like we know them well. Masonry and stacking, or both the practice and the method used to combine them, are as familiar as the material itself. Stacking is one of the most accessible and straightforward methods for organising and re-organising material, and its characteristics can be recognised in numerous instances: heaps and piles of dishes, glasses, clothes, crates, containers, planks, boxes, plates, chairs, firewood, sheets of paper, books, and many more. Stacking as a bodily activity is recurrent and intuitive, and we perform the acts on multiple occasions without really paying attention to it. In principle, bricks and their analogues are easy to take in the hand, to handle, to pile up and combine. They are abundantly available and with inexhaustible alternatives in composition, texture, formats and colours. The variations are like nuances that make them all more or less different from one another. But all bricks also share properties that make them belong to a big family. Depending on the process of fabrication each brick has an identity of its own in a higher or lesser degree, meaning that it has both common characteristics or a sameness that is shared between members of a group, and particular traits that mark off the individual from the others. All bricks are the same whilst all being different.

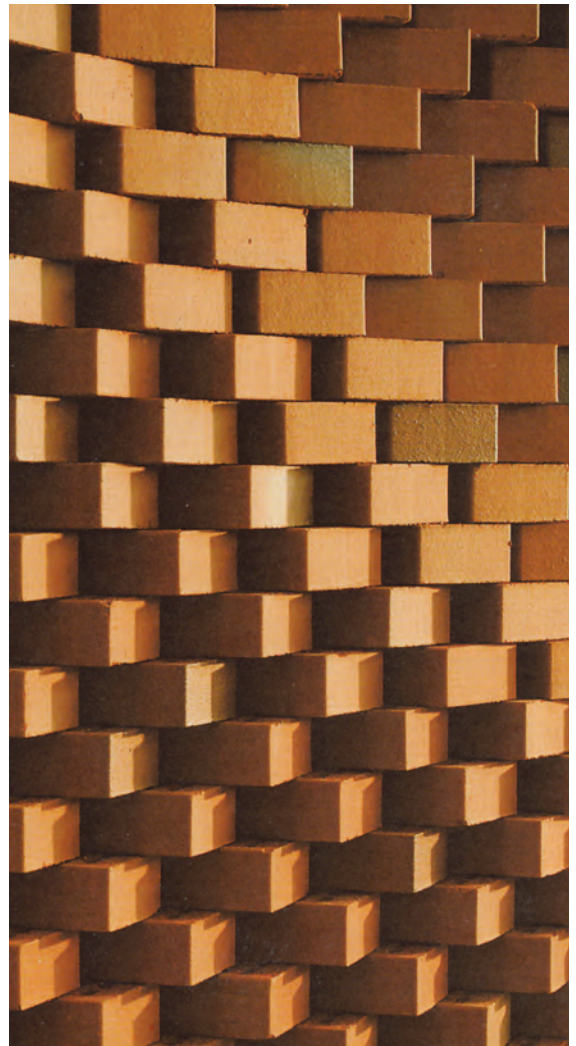
The identity of bricks is influenced by and associated with the way in which they are spatially distributed and combined (to make walls, vaults, etc.), and the inverse is also applicable. In the realms of 'digital materiality' and 'digital fabrication' this close connection remains the case, although some interesting additional arguments in favour of that specific way of executing masonry are brought into the game. The way in which ETHZ's pioneers Gramazio & Kohler describe this specific method for executing masonry gives an indication of the hopes and dreams associated with it: *'Materiality is increasingly being enriched with digital characteristics that substantially affect architecture's physis. Digital materiality evolves through the interplay between digital and material processes in design and construction. The synthesis of two seemingly distinct worlds - the digital and the material - generates new, self-evident realities [underlining added by author]. ... Material is thus enriched by information; material becomes informed'*.⁴⁹ Digital materiality's discourses are epitomes of positivist

49_ Gramazio & Kohler 2008, p.7

technology-based outlooks on architectural construction. Following description suits them like a glove: *'In order to explain the relationship between technology and form, a positivist model has often been constructed, according to which there exists a direct relationship of cause and effect between innovative technology and the generation of new formal paradigms... This is in keeping with a more general idea, the possibility of achieving constant and unlimited development thanks to the evolution of science and, in particular of its more pragmatic component: technology.'*⁵⁰ The manner in which technological and scientific developments are accounted for in architecture is frequently characterized by a pronounced lack of doubt. The tone is often dominated by the affirmation of an unwavering belief in the positive aspects of novelty and its associated benefits for inducing new methods, new processes, new expressions, new sensibilities, new capabilities, new possibilities and eventually new ways of thinking. The arguments developed to back it up are themselves often supported by an anthology

ill.3.67 & 3.68:
Bricks becoming
increasingly the same to
accommodate the 'new'
system

photos from 'Digital
Materiality in Architecture',
Gramazio & Kohler, Lars
Müller Publishers, 2008,
pp.60&63



of superlatives: increased, enriched, sophisticated, intensified, diversified, fascinating, seducing, multiplying, and so forth. When allusions are made to the situation existing prior to the new one, the enthusiastic tone subtly changes and words with another connotation appear, like: archaic, limited, predictable, less, and so forth.

I am not a proponent of a romantic conception of construction, and I agree that a number of the changes related to digital materiality/fabrication genuinely transform the available possibilities of architectural design and construction, and on top of that they potentially extend their scope. But qualifying the changes as exclusively positive is misleading. The arguments elaborated by Gramazio & Kohler in *'Digital Materiality in Architecture'* in support of their research on additive construction processes that are digitally controlled by computer and executed by robots is illuminating in this respect. In the introductory essay bearing the book's title and in the chapter 'Adding On', they make a number of statements about building with robots and stacking bricks that clarify their position: *'As we accumulate materials **precisely** at the point where they are needed, we can weave form and function **directly** into building components'*.⁵¹ *'The potential of digital design and production processes can **best** be exploited where a very large number of parts must be combined. Here they **extend** the architect's human capabilities; they **improve** his or her overview and **multiply** the possibilities for control of the design'...* *'Repetition makes it possible to organise **variation** manually, to control and construct it with simple procedures. ..., the frontier between system and variation is renegotiated ... A language of **diversity** is emerging that **gains** its identity through the design of processes rather than final forms.*⁵² *Through the continuously, procedurally controlled variation of position and rotation of individual bricks'*.⁵³ *'Unlike a mason, the robot has the ability to position each individual brick in a different way without optical reference or measurement, i.e. **without extra effort**'*.⁵⁴ [emphasis by author].

50_ Ferrater 2003, pp.7-8. How the term 'form' must be interpreted in this statement is not entirely clear. It can both refer to shape/geometry and to way in which things are structured/ordered/organised. See part 2 'Construction IS', section 2.II 'What We Talk About when ...', chapter 'Construction Is Con and Struere'

51_ Gramazio & Kohler 2008, pp.8-9 & p.61

52_ This reads as a proposal to shift some emphasis towards process rather than form and therefore seems to coincide with the arguments developed in this thesis for realising such a displacement. Whether there is an actual correspondence and whether this specific knowledge domain of architecture can indeed contribute to this endeavour is something that I did not investigate, but definitely is a topic that ought to be granted more attention in the future. See also part 2, 'Construction IS', section 2.II 'Patterns of Interaction between Process and Form' and part 5 'Process and Form'.

53_ Gramazio & Kohler 2008, *ibid* p.9

54_ Gramazio & Kohler 2008, *ibid* p.62

The key concept in the entire argument in favour of the new system is that architects gain more control through the use of computers, parametric design software and robots. These are all directly connected in a chain of production and go in one straight line from design to end product. The claim is that architects acquire more influence to direct the procedures and processes of construction due to a reduction of intermediate phases and the interference of others. Although the power-related issue of control is an integral aspect of architecture and construction, one must also be conscious that control is shared, or at least mutually impacting. A gain for one of the actors in the process is not by definition a gain for everyone or everything involved in the process. The modification in the kind and degree of control that a certain actant has, can have considerable implications on the relational balance between the different actors involved in the process.

The changes highlighted by Gramazio & Kohler are mainly situated in two aspects. The first is the assumption that the architect becomes more independent from others participating in an architectural artefact's process of becoming. In the case of masonry, the masons will most probably see their role modified in return, initially in the sense that their influence on process and result will be diminished, and eventually that their job might change beyond recognition or be at stake altogether. The second aspect affects the level of accuracy demanded of production and execution in different stages of the process, because this needs to increase substantially. The combination of computer and robot makes it possible to position each single brick very precisely in a pre-defined location. The human hand (and by the same token the person guiding it), is incapable of attaining a similar level of positional accuracy. This automatically implies that digital making lifts a number of constraints inherent in manual work. Some may even argue that using the term 'limitations' instead of constraints is more suitable.

This double modification of the conditions in which architectural work is realised, is consistently presented as very favourable for architects and architecture more in general, because it leads to both an expansion of the architect's palette of material possibilities, and to a qualitative improvement of the architect's toolbox. More creative freedom is considered within reach because assemblies that were impossible to realise before suddenly become feasible, and the confinement within the limits of the so-called more conventional methods is lifted. However, the discourse is ambivalent, to say the least, since it unknowingly supports an argument in favour of more freedom and increased control and appropriation (for and by the architect), with

an increased domination or outright exclusion of other actors involved in the process of becoming. This is surprisingly inconsistent and not free of risks, because similar arguments can supposedly be developed to do the same to architects. To be clear, my follow-up arguments will focus exclusively on the specific case of making constructions with bricks, and will not engage in larger social or political issues, even though they are also of vital importance in relation to this specific issue.

The familiarity and apparent simplicity of bricks is deceptive. We easily overlook some implications of their properties and capacities. These result from the technical process by means of which they are produced. Architects don't manufacture bricks themselves, nor are bricks seldom fabricated following an architect's wishes or demands; an example like Peter Zumthor's Kolumba museum notwithstanding.

Architects are dependent on what is made available to them by an industrial complex, and their role basically consists in making a selection within a fairly broad range of types with their specific colour, shape, format, texture, composition, hardness, porosity, etc. Note that architects may not even be independent in making this fairly simple choice, and in that case are also dependent on others. Although the number of options is extensive, it is by its nature limited, as is the ensuing freedom of choice. Besides, in architectural applications bricks are never solitary; they are assembled (or brought together) in ordered collectives in a by necessity controlled manner. If we would not bring in some degree of order, we would not manage to make a brick wall in the first place, but only a messy pile. The order expresses a relationship that is constrained by external and internal conditions, that is, the bricks themselves, their relative position with respect to each other and the degree of bonding in between them. It is the way of combining that defines how they hold together to form a collaborating collective of bricks. Modifications in the positional order of the bricks in a stack always affects the coherence of the whole, besides affecting the visible bonding patterns in the brickwork. To hold the assemblage together in a strong, stiff, stable and durable manner, a mediation must be realised in the space between the bricks. This mediation has two main characteristics: it must first create mutual solidarity between the bricks by means of a securing physical connection, and second, it must allow for an adjustment that compensates for deviations in shapes and sizes in-between individual bricks.

Because they are the same only in appearance. When looked at from close up, a number of more or less subtle differences may appear: convex, concave and torsioned shapes (due to the combined action of heat and composition), longer and shorter, thicker

and thinner, broken pieces, missing corners, holes and cracks, etc. To a certain extent, every brick is different from all the others, and therefore an individual. The degree of difference between them defines the degree of negotiation needed and influences the importance of the interstice needed to achieve it.

Brick/module, position/order and mediation/joint are three of the traditional main issues that internally define and delimit the system termed as masonry. Modifications with regard to one of those variables automatically influences the others, and the relations that exist amongst them. All of this is known and an integral part of the long and rich tradition of masonry. But it is also in this relational realm that ambivalences in the discourse supporting digital materiality become visible.

Some distinctive characteristics of the digital robotic systems are their highly increased accuracy in placing, the extended range of positional variations, and the decrease of interstitial space available for mediation. Therefore these systems must by necessity be less forgiving for deviations in the bricks themselves. The singularity of each brick has to be reduced drastically, which means that every single brick in the assemblage must be as identical to the others as possible^{3,20}, and deviations of for instance geometry have to be avoided. The bricks have to conform more closely to an ideal, or to a (digital) model that exists in, and is needed by, the virtual world of software. To ensure this inter-brick conformity, a system for cloning or making exact

*ill.3.69:
Bricks allowed to be
different in the more
generous 'old' system*

*Photo by Jens Markus
Lindhe in Mette Jerl
Jensen, Mur Sten, p.76*



replicas must be set up. The consequence is that the freedom gained by architects, is lost in the process of becoming of the individual bricks, and in the formation of the assemblage where the bricks are togethered. Wide-ranging systems and methods to control the entire manufacturing process need to be put in place. They range from substance to material to end product, and they have to be implemented and followed scrupulously: this actually means increased control of substances, control of proportions of each component/ingredient in the mixture, humidity control, temperature control in the kiln, control of the drying, dimensional calibration, adjustment and calibration of tools and machines, and so forth. As a matter of fact, one inadvertently stumbles into a situation where dependence on an industry, on control systems of all kinds, on a 'superior' quality of bricks, on exactitude, precision, conformity etc. increases substantially, and necessarily so.

What can firmly be asserted concerning the 'old' system, is that it leaves more leeway for redundancy, for deviations, for singularity, for the use of all kinds of bricks, also the queer ones. In this respect traditional masonry -that supposedly limits the freedom of the architect- is definitely more generous. It permits more variation within the population and more participation of individuals that would otherwise be rejected. Equally important, the capacities of others involved in the process are treated with more respect and generosity, even though they may be less perfect. The same applies to those who actually perform the work of negotiation and approximation that the moving and placing of bricks has always been about, until the appearance of something 'new'. I realise that the argument developed above may seem conservative, but that is not the case and asserting this would be beside the point. I do not reject new or alternative possibilities, quite on the contrary, but I do criticise the self-serving arguments that architects can develop, unknowingly or not, to further their sometimes dubious and/or short-sighted agendas.



Ill.3.70 & 3.71:
Architecture and photos: A.J. Lode Janssens

CONSTRUCTION ENHANCED - WASHING WINDOWS

How to go beyond cleaning as a mere practical and tedious activity oriented towards removing dirt? How to transform acts of maintenance into acts of making that create more transparency; or frames for views outwards and into; or more localised and contrasting illumination; or a template for projecting new patterns of light and shadow? Or in more straightforward terms, the creation of windows defined by meetings between cleaned and dirty areas. The circular outlines on the surface of the inflated dome-home are tokens of movements executed by bodies. The superimposed inner and outer circles are slightly displaced and their edges fuzzy and slightly out of focus due to the inevitable imprecision of the movements performed by cleaning hands, slippages of the towels and the excess water flowing off the surfaces. The precision that is achievable in abstraction is not reachable here.

Beyond issues of geometry, materiality and method, a human proximity and pursuit can be sensed in how surfaces have been modified carefully and with attention. They are the result of trivial events in a little girl's and her family's life, filled with the excitement of choosing places and imagining shapes for new windows on a surface that had become opaque over time due to a real tree-filled context. Laborious tasks were transformed into pleasurable and animated occurrences that managed to change the house's architectural fabric into a slightly different one.

At set moments during the year, when the balloon in which they lived was covered with a thickening and fuzzy layer of dust and stains, akin to a flattened fog of particles, and when the surrounding trees and other stuff had become actors in a blurred shadow play, they decided to wash and clean the balloon in order to return to a more transparent version of it. They could have made it more easy on themselves by using the garden hose and forcefully spray all dirt off the balloon's plastic skin in a festival of water gushing up and running down.

Instead they decided to intervene punctually, freeing the balloon of its opaque cover in some places. In so doing they washed new windows; windows that would disappear again over time and reappear in other places after new rituals of careful making/maintenance, understanding architecture '*... as an ongoing practice rather than a nominal fact, and housework means 'to be exposed', to enter into a relationship with architecture defined by brutal intimacy*'.⁵⁵

55_ Gabrielsson 2012, p.78

PARADOX OF LANGUAGE 1

NOUNS and VERBS / OBJECTS and (INTER-)ACTIONS

The knowledge of construction-technology is entirely structured on the basis of individually designated entities, and the object-categories to which they belong. They are denoted by nouns that unknowingly emphasise and prioritise discrete and fixed properties. Due to the predominance of nouns, inter-relations and activities that need the presence of verbs, are almost inevitably pushed outside the field of view. An illustrative instance of the tension between noun and verb within nouns themselves can be found in the comparison of the terms brickwork [^{noun}] and masonry [^{mass noun}]. Brickwork highlights the material [^{noun}] as object [^{noun}], i.e. the brick [^{noun}] more explicitly than the latter, i.e. masonry, that also refers to the performance of the work by a hand-ler, i.e. a mason, and the connected actions that create the relations between the bricks. The term mason can be both noun and verb, and as a result has the capacity to denote more, i.e. the activity of making, the work done, and the outcome or result. Another example is the term 'wood'-work versus 'carpentry'.

The relation between noun and verb can be regarded as an analogue of the relation between form and process, or between digital and analogue. Richard E. Nisbett explains that a verb normally involves a relation between two things, and some kind of action that connects them in some way. In those cases, it is not sufficient to simply point at an object, to name it and define it, because the actions and inter-actions that a verb implies are also needed.⁵⁶ He adds that nouns are more easy to grasp than verbs, since they provide constancy, whereas verbs are more ambiguous. Their meaning is less fixed, because they depend on relations and contexts (of actions and events), and their meaning is therefore more likely to be altered than is the case with more static nouns. Nisbett labels nouns as 'more inert', and verbs as 'more (re-)active'

Gregory Bateson touches upon the broader implications of the issue and dissects pre-suppositions that affect communication and thinking. The part '*Language commonly stresses only one side of any interaction*', is particularly clarifying, and I use the full quote to emphasise the scope of the topic:

'We commonly speak as though a single 'thing' could 'have' some characteristic. A stone we say, is 'hard', 'small', 'heavy', 'yellow', 'dense', 'fragile', 'hot', 'moving', 'stationary', 'visible', 'edible', inedible, and so on. That is how our

56_ Nisbett 2003, pp.148-149

language is made: 'The stone is hard'... And that way of talking is good enough for the marketplace: But this way of talking is not good enough in science or epistemology. To think straight, it is advisable to expect all qualities and attributes, adjectives and so on to refer to at least two sets of interactions in time'. "The stone is hard" means a) that when poked it resisted penetration, and b) that certain continual interactions among the molecular parts of the stone in some way bond the parts together. "The stone is stationary" comments on the location of the stone relative to the location of the speaker and other possible moving things. It also comments on matters internal to the stone: its inertia, lack of internal distortion lack of friction at the surface, and so on.' Language continually asserts by the syntax of subject and predicate that "things" somehow "have" qualities and attributes. A more precise way of talking would insist that the "things" are produced, are seen as separate from other "things", and are made "real" by their internal relations and by their behaviour in relationship with other things and with the speaker'. It is necessary to be quite clear about the universal truth that whatever "things" may be in their pleromatic and thingish world, they can only enter the world of communication and meaning by their names, their qualities and their attributes (i.e. by reports of their internal and external relations and interactions)'.⁵⁷

This presents us with a paradox of language and coding. The descriptions and explanations of construction-technology are formatted on an object-basis, and not on the rationale of relations, actions and events. It is a paradox because the distance that is created within the space of writing, drawing, measuring and calculating by arresting things in symbolic and abstract forms is necessary in order to make them intelligible.⁵⁸ In other words '*A picture has to be arrested before it can be mobilised*'.⁵⁹

57_ Bateson 1979/1980, p.72

58_ McGilchrist 2010, pp.30-31: '*Experience is forever in motion, ramifying and unpredictable. In order for us to know anything at all, that thing must have enduring properties. If all things flow... one will always be taken unawares by experience, since nothing being ever repeated, nothing can ever be known. We have to find a way of fixing it as it flies, stepping back from immediacy of experience, stepping outside the flow. Hence the brain has to attend to the world in two completely different ways, and in so doing to bring two different worlds into being. In the one, we experience a net of interdependencies with which we are deeply connected. In the other we experience a 're-presented' version of it, containing static, but essentially fragmented entities, grouped into classes, on which predictions can be based. This kind of attention isolates, fixes and makes each thing explicit by bringing it under the spotlight of attention. In doing so it renders things inert, mechanical, lifeless. But it also enables us for the first time to know, and consequently to learn and to make things*'

59_ Evans 1995/2000, p.359.

Inscriptions and their deployment also impacts on cognition and learning, and has implications for the critical moments when architectural inscriptions have to become operational within the sites and processes of construction or building/fabricating/manufacturing. In the space of textbooks and the classrooms of architecture's educational institutions, a brick, is not a brick. It is not the hand-sized fired clay object, the tangible material thing one can pick up in one place -an ordered stack on a pallet for instance- with one's own hands, and then move to another place, like the wall in the making. A brick is a word that denotes the object, i.e. it is a noun that identifies the brick as an autonomous and discrete entity, and defines it as a member of the general object-category of bricks following rules of and for belonging to that category.

According to the previously mentioned chain from small to large, it is understood that with the 'brick' [noun] one makes a thing named 'wall' [noun], which is another category with its specific properties. In Deplazes' categorisation a wall is a construction-'element' [noun] that is itself a member of a category on a higher level, i.e. the building-'structure' [noun]. This in turn is a part of the building [noun]. Previously mentioned framing of architectural construction as an additive sequence running from small to large also appears to be a chain of nouns denoting discrete entities.⁶⁰ From a mechanistic point of view this logic can also be applied to a word for instance, since it is formed by putting letters together. But many aspects of the world resist being turned into a fixed and static form or image: flowing water, processes of erosion, and direct intimate relations between humans and matter/buildings that occur within actions and activities of making, maintenance, cleaning and repair, to name just a few. How do we acknowledge those, and how do we presence them, knowing that it is difficult if not impossible to arrest them without losing their specific dynamics and interactions? Some things can be fixed and others not, but that does not make them less important. Placing the emphasis of learning and knowing construction almost exclusively on more or less abstract representations and models –to avoid using the notion of theory– is not as obvious as it has come to appear. To paraphrase Bruno Latour and Albena Yaneva, *'there is an injustice in reducing matter to what can be drawn. ... to reduce materiality to objectivity'*, and by analogy to reduce construction to what can be written, measured and calculated, or in short to what can be codified.⁶¹

60_ see part 2 'What We Talk about ...', section 2.1 'Construction IS', chapter 'Construction IS Making', Construction motif C.2 Concrete / Abstract.

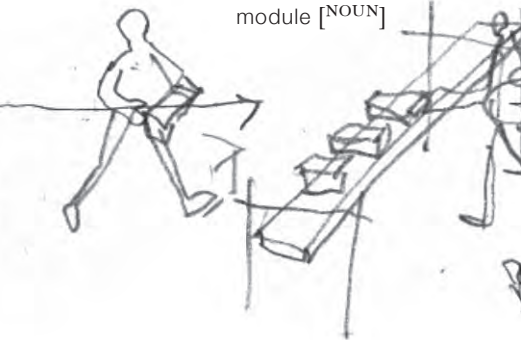
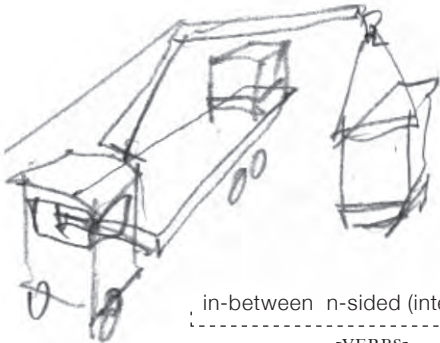
61_ Latour, Yaneva 2008, p.83

the chain from small [ADJ.] to large [ADJ.] - from noun to noun - from object category to object category

delivery [NOUN]

brick pallet [NOUN]
stack of ...

brick [NOUN]
module [NOUN]



in-between n-sided (inter-)actions
[VERBS]

in-between n-sided (inter-)actions
[VERBS]

in-between

ill.3.72:
Drawing by author

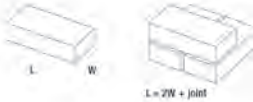
The Generic Rules for Combination

The principles of masonry bonds
using English bond as an example

This applies only to a bond consisting of man-made masonry units (i.e. clay, calcium silicate, concrete bricks, or blocks).

1. Exactly horizontal courses of masonry units are the prerequisite for a proper masonry bond.
2. Stretcher and header courses should alternate regularly on elevation.
3. There should be as many headers as possible in the core of every course.

4. There should be as many whole bricks or blocks as possible and only as many bats as necessary to produce the bond (3/4 bats at corners and ends to avoid continuous vertical joints).
5. As far as possible, the perpend in each course should continue straight through the full thickness of the masonry.
6. The perpends of two successive courses should be offset by 1/4 to 1/2 of the length of a masonry unit and should never coincide.
7. At the corners, intersections, and butt joints of masonry components the stretcher courses should always continue through uninterrupted, whereas the header courses can form a straight joint.
8. At an internal corner the perpend in successive courses must be offset.



Numerous variations can be produced according to the principles of masonry bonds, indeed as interesting derivations based on the following logic: the length of a masonry unit is equal to twice its width plus one perpend (e.g. 29 = 14 + 14 + 1).

Weight
approx. kg
9.4
6.9
4.5
3.2

Masonry
Properties of materials

Individualised Object

SwissModul® brick 250 mm			
Basic format	Make-up units	L x W x H	Weight approx. kg
		mm	
B 25/19		250 / 250 / 190	12.6
B 25/14		250 / 250 / 140	9.3
B 25/9		250 / 250 / 90	6.8
B 25/5		250 / 250 / 85	4.3

Reveal bricks (suitable for cutting) 125 mm			
Basic format	L x W x H	mm	Weight approx. kg
B 15/19 reveal brick	250 / 150 / 190		7.9
B 15/14 reveal brick	250 / 150 / 140		5.5
B 15/9 reveal brick	250 / 150 / 90		3.4
B 15/5/14 reveal brick	250 / 165 / 140		8.2
B 17.5/19 reveal brick	250 / 175 / 190		9.7
B 17.5/14 reveal brick	250 / 175 / 140		6.4
B 19.5/19 reveal brick	250 / 185 / 190		8.3
B 19.5/14 reveal brick	250 / 195 / 140		6.9
B 20/19 reveal brick	250 / 200 / 190		8.8
B 20/14 reveal brick	250 / 200 / 140		6.9
B 25/19 reveal brick	250 / 250 / 190		10.1
B 25/14 reveal brick	250 / 250 / 140		7.3

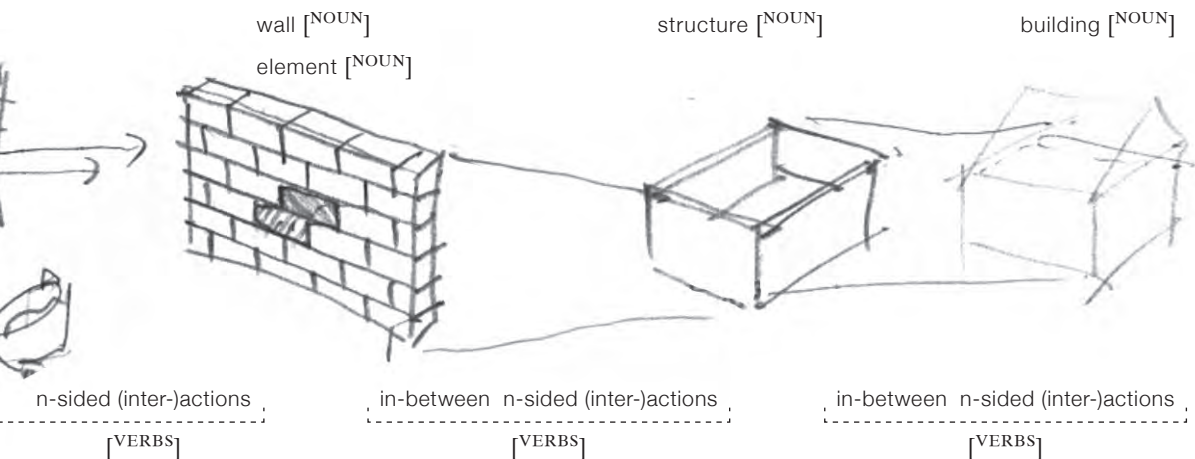
CALMO® sound insulation bricks			
Basic format	L x W x H	mm	Weight approx. kg
B 12.5/9 CALMO	250 / 125 / 90		4.8
B 12.5/14 CALMO	250 / 125 / 140		7.1
B 15/9 CALMO	250 / 150 / 90		5.5
B 15/14 CALMO	250 / 150 / 140		8.6
B 17.5/9 CALMO	250 / 175 / 90		8.4
B 17.5/14 CALMO	250 / 175 / 140		10.0
B 20/9 CALMO	250 / 200 / 90		7.4
B 20/14 CALMO	250 / 200 / 140		11.5

OPTITHERM® brick 150 mm			
Basic format	Make-up units	L x W x H	Weight approx. kg
		mm	
BL 15/19 OPTI		300 / 150 / 190	8.8
BL 15/14 OPTI		300 / 150 / 140	6.1
BL 15/9 OPTI		300 / 150 / 90	4.1
BL 15/5.5 OPTI		300 / 150 / 85	3.0

OPTITHERM® brick 225 mm			
Basic format	Make-up units	L x W x H	Weight approx. kg
		mm	
BL 22.5/19 OPTI		300 / 225 / 190	12.5
BL 22.5/14 OPTI		300 / 225 / 140	9.2
BL 22.5/9 OPTI		300 / 225 / 90	6.6
BL 22.5/5.5 OPTI		300 / 225 / 85	4.3

showing how formalised technological knowledge focuses on individualised static and de-contextualised objects, object properties and generic rules of combination using nouns, formulas and metric information.

scans by author



Masonry terminology

The Rules for Belonging



Fig. 32: Irregular or rustic bond

Definitions

Excerpted from *Wasmuths Lexikon der Baukunst*, with borrowings from the *Penguin Dictionary of Building* and *British Standard 6100*.

Clay masonry unit. A brick or block made from loam or clay and hardened by means of firing. Available in various forms and sizes. See "Clay brick" below for more information.

Clay brick, clay block. A man-made building component made from clay, loam or clayey substances – sometimes with the addition of sand, quartz fragments, dried clay dust or fired clay – dried in the air or fired in a kiln. If they are fired, we obtain the familiar clay brick commonly used in building. They are generally prismatic in shape but there are regional variations in the dimensions which have also changed over the course of time.

Hard-fired bricks. Clay bricks fired up to the point of sintering, and with a surface which is already lightly vitrified. Such bricks are used for facing masonry applications. One stretcher and one header face are fired to "facing quality".

Bed joint. A horizontal mortar joint in brickwork or blockwork. In arches and vaulting the bed joints run between the arching/vaulting courses.

Perpend. The vertical mortar joint (1 cm wide on average) between bricks or blocks in the same course of brickwork or blockwork, which shows as an upright face joint. In arches and vaulting the perpend are the joints between the masonry units of one and the same course.

Stretcher. A brick, block or stone laid lengthwise in a wall to form part of a bond.

Header. A brick or block laid across a wall to bond together its two sides.

Course. A parallel layer of bricks or blocks, usually in a horizontal row of uniform format, including any mortar laid with them. Depending on the arrangement of the masonry units we distinguish between various types of course (see Fig. 33).

Bonding dimension. In a masonry bond this is the dimension by which the masonry units in one course overlap those of the course below.

Masonry. A construction of stones, bricks or blocks.

Wall. Generally, a building component constructed using stones, bricks, blocks or other materials with or without a bonding agent. Walls in which there is no mortar in the joints, merely moss, felt, lead, or similar, are known as dry walls.

Depending on height and function, we distinguish between foundation, plinth, storey and dwarf walls. These expressions are self-explanatory, as are the distinctions between enclosing or external walls, and internal walls or partitions. If walls support the loads of joists, beams, etc., they are known as loadbearing walls. If they have to withstand lateral pressures, they are known as retaining walls.

Ill. 3.75:

Excerpt from the book
"Constructing Architecture:
Materials, Processes,
Structures" p.35
Birkhäuser (2005)

showing how formalised
technological knowledge
describes a system by
listing individual criteria
labelled by nouns

scan by author



ill.3.75:
Image from the book
"Valerio Olgiati 1996 2011
Harmonized Discordances
p.84
El Croquis 156 (2011)
showing a render of
The Lake Cauma Project
Films, Switzerland 1997

scan by author

An interesting case in point is water.⁶² It resists accurate and truthful representation, because it is dynamic and never static, even when it is a frozen solid. It is difficult to draw water without killing its dynamic nature. Coded abstract media arrest the more or less dynamic traces that it leaves behind in architecture's material fabric, and bring water to a standstill. Architectural representations of water's workings and tracings on architecture's surfaces are fairly scarce. I came across two expressive examples; one of those are the drawings of façades made by 19th century Danish architect Christian Frederik Hansen, and the second is a drawing by Valerio Olgiati's office for a project on lake Cauma in Switzerland.

But here again the drawings are static and cannot account for the dynamic nature of an environmental actor such as water (and others for that matter). In contrast, the actual material inscriptions within a tangible place generated by the interactions between water and the material world it comes into contact with: they intensify and fade, expand or evaporate, deposit, wash away, clean or carve themselves into matter. Water has no shape in itself because of its liquidity, and it has the inherent capacity to respond to the shapes it encounters. Architectural artefacts assist it in particular ways by guiding its movements; containing it; making it stagnate temporarily or letting it flow over materials at various speeds, with force or smoothly and gently; by letting it

62_ see also part 3 'Territories', section 3.II 'Encounters', chapter 'Generative Interactions and Emergence' and next chapter 'Paradox of Language 2'

fall down abruptly or allowing it to penetrate into its cavities and pores; concentrating, dispersing it; hiding or revealing it, etc. They don't do this by themselves but in partnership with an environment they are situated in, and the specific and continually mutating conditions it sets.

ill.3.75:
Drawing by
Christian Frederik Hansen
Copenhagen
for project
Christiansborg
source unknown

scan by
Thomas Bo Jensen



PARADOX OF LANGUAGE 2

MODES OF ARTICULATION / SUSPICION and GENEROSITY

'Architecture works by means of a necessarily mixed assemblage of procedures, and requires multiple tactics of explanation. The purpose of writing is not so much to explain, or to justify a particular work or working method, as it is a continual process of clarification'.⁶³

'L'auteur éclaire son propos de références puisées dans de multiples registres: littérature, art, poésie. La Science semble naître de ces interférences et non de les dominer. Elle paraît imbriquée dans un ensemble compact susceptible d'être lu à chaque fois de façon différente. Tantôt sur un mode, tantôt sur un autre, suivant la face à décrire. Parfois les termes pesés de la philosophie conviennent à la description, parfois les métaphores de la poésie s'y prêtent mieux, parfois les mots savants de la science. Parfois encore les mots ne conviennent pas. Les dessins suffisent'.⁶⁴

The perspectives held in a field of knowledge; its stories, descriptions, representations, schemes, formula, codes, etc., affirm a certain direction, involve assumptions and priorities, choices of what to emphasize and what to leave out of consideration. That '*every perspective holds its own reductions*', and that '*a point of view favours one place rather than another*' are truisms.⁶⁵ But it is nonetheless of valuable to remain aware of this and make it explicit, especially in contexts of learning. It amplifies the visibility of the conceptions held within a field of knowledge, and how they effectively incite, steer, support and sustain interpretations, attitudes and actions.

In the essay 'Towards a Critical Technical Practice', Scientist Philip E. Agre, expresses his experience with the issue in following terms: '*...[A knowledge domain's] existing language and technical practice, like any disciplinary culture, runs deeper than*

63_ Allen S. 2009, p.YY

64_ Clément 2004, p.36. '*The author clarifies his discourse with references sourced from multiple registers: literature, art, poetry. Science seems to originate from these encroachings rather than dominate them. It appears to be imbricated in a compact assemblage that is susceptible to be read each time in a different way. Sometimes in one mode and some other time following another depending on the side or aspect that needs to be described. On occasion the thoughtful terms of philosophy are suitable for the description, at other times the metaphores of poetry are more appropriate, or the wise words of science. Sporadically words are not suited. Drawings suffice*'. Translation by author

65_ Gustavsson, 2002, p.3 and Fehn/Fjeld 1983, p.32

we are aware. ... having been socialised into the field, ... I had acquired an extensive network of linguistic forms, habits of thought, established techniques, and ritualised work practices, ways of framing questions and answers, genre conventions, and so forth'. It [is] impossible to simply cast off that whole network of cultural forms ...'. '... It is difficult to become aware of the full range of assumptions underlying existing practices, from technical methods to genre conventions to metaphors'.⁶⁶

Following thought-provoking meeting between two distinct written descriptions of water is a revealing in this respect. It foregrounds a mind-boggling inversion of attitude towards it. In a context of construction-technology, prediction and control are prime concerns since architecture's built works need to be effective. It is one of the responsibilities of architects and the architectural profession to ensure that they do so and keep on doing so for a building's lifetime. Architectural technology and engineering provide the knowledge and the means for it: '*... it is a form of knowledge that enables a practice to be assured of its results*'.⁶⁷ The associated conceptual frameworks are meant to be instrumental in this context and for this reason are both necessary and legitimate. However, they can also lead to defensive and wary ways of thinking. Edward Allen's *How Buildings Work, The Natural Order of Architecture* contains a compelling example of how this symptomatic caution can be articulated with regard to an intractable actant in architecture's tangible material world:

'Elaborate and expensive precautions are taken in buildings to prevent the entry of even a drop or two of water, because water is an agent of destruction.

Water chills the skin, destroys the insulating value of clothing and building fabric, and raises the moisture content of the air in buildings to unhealthy levels. Water is the universal solvent, dissolving many materials used in building interiors and encouraging the staining and corrosion of others.

Water is a necessity for all forms of life, including bacteria, moulds, mildew, other fungi, plants and insects A leaking building is not only uncomfortable and unsanitary, but is also destined for an early death through corrosion, decay, and insect attack'.⁶⁸

When something is explicitly framed as an agent of destruction, what can then be expected of the manner in which it will be attended to? The statement is very effective

66_ Agre in Bowker et.al.1997, p.150 and p.152.

67_ Leatherbarrow 2001, p.99

68_ Allen E. 2005, p.109. For a similar tone of voice see Alberti quoted in Brand 1994, p.114

for inducing anxiety and a tendency to contain and inhibit by force and counteraction. Water is indeed a potent agent of destruction, and it is not wise to be naive when it comes to that. But reducing it to this aspect is problematic, because it a priori either reduces¹⁴⁹ or excludes a range of generative possibilities, and inhibits exploration of alternative solutions to the problems it generates. It also overemphasises distrust in the intensive processes at work in our environment. The world becomes an opponent to keep out and keep under control; that has to be dominated and appropriated.⁶⁹ Construction's meaning can use more dynamic range than what is made available in the textbooks of construction technology, and it would also be beneficial to reflect on the language and associated value systems used within this specific domain. It is a question of highlighting influences and exploring connections that go beyond convention.

The second description has been written by French poet Francis Ponge, and is situated on the other side of the range. It is taken from a poem that is appropriately entitled 'Water':

'... Water is colourless and glistening, formless and cool, passive and determined in its single vice: gravity. With exceptional means at its disposal to gratify the vice: circumvention, perforation, infiltration, erosion. ... You might almost say that water is insane, given this obsession, this fixation, the hysterical need to obey its gravity alone. ... By definition, liquid is what seeks to obey gravity rather than maintain its form, forgoes all form to obey its gravity.

... Because of this vice, which makes water rapid, headlong or stagnant, formless or savage, savagely burrowing, for instance, crafty, infiltrating, circumventing - to the point where you can do as you will with it, run water through pipes to make it gush up vertically, so as to enjoy the way it eventually comes plashing, raining down: truly a slave. ...

Water escapes me ... slips through my fingers. And that's not the worst of it! Things aren't even as neat and clean as that (as a lizard or a frog: I'm left with traces on my hands, blotches that take awhile to dry or have to be wiped off. It eludes and yet marks me, without my being able to do a whole lot about it. Ideologically it's the same thing: water eludes me, eludes all definition, yet

69_ For a gripping historic contextualisation of the sweeping reduction to which water is subjected see Ivan Illich's 'H2O and The Waters of Forgetfulness': *'Water became that stuff that circulates through indoor plumbing'* (Illich 1986, p.1). ... *the H2O which gurgles through ... plumbing is not water, but a stuff which industrial society creates'*. (ibid., p.7).

leaves its traces in my mind, on this paper - formless blots. Water's anxiety: sensitive to the slightest change of incline. Leaping downstairs two steps at a time. Playful, childishly obedient, returning the moment we call it back by tilting the slope this way'.⁷⁰

The alternative discursive mode that poetry provides, can be used as an additional layer of meaning and explanation, even though it is not part of the usual set of cognitive tools in construction-technology. But the juxtaposing of multiple descriptions can be considered both relevant and useful nonetheless, because from it information of a new logical type can emerge, as Gregory Bateson argues: *'In principle, extra 'depth' in some metaphoric sense is to be expected whenever the information for the two descriptions is differently collected or differently coded'*.⁷¹ *'In many cases, an increment of insight is provided by a second language of description without the addition of any extra so-called objective information'*.⁷²

In contrast with the first description by Edward Allen, taken from a chapter with the revealing title *'Keeping Water Out'*, Ponge's poem portrays how water interacts with the things it meets, and honours the multiplicity of ways in which this can occur. Besides the poem 'water', there is a second and very complementary one entitled 'Rain' that adds even more nuances to water's perplexing relational capacities. The creation of the manifold is relevant for architectural construction in any case, but particularly with water because of its many appearances, and the difficulty to define it precisely and adequately, let alone control it.

Water can be substantial and intangible; ephemeral and durable; solid, liquid and gaseous; hard, sharp, sweet and soft; apparently absent, fleeting and invisible; omnipresent and overwhelming; destructive and constructive. Technological language abstracts water and aims at a description of properties, the explanation of rules and methodological instructions. But this is not sufficient to adequately grasp its complexity. Poets may not solve practical problems with the poems they write, but can show that alternative ways of looking at things are available and these can be an antidote for simplification and generalisation. *'Some substances become mythical. They transcend their physical and chemical materiality and manifest themselves in our minds as symbols, as qualities. In the collective unconscious of a culture, their material*

70_ Ponge 1942/2011, pp.37-38

71_ Bateson 1979/1980, pp.80-81

72_ Bateson 1979/1980, p.84

constitution becomes secondary to their symbolic value. ... In general, a scientific account of mythical substances is bound to disappoint'.⁷³ A polysemic descriptive environment that combines modes of thinking and the specific languages used to articulate the associated views, increases the range of workable concepts, and adds complexity in the sense of relevant variety; it creates a more comprehensive cognitive context. The connection of different modes of expression and explanation creates a space that ascertains the fact that several truths and ways of seeing can effectively be used alongside each other; not to replace, but to be complementary. Philosopher Bernt Gustavsson explains that it is possible to envisage a many-sided acknowledgement of all the levels by which we try to gain knowledge and understanding about man and reality. '...What is of interest, ...is to look at the relationships between the different disciplines and the forms of knowledge with which they are connected ...the different disciplines are forced into a dialogue with each other, which in itself produces new knowledge in the form of new interpretations... A dialogue-based view of knowledge presupposes understanding that a complex phenomenon can be understood from different perspectives, and this requires an openness to different interpretations. ...when we generalise this fundamental view of knowledge, it means that a pluralistic attitude towards knowledge, with its many different perspectives, is regarded as an enrichment'.⁷⁴

73_ Ball 2001, p.xiii

74_ Gustavsson 2002,p.4

4

CONSTRUCTING WITH

CONSTRUCTING WITH LINES

ASSUMPTIONS

'If you are surveying a piece of land, or mapping the stars, you have two bodies of knowledge, neither of which can be ignored. There are your own empirical measurements on the one hand and there is Euclidean geometry on the other. If these two cannot be made to fit together, then either the data are wrong or you have argued wrongly from them or you have made a major discovery leading to a revision of the whole of geometry'.¹

What is a line? In other words, how to define this deceptively simple concept? The Oxford Dictionary lists six sub-entries with several sub-distinctions for each of them. The list in Wiktionary contains no less than thirty-four sub-entries, and according interpretations. A number of them are irrelevant for an architectural purpose, but still there are many ways to go. Following Gregory Bateson, this question can be approached from two perspectives, from a theory and from experience, or stated differently, from reflection at a distance and action in context. He affirms that these two realms also need to be connected and have to match in one way or another. It is this landscape that I explore in what follows. I do this on the basis of Bateson's two assumptions. First, the necessity to combine information extracted from the physical world with (abstract) tools that provide the means to describe and measure it, and make some kind of controlled action in it possible. Second, the assumption that Euclidean geometry has a core status that cannot be set aside.

Euclidean geometry in written form is a fascinating fusion of a mathematical theory book with a DIY-like instruction manual for making shapes and forms. The 'Elements of Geometry' starts from a set of axioms that are in essence a set of unquestionable assumptions. Things that one holds for true, without really knowing whether they are really true. It is a set of required beliefs, without which everything that follows falls apart. It is a set of descriptive statements of which the truthfulness cannot be questioned. Euclidean geometry is exceedingly effective at making geometry simple. It makes the shapes it describes straightforwardly intelligible and accessible.

1_ Bateson 1972/2000, p. xxviii



ill. 4.1 & 4.2:
Two seven year old girls
preparing the points by
which a line will be defined
afterwards by the uninvited
intervention of weather
and wind

Photos by author.



AN IMAGINARY LINE

The axioms, definitions and propositions have a simplicity that is deceptive, because it is not easy to find lines that exemplify Euclid's propositions. The compliance of the lines to the rules always needs to be imagined to a certain extent. I have been on the look-out for material instances of line that manifest the Euclidean pattern of line-construction, and this is all but simple. A line that comes close however is present but not visible in the images on the facing page.

In order to be able to read the line in the image, the story of the line's becoming must be told. The line was initiated one afternoon by two seven year old girls, engaged in a play of making soup. After some time of collecting, washing, cutting and mingling their vegetables they finally prepared two small plastic bowls filled with their soup. They had great fun and after a task well-done they left the bowls on the table outside, one next to the other. They did not clean their kitchen after cooking and the bowls remained there for several days, until the weather changed and the wind reorganised the setting. The green bowl was lifted up from the table and projected to its new destination, approximately three meters further and lower on the garden floor next to the terrace. The presence of the stain on the terrace floor betrays that the bowl, during its trajectory along an approximately linear path, must have come into contact with it forcefully. The path was drawn in the air by the interaction of the driving force of the wind and the gravitational force that guided the relation between the two bodies of planet and bowl with expired soup. For some unknown reason the orange bowl remained on the table. Apparently it was assigned the role of marking the place from where the green bowl started its movement. The result of this banal event is an imaginary line of flight, a line shaped by the movement of a point disguised as a bowl from one place in space to another.

As I understand it, this is one of the instances of line that conforms to the Euclidean definitions, since we can recognize it as 'a breadthless length'² (Euclid's *The Elements*, Book 1, def.2), and by the fact that 'its extremities are points' (*ibid.*, Book

2_ The spelling check in the computer indicates a necessity to correct this word, and proposes to substitute it for 'breathless'. A search in both the 'New Oxford American Dictionary' (digital Version 2.1.3 (80.4) 2005-2009 on Mac OSX v.10.6.8) and the 'New Cambridge English Dictionary' gives the same result. Surprising and enthralling, having to change extensive for intensive, dimension and quantity for feeling and sensation. A search in Wiktionary leads to breadthless with a 'd', the attribute of 'being without breadth'.

1, def.3). Therefore, the line of flight can be considered as an example of Euclidean geometry in action. Not just because the line is a result of a series of events, but also and not in the least, because it gives an indication of the constructive nature of Euclidean geometry. It is essential to note that the definitions describe the manner in which the thing they describe can actually be constructed. They contain instructions for performing operations in the intelligible realm of the mind and the sensible realm of experience and material situations. In *'Cosmology and Architecture in Pre-modern Islam'*, Samer Akkach writes: *'The philosophical distinction between the sensible and the intelligible that underpinned the hierarchy of the world was extended to geometry. ..., the Ikhwan defined geometry as the science that deals with "measures" and "dimensions", in their quantitative and qualitative aspects. Distinguishing two kinds of geometry, Sensible geometry was described as the science that deals with sensible measures and configurations, those that can be sensed by sight and touch, whereas intelligible geometry was seen as the science that deals with abstract, immaterial concepts, those that can only be known and understood by the intellect. ... Geometry was also conceived as being based on the imaginary movement of the point, its generative principle'*.³

INTERPRETING and ABSTRACTING

The previous should be read in conditional terms, because the imaginary line of flight is an interpretation of an abstract concept based on two photographic images of a tangible situation, which amounts to ‘finding applications for concepts’: *‘It is a process of looking about for kinds of things to which a certain form belongs. If for instance, we would interpret the abstract concept of rotation, we would think of the rolling of a wheel, the motion of a heavenly body, the spinning of a top, the whirl of a propeller ... all different contents for the abstract concept rotation’*.⁴ According to this model of thought, the line produced by a bowl moving from place/point to place/point is one possible content for the concept line, no more and no less.

The concept bearing the name line is an abstract concept for a geometrical form, and it is a form that many things in the world have in common. In Langer’s words: *‘When we consider the common form of various things, or various events, and call it by a name that does not suggest any particular thing or event, or does not commit us to any mental picture ... we are consciously, deliberately abstracting the form from all things which have it. Such an abstracted form is called a concept. From our concrete experience we form the concept of [line]’*, in this very case.⁵ She continues the argument by saying that the fact that so many things in nature exemplify the same forms, makes it possible for us to collect our enormously variegated experiences of nature under relatively few concepts. If this were not the case, we could have no science. If there were not fundamental concepts such as oscillation, gravitation, radiation, etc., exemplified in nature over and over again we could have no formulae of physics and discover no laws of nature.⁶

Admittedly, the concept line could be considered as being one of those fundamental forms, and in the Elements, Euclid describes a pattern that numerous instances of line have in common, *‘a same fundamental something’*.⁷ Since then, history has somehow agreed with him and with the propositions he did. These propositions can be regarded as a very successful attempt to capture the diversity of things –lines

4_ Langer 1967, p.37

5_ Langer 1967, ibid. p.36

6_ Langer 1967, ibid. pp.36-37

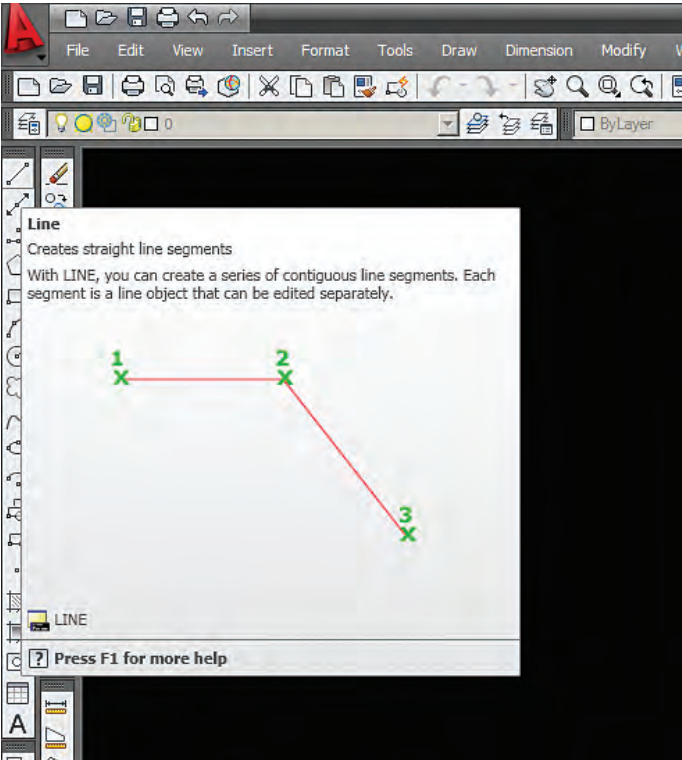
7_ Langer 1967, ibid. pp.36-37

in this case– in what Langer calls ‘*mere differences of appearance*’.⁸ The multiple manifestations of lines can then be looked upon as ‘*mere*’ material variations of the same abstract concept and its Euclidean form.

If indeed the Euclidean definitions provide a method to make interpretations of the abstract concept line, they should make it possible to perform at least two very distinct actions from and with them. The first is to recognize other instances that display analogous characteristics and a connected increased aptitude to identify those as particular instances of the concept line. The second is a competence to create new instances and new interpretations of line on the basis of the Euclidean model. From the preceding it follows that the Euclidean reference will have an influence on subsequent interpretative actions. The following examples are meant to clarify some implications of these apparently simple assertions.

ill.4.3: The line as a point to point connection

Photo by author



8_ Langer 1967, pp.36-37

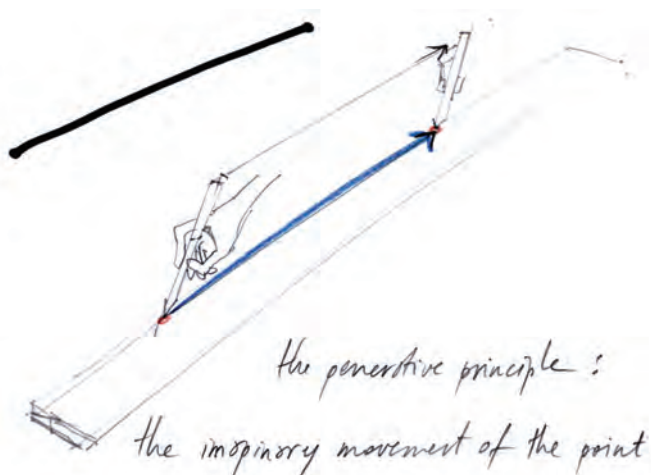
9_ Akkach 2005, p.57

A DRAWN LINE

The previous example may appear trivial, but another and more relevant one, is set by what happens in drawing. This looks like one of the most direct translations into physical action of previously mentioned '*generative principle of the imaginary movement of the point*'.⁹ The line is materialized as a trace on a surface from the moment onwards that the tip of the pencil touches the page (one point, one end), is then followed by a movement engaged by a hand in a certain direction, and is finally interrupted abruptly or slowly and steadily coming to a halt (second point, other end). The result is a thin and sharp hairline, or a calligraphic stroke, or whatever else giving articulation to the same model.

In digital drawing, the same pattern is recognisable, but in an immaterial mode, and with a higher level of abstraction. It is also superior in conformity with regard to the Euclidean description because it articulates the parsing of the action more explicitly. Every click on the mouse-button or the trackpad corresponds with a moment in which a point is positioned, and the line as a connection between them is created afterwards. The action of drawing the line on paper is more continuous, but in principle it can be digitised too, as described above. Note that in a calligraphic stroke the points at either end are both not visible and not marked. They have to be projected into the resolute start of the line and its progressive ending that slowly and gently lifts the pressure applied to the page by the brush, and ultimately makes the line narrow down and fade.

ill.4.4 & 4.5:
Photo and drawing by author



point



point



*ill.4.6: The points at
both ends of the cut are
immaterial and imaginary*

Photo by author

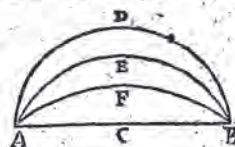
A LINEAR CUT ...

The Euclidean descriptions are of the domain of the digital, since they introduce gaps in the continuum of actions, or in other words, they map discontinuity on continuity. It is this parsing into discrete moments that generates the constructive aspect of Euclidean geometry, namely, the possibility to repeat on the basis of distinctive moments that are associated with both distinct actions and constitutive parts of the thing to be made. As a consequence it becomes possible to project the 3rd Euclidean definition, ‘*the extremities of a line are points*’, and the 4th. ‘*A straight-line is (any) one which lies evenly with points on itself*’ of Book 1 of the Elements upon a straight line created by a plunge-cut circular saw in a plywood plate.¹⁰ In doing so we associate the idea of the point with the extremities on either side of the cut, which also coincide with the edges of the plate. But the points are actually not there, physically present, and the point to point connection is an imaginary one. In this case the model is mapped on the situation. We see it like this because we want to, regardless whether it is really there or not. In this respect Euclid’s definitions are more than methodological because they also create an image of and for thought.

In his translation of Euclid’s Elements, D. Henrion, a French mathematician and contemporary of Descartes, slightly transforms the description of def.4 and makes it a little more suggestive: ‘*The straight line, is the one that is also included and extended between the points*’.¹¹ By means of Euclid’s definitions of a line, a connection can

4. La ligne droite, est celle qui est également comprise & estendue entre ses poinçts.

Les Mathématiciens ont de trois sortes de lignes, c’est à sçavoir la ligne droite, la ligne circulaire, qu’ils appellent aussi ligne courbe, & la ligne mixte: Euclide définit icy la droite, laquelle il dit estre celle là qui est également effendüe entre les poinçts: ainsi la ligne ACB est dictte ligne droite, pource que tous les poinçts entre-moyens d’icelle ligne, comme C, sont également posés entre les extremes A & B, l’un n’estant plus esleué ou abaissé que l’autre: ce qui n’aduient aux trois autres lignes ADB, AEB, AFB, car il est manifeste que les poinçts entre-moyens D, E, F sont bien plus esleuez que les extremes A & B. Quelques autres Auteurs ont diuerfement définy la



ill. 4.7:
excerpt from D. Henrion
1632, depicting Euclid’s
fourth definition of the line

10_ Fitzpatrick/Euclid 2007, p.6

11_ D. Henrion/Euclide 1632

be made between imaginary presence and physical presence, between the virtual and the actual, between creation and formation. Samer Akkach writes that this runs as a hermeneutic and heuristic thread throughout the whole 'Cosmology and Architecture in Pre-modern Islam', and that it has found a clear and explicit articulation in geometry, where imagination is assigned a central role:

'An intelligible point, too, cannot be seen on its own, but only where a line is divided by imagination into two halves; wherever a division is indicated the point is marked there. ... And know, O brother, that every straight line conceived in the imagination must have two ends which are its two extremes; they are called the two imaginary points'.¹²

... AND CIRCULAR LINES

'If you imagine that one of the two points has moved, while the other stayed still, until it returns back to the point where movement began, an imaginary circular plane will occur in your mind. The still point then becomes the centre of the circle, while the moving point marks, in your mind, by its movement the circumference of the circle'.¹³

Though not recent –around halfway in time between Euclid and us– the citation is familiar and is a quite accurate account of the method for making circles. This description is more methodological than the Euclidean definitions to which it refers, and through it a distinction between two ways of describing and prescribing constructions comes to the fore.

Euclidean definitions, of the circle for instance, set out characteristics or attributes that a form needs to possess in order to conform with, and be identified as belonging to that specific family of forms:

Book 1 def.15: 'A circle is a plane figure contained by a single line (which is called a circumference), (such that) all of the straight-lines radiating towards (the circumference) from one point amongst those lying inside the figure are equal to one another;

Book 1 def.16: 'And the point is called the centre of the circle';

Book 1 def.17: 'And a diameter of the circle is any straight-line, being drawn through the centre, and terminated in each direction by the circumference of the circle. (And) any such (straight-line) also cuts the circle in half';

Book 1 def.18: And a semi-circle is the figure contained by the diameter and the circumference cuts off by it. And the centre of the semi-circle is the same (point) as (the centre of) the circle'.¹⁴

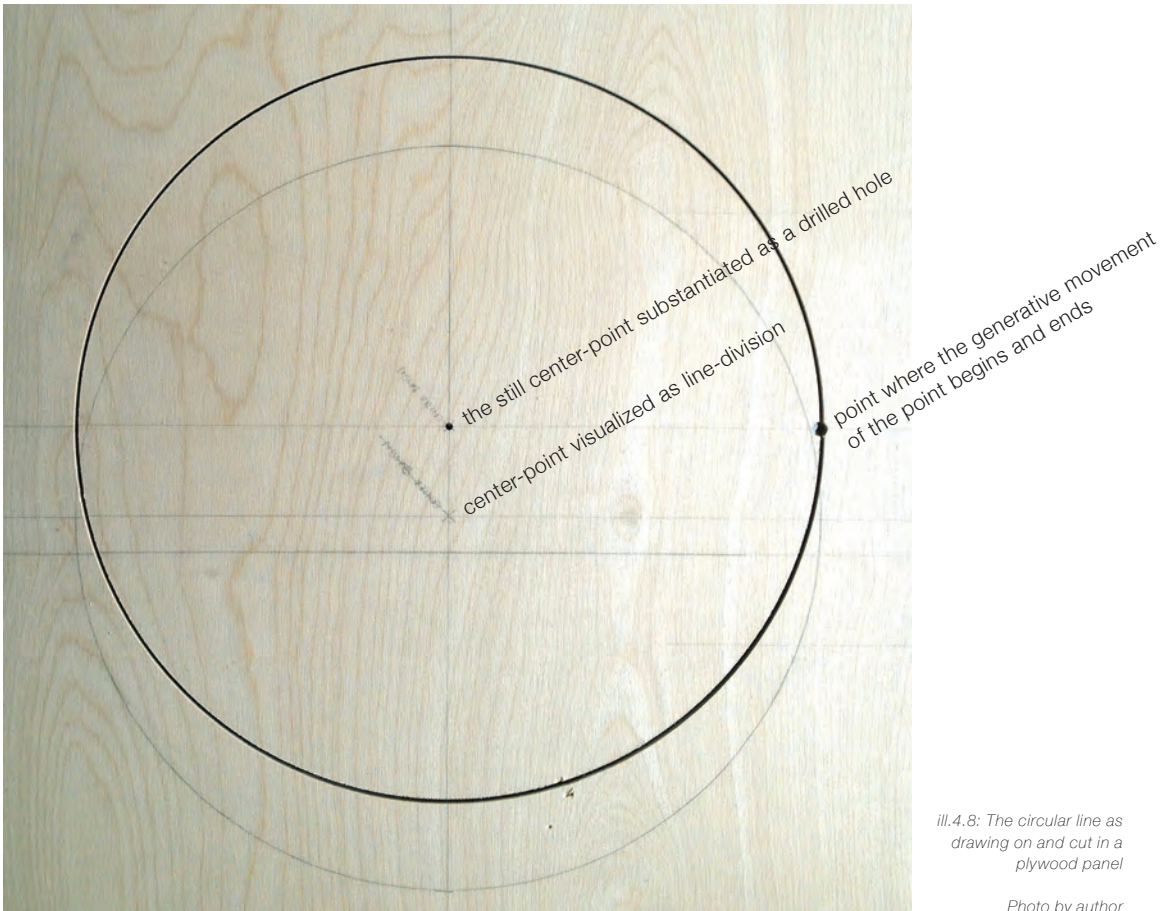
In comparison, the other description –using the metaphor of the 'generative principle of the imaginary movement of the point'– proposes a series of step-by-step procedural instructions that one can (or must) follow to execute the construction of circular lines. The procedure is abstract and generic, in the sense that it is independent from any material instance of circles, and can be used and repeated at will to create

13_ Akkach 2005, p.160

14_ Fitzpatrick/Euclid 2007, p.6

them. It can be carried out for drawing a circle with a compass on the surface of a board of birch plywood, and for extracting that circle from the same board by cutting it with a pendulum jigsaw.

During this second stage of line-construction and -extraction, one can recognize the different steps from the pre-modern Islamic instruction-set as follows: the radius-line defined by the points at its extremities, both materialized by cylindrical holes drilled in the board; the first one will act as the static centre, the other as the marker of both start and end of the dynamic circular movement. The first and smaller hole must accommodate for the insertion of the axis of the saw-guide and the second bigger one for the insertion of the saw-blade; the saw, once engaged in the circular movement will erase the drawn line by removing the material on which it was deposited. As a result of the movement a new line is created, which in fact is a non-line, a void, a



space emptied of its solid matter, and a space filled with air. The line transforms from border to boundary, interrupting the continuity of the plywood board and delineating a disconnection between the inside and outside of a circular line. The line turned from one defining the circumference, to another that defines surfaces. The line as void will only exist for a short moment, because it will disappear once the circular 'surface' inside is taken out and two circular surfaces will become visible, one substantiated as a board and one as a gap. The interruption that is articulated by the line as a void, marks an additional distinction, that is, something that was 'one' starts to exist as 'two'.

Once we engage the 'sensible' world of matter, the abstract rules and procedures devised to get a grip on geometry start to transform. The points and lines get 'substantiated' in the double sense of 'coming into existence as material substance' and of 'evidencing the existence of the form described in abstracto'. As David E. Joyce, commenting on Euclidean definitions of the circle asserts: *'A definition ... describes what circles are. Definitions do not guarantee the existence of the things they define'*.¹⁵ The question is whether the making of the thing that is being defined, validates the definitions, or not?

15_ Joyce 1996,1997

ill. 4.9:

The lines of the plan of a building redrawn and materialised on a ground's surface.

The spread out chalk exemplifies the move from an abstract realm of black precision and breathless sharpness to the actual ground where powdery whiteness roughly marks the locations for future incisions, extractions and insertions; the transgressive acts that will leave indelible scars in the earth (with and without capital E) but soon will be covered up by architectural production.

It is the extended moment that can take days, weeks, months and that Sverre Fehn identifies as one where dimensions are born (see p.254), when intangible intentions becomes something with real implications.

Photo by cookscrn99

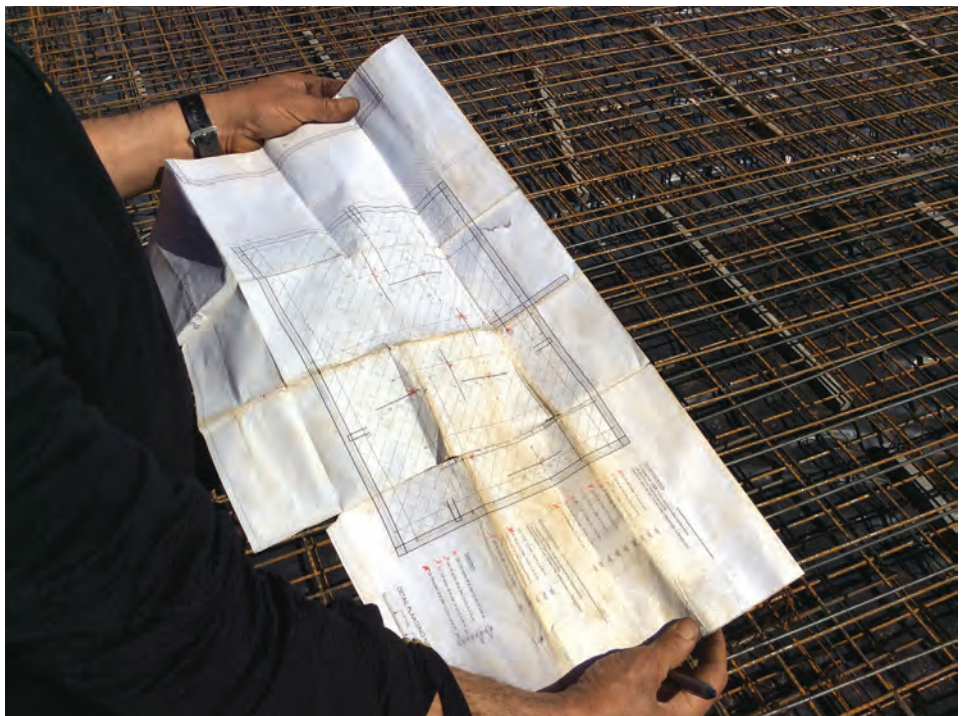
<https://www.flickr.com/photos/20267310@N04/>



LINES ON SITE - FROM PLAN TO PLACE

'Buildings are both imagined and constructed from accumulated partial representations'.¹⁶

The assertion '*architects do not make buildings, they make drawings for buildings*', emphasises that architects arrest the images of buildings to come in abstract and static notations. Architecture's arrested imagery is structured on the basis of an intended result or an arrangement to achieve. They do not describe the type of actions that need to be undertaken, nor the organisation of the activities, the places, and the temporal arrangements. The plan freezes and unifies time, and is disconnected from the conditions of places in which actions take place. Constructors need to unwrap and (re-) activate this time within the specificity of place. The division between architecture and building as two self-sufficient and autonomous categories of practice tends to veil this general problematic of the deployment or making operational of architectural images



ill.4.10:
A building practioner at
work, trying to establish
the correlations between
the lines on the page and
the lines on site

Photo by author

16_ Allen 2009, p.7

within the sites of building practice, fabrication and manufacturing. This can only be done by those who have a capacity to read and interpret the arrested diagrams, and who can subsequently transform the abstract symbolic referent into site-specific-actions and operations, and into tangible material things. This movement with its associated relational dynamics is generative, but can also induce all kinds of misunderstandings and tensions between architects and builders.¹⁷

For instance, the activity of setting out the outlines of a project's plan in a site is one of the first steps in performing the movement from plan to building. During this process the drawing on paper is transferred to the site. But this transfer is not a mere displacement but a re-drawing, and hence a (re-)activation of the drawing in another space, at another scale, and with other means: wooden sticks, nails, a hammer, rope and other stuff, instead of software or paper and ink.¹⁸ During the re-drawing the action-plan that is immanent but invisible in the reference-drawing, becomes a new drawing that is substantially different from the initial one. In the space of sentences it may look as a two-step operation, but in fact a whole set of several distinct ones need to be executed.

One of Sverre Fehn's metaphors epitomises the influential transformations that lines go through from abstract to concrete, from mind to matter, from drawing to a material and spatial construction, and when they move away from the graphic description in immaculate Euclidean space to become participants in a physical and tangible environment: *'To grow out of the earth is a privilege of nature. Man's imitation is a false spring. His construction meets the earth: the moment it touches is the birth of its dimension'*.¹⁹ During a sequence of transformations, the line is transformed from a line 'on' a surface or ground, into a line 'in' the ground, and gains depth and relief. During the process, the drawn lines in the earth become more inaccurate than the ones on paper or in the computer. Depending on the point of view, they are freed from lifeless precision or rather become utterly imperfect.

The question that needs asking is whether it is possible to understand these dynamic transformations, inherent in construction processes, without some experience

17_ see also part 2 'Construction IS', section 'What We Talk About When We Talk About Construction', chapter Construction IS Making, Construction motif C.3- Interpretation.

18_ idem

19_ Fehn/Fjeld 1983, p.40

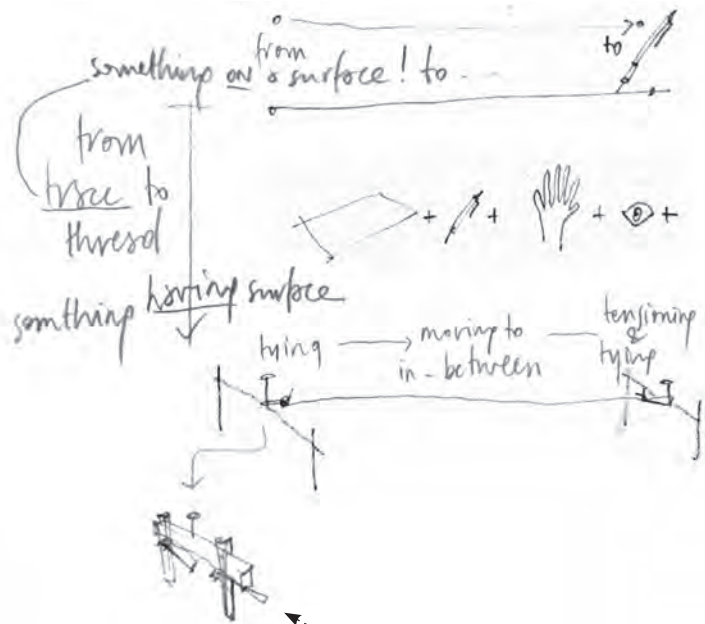
of active participation in the events that occur as the trajectory unfolds. In other terms, architects do indeed make drawings for buildings, but to understand the interactions of those with their material embodiments, it is not sufficient to make 'drawings for'. One also needs to use them in order to experience what they do and don't do in action, and to experience what is on the map that gets into the territory, to flip Bateson's phrasing upside down.²⁰ It is meaningful to conceptualise drawing in construction as a dialectical relation between notational articulations of abstract codes on one side, and a material articulation of traces and marks in an environment on the other. Both are an expression of stigmergy, the exteriorisation, storage and accumulation of information on accessible surfaces, perceivable in an actual territory.²¹

...'so what about geography? the ability and desire to make connections with new things depends on position. Recent feminism makes a strong argument for understanding knowledge as situated - that we know things differently depending on where we are. First in one place then in another, we are both stationary and in motion. I think it is easier to make connections with another when in motion, when you are out of your place'.²²

20_ Bateson 1972/2000, p.457

21_ Heylighen 2008, p.

22_ Rendell and Wells in Hill 2001, p.158



ill. 4.11:
Drawing by author



ill. 4.12:
Photo by author



ill. 4.13:
 Wrapped lines ready for
 action and waiting to
 put Euclid's constructive
 principle at work:
 traced, extended,
 attached and tensioned
 to enact a line from nail/
 point to nail/point

Photo by author

Architects make drawings;

Lines are created by the moving point of a pencil, or a cursor on a screen;

They are traced by flowing or sprayed ink, or imprinted by a laser beam;

The lines appear on a flat surface; are deposited upon it;

They emerge in an interstitial zone, in-between tool and page;

The constructor re-draws;

The line moves from plan to place; transforms from trace to thread;

From a line on a surface, to a line with a surface;

The materialised line on site is made by connecting a point to another point;

But, the formative actions needed for making an abstract line on a page or a screen,
 are not representative for the actions needed to re-trace it as a thread;

The former anticipates on the latter, but it is not an instruction for it;

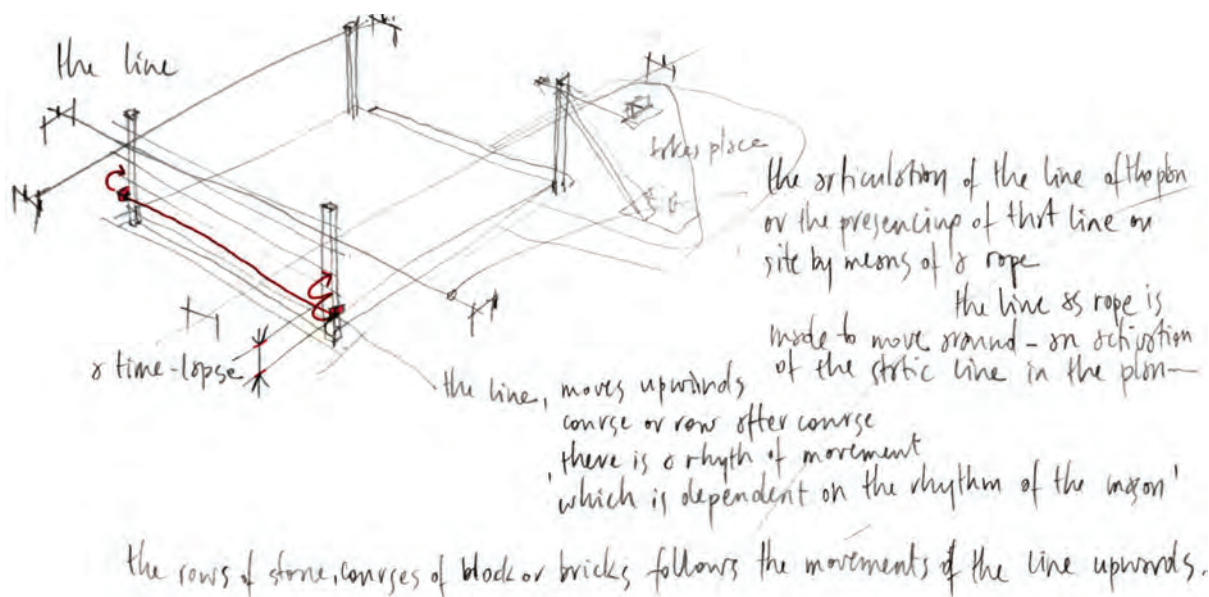
It provides no information for how to realise its actual and tangible version;

It merely presents certain properties to be produced, like position and dimension;

Making points and lines on site requires a different preparation, a building site,
 people, materials and tools like a ruler, wooden sticks, a hammer, nails, a marker or
 pencil, and yellow, white or red rope, ... all of these are necessary for making *'this'*;

Points and lines on site are made out of parts, and are constructed step by step.
 The point is the combination of a wooden support-structure, the ground holding it, and a (rusted) nail to attach the rope to;
 The maker finalises the first point by making a loop around it with the rope;
 He or she then raises the body, turns around, and walks towards the other point, at the opposite side;
 The point moves together with the hands in which it is held;
 and the thread unwinds from a revolving roll;
 The generative movement of the point coincides with the movement of a person, who by moving lays out the line from point to point;
 The rope is tautened to create the straight line that was intended all along.

The line is a dynamic entity; flexible and needing re-tensioning and re-positioning;
 It moves with the wind; bends due to its weight; or a beam inadvertently dropped upon it that stretches and re-shapes it; it can also be stumbled over, which is unlikely to happen with a drawn line on a plan;
 Threads on site are the stand-ins for the abstract lines on the drawings;
 But they appear in many guises; as free-floating in the air; as tracings with spray paint or coloured chalk; or as imaginary shadow-lines on a surface.



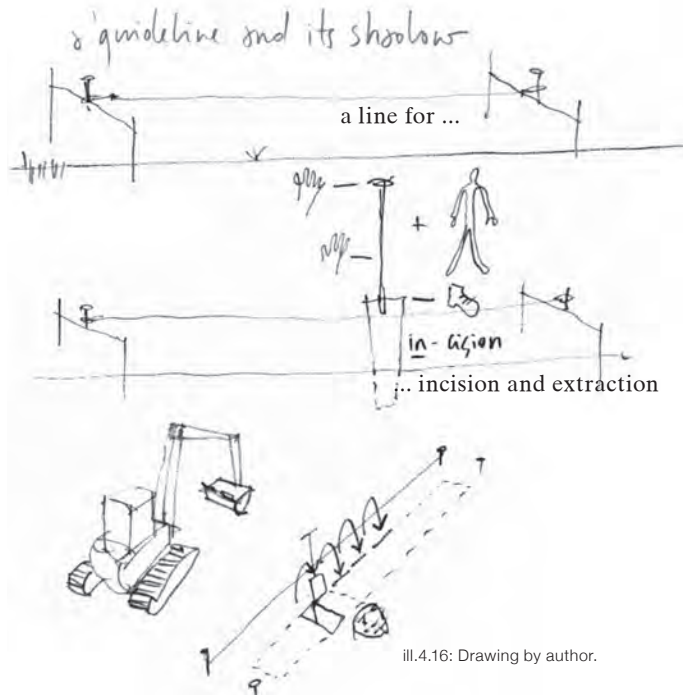
ill.4.14:
Lines moving around on site

Drawing by author

Many will appear and disappear during the many stages that the work of building goes through;
 They move around, and are re-enacted or re-drawn again and again on site, integrated in activity, or in other words, put into practice and operation;
 Threads and tracings are moving mediators;
 They guide incisions and extractions;
 Indicate edges and corners, lengths and heights;
 Mark places for meetings, separations, dis-assemblies, ...
 The lines are mediating tools between constructor and construction, between drawing and material, between project and object;



ill.4.15: Lines on site are part of an infrastructure of assistance.
 Photo by cookscrm99
<https://www.flickr.com/photos/20267310@N04/>



ill.4.16: Drawing by author.

One line is never enough;
 The work requires congregations of them;
 Together they form an infrastructure of assistance;
 Their lifetime is limited, and corresponds to the time that is necessary for performing the actions that need their presence;
 Gradually they are assisted by the construction in the making, that itself becomes a referential body and guiding infrastructure for additional actions;
 Ultimately they become redundant and discarded disposables.



the line for incision and extraction

ill.4.17:
Photo by author

The assistance provided by the dynamic networks made with threads and disguised points express the sustained attention needed to make things fit together, and in that sense they transcend the more reductive and constraining focus on control and conformity. Construction conceptualised as a process of gradual generative transformations through time, implies that the mobile and incessantly changing drawings made from threads floating through the air on the building site are integral to its unfolding processes. Moreover, these transformations through time cannot simply be inverted –like turning assembly into disassembly– because the specific kind of close attention needed when making connections between things, is not required when those same things are taken apart. At best, the unmaking of relations is executed with prudence and care in order not to damage or destroy the parts that are being separated in the process. De-constructing, dis-assembling, demolishing and the like are therefore of another conceptual and methodological type than constructing; they presuppose a substantially different kind of care, attention, involvement and consistency.



ill.4.18:
The network of lines
gradually moving upwards

Photo by author

LINES ON SITE - EXPRESSIONS OF POINT



ill.4.19 & 4.20:
How can a point be
defined when materialised
on site?

Photos by author



ill. 4.21:
Photo by author

LINES ON THE MOVE - PROGRESSIVE TRANSFORMATIONS

Dis-continuous sequences of change - a recursive converging and diverging

Tuesday, 19 April - the line defining the meeting between foundation and ground



ill.4.22:
Photo by author



ill. 4.23:
Photo by author

Thursday, 21 April - the line defining outside



ill. 4.24:
Photo by author



ill. 4.25:
Photo by author

Friday, 22 April - convergence / the line of meeting between formwork and concrete



ill. 4.26:
Photo by author



ill.4.27:
Photo by author

Friday, 22 April - convergence / meeting-line becomes meeting-surface



ill. 4.28:
Photo by author



ill. 4.29:
Photo by author

Monday, 25 April - divergence / line of separation between foundation and formwork



ill.4.30:
Photo by author



ill.4.31:
Photo by author

Monday, 25 April - divergence / line of separation becoming a line defining the building's outside



ill. 4.32:
Photo by author



ill. 4.33:
Photo by author

Monday, 25 April - line/surface defining outside



ill.4.34:
Photo by author

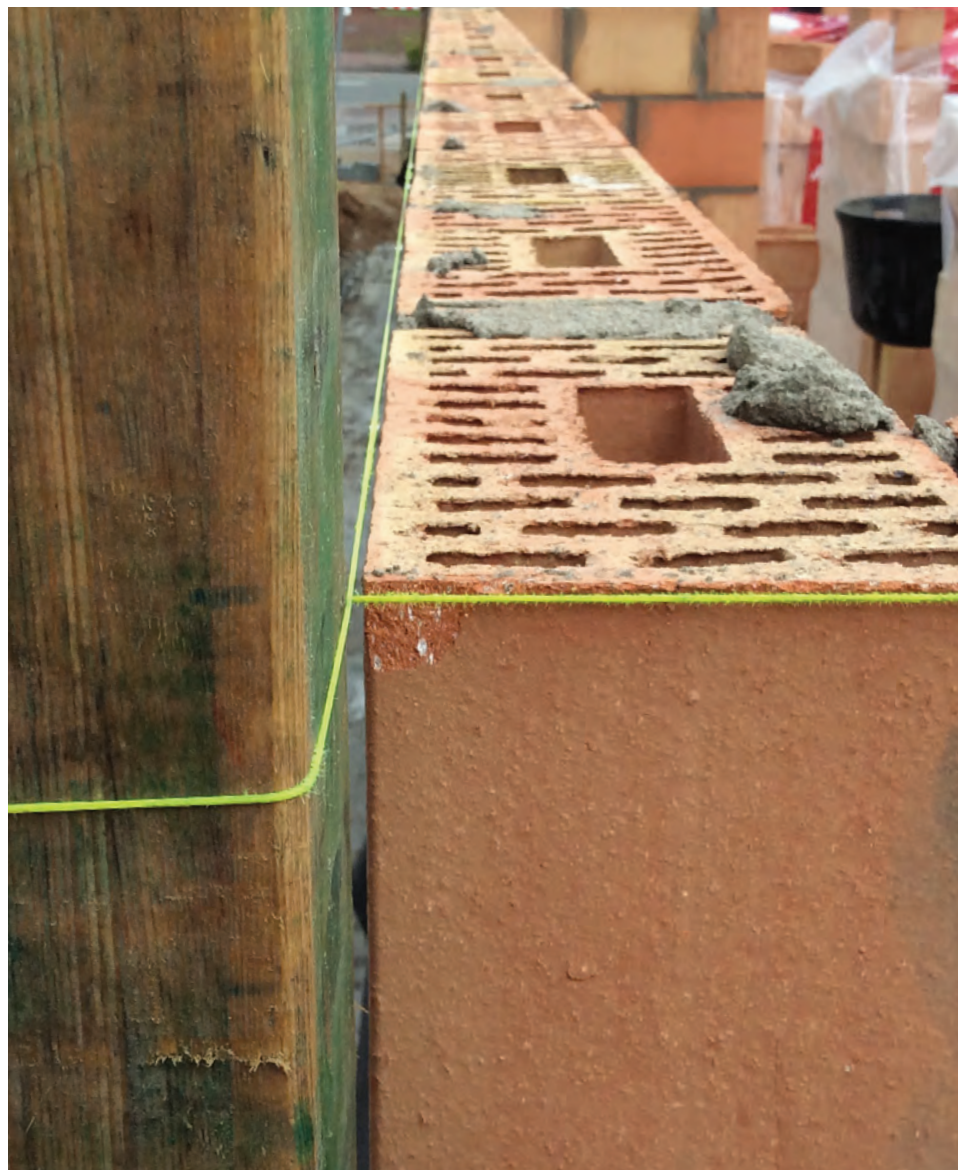


ill. 4.35:
Photo by author

Tuesday, 26 April - the line defining outside on the move



ill.4.36:
Photo by author

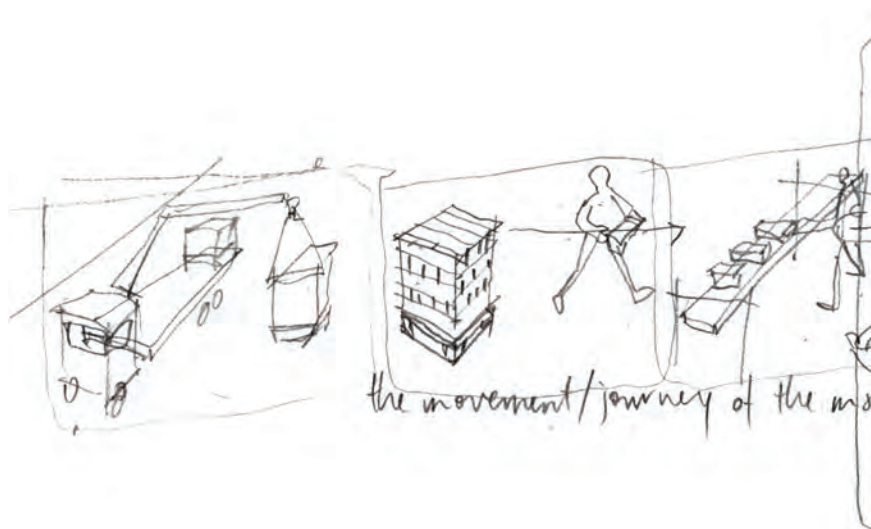


ill. 4.37:
Photo by author

Monday, 2 May - lines of guidance and the corner point disguised as intersection of lines



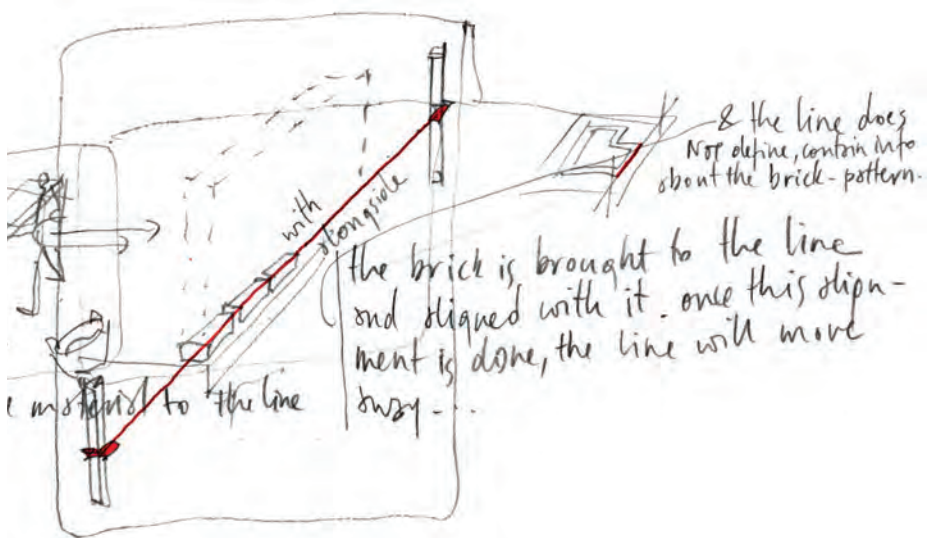
ill.4.38:
Photo by author



ill.4.39:
Drawing by author



ill.4.40:
Photo by author



The actions of wall-making following the guiding lines



ill.4.41:
Photo by author



ill. 4.42:
Photo by author



ill.4.43:
Photo by author



ill. 4.45 & 4.44:
*Light's intensity transforms
 the meeting between
 light- and shadow-
 covered surfaces from
 a blurry zone to a sharp
 contrast, ranging from an
 abrupt dark into light to a
 fuzzy gradient, from the
 perception of a line to that
 of an area*

Photos by author

CALIBRATIONS OF LINE

'According to Euclidean geometry, everything begins with the point, the principle to which the entire science of geometry, its intelligible and sensible forms, can be reduced. ... an intelligible line cannot be seen on its own, but only as it lies between two surfaces, like the borderline between sunlight and shade. If there were no sunlight and no shade you would not have seen a line [defined] by two imaginary points'.²³

As suggested earlier, Pre-modern Islamic Cosmology is an epitome of a conceptual system permeated by Euclidean geometry, and the architecture created on its basis is no less. The way in which the relation between empirical observations of a phenomenon and the abstract axiom/postulate is staged is regularly intriguing. The physical process from which a perceivable line emerges, is directly translated into an underlying principle that defines what a line is, on the basis of a presumed one-to-one correspondence. This is confusing, because from what can be observed in the meeting between sunlight and shadow, no indication or hint whatsoever of the first three axioms of Euclid's *Elements of Geometry* can be recognised, that is, the point where everything begins; a breadth-less length; and two extremities that are points. One must have a vivid imagination to jump from the identification of a line as the meeting between shadow and sunlight to the Euclidean definitions within the space of two sentences as in the quote above.

The ambivalence –or even outright non-fit– stems from the blunt mapping of a concrete instance of line on an abstract principle. It is also an indication that lines can come into being in other ways than by an intellectual point to point connection and the generative movement of the point. In this case the line is created/defined/shaped/ drawn in the contact zone between an illuminated lighter surface and adjacent area of that surface that receives less light. When the contrast between both areas increases, the meeting becomes more straightforwardly recognisable as a line. Conversely, with decreasing contrast it turns into a graded transitional area. Besides, the surfaces of sunlight and shadow and the more or less sharp line can only become visible because of the dispositional properties of the context in which the process occurs, i.e. a surface

23_ Akkach 2005, p.159



ill. 4.46:
Water at work to provide a
similar range of expression
as light does

Photo by author

that captures and reflects the light, and a neighbouring object that casts a shadow and thus prevents the light from reaching a portion of that same surface.

Mutual positions, degrees of proximity, and the intensity of light influence the breadth and sharpness of the zone between light and shadow. The line that we isolate as the object/subject of attention, is created by the interaction between different elements within an environment and is dependent on it; without there can be no line. One could therefore consider adding a conceptual tool to the toolbox, next to the '*generative principle of the imaginary movement of the point*', i.e. the '*generative principle of the (imaginary) meeting between surfaces*'.²⁴

Meeting connotes encounter between two or more things, and creates an 'in-between' that in Akkach's words '*exists only through the existence of the neighbouring domains*'. '[It] cannot be seen on its own, but only as it lies between two surfaces' and moreover, '*you would not have seen [it]*' if it were not for the two neighbouring surfaces meeting.²⁵ With some imagination, those statements taken together could be thought of as being constructive, like the Euclidean definitions, but they lead towards different readings and outcomes. The place where illuminated and dark or wet and dry surfaces meet, is not fixed and static, but dynamic instead, incessantly transforming. At a certain moment it can be sharp, and at another it becomes a fuzzy buffer zone, or

24_ Akkach 2005, p.57

25_ Akkach 2005, *ibid.* p.87 and p.159

26_ Rescher 2000, p.22

in other words, a shape-shifting line that emerges from an ongoing formative process. The interstice may be more difficult to draw or pin down and fix exactly than the Euclidean lines that are sharp as a knife, measurable, quantifiable, calculable and above all precise, controllable and definitely more practical. It is apparently framed as a dichotomy, a clean incision versus an irregular fracture, or mathematical precision versus misty ambiguity. But appearances can be deceiving, because if both are constructive, together they expand the addressable register: not just stating a difference, but also being a site for gradients and transition; a site of increase and decrease in magnitude; for fading light and darkness growing in intensity simultaneously; an area of merger, interweaving, fusion, and dissolution; a place where both sharpness and blur can occur, both having a dimension and being breadthless. A difference is that Euclidean geometry is more straightforwardly enabling, because it provides tools to make things by means of descriptions that can be translated into instructions. It offers clarity and precision, predictability, which makes it more attractive in a realm where control is predominant.

The incision in a plywood panel becomes a line of separation/division that subsequently transforms into one of assembly, that is, a new encounter. This too is a process, since consisting in '*a series of connected developments unfolding in programmatic coordination*',²⁶ It leads to a change in the degree of proximity between neighbouring domains, and alterations to the dimension and precision of a line. By analogy, other instances of 'meeting-dividing' or 'converging-diverging' become discernible, for instance, line as void or joint, empty or filled; line as overlap; line as

the 'line' of separation or divergence

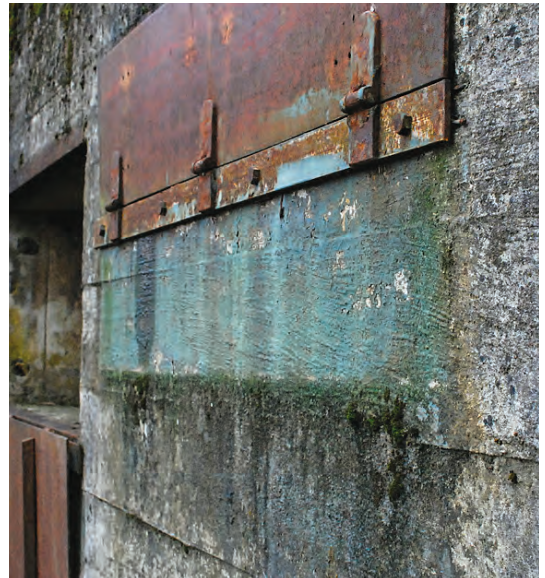


... becomes ... the 'line' of meeting or convergence



ill. 4.47 & 4.48:
Photos by author

overlay; line as insertion and incision; line as fold, valley or ridge; line as crack, etc. They manifest alternative possibilities for making connections, and add multiplicity and relevant variety, or as Umberto Eco puts it: *'the ability to situate aesthetic pleasure less in the ultimate recognition of a form than in the grasping of a continually open process that enables us to see continuously new profiles and possibilities within a form'*.²⁷



ill. 4.49 & 4.50:
Lines defined by meetings

Photos by Calum Duncan
accessed on
<https://www.flickr.com/photos/calduncan/>



III.4.51 & 4.52:
Lines defined by meetings

Photos by author



ill. 4.52:
Photo by Eija, accessed on
<https://www.flickr.com/photos/eijakristiina/>

LINES FOR ISLANDS - DRAWING WITH WATER

The encounter between a solid surface and water in its liquid form is one between something that defies gravity and something that surrenders itself to it. Water responds to the surfaces and shapes itself according to what it encounters. Alternating higher and lower areas, in combination with solid and liquid, is a mechanism that recursively produces islands. The relation applies from small to large, from roof to tile and to public square; the outcomes have a family resemblance, but are not the same. The tiniest depressions in the surfaces collect and retain the water. Relief is marked in various tonalities, and the time it takes for water to evaporate, gives an indication of depth, and the amounts of water contained. The outline created at the meeting between wet and dry shows the variations in surface geometry, texture, height differences. The pools of liquid evaporate, but the repetitive cycles of getting wet and drying again, create more and more visible tracings, and something ephemeral transforms in something more permanent.

ill.4.53:

Photo by Yosigo, accessed on
<https://www.flickr.com/photos/yosigo/>



CONSTRUCTING THINGS FOR CONSTRUCTING OTHER THINGS



*Ill. 4.54:
One of the site-specific
constructions made
during the EIP workshop
'Structures in Building
Culture' in Spain. It is at
the centre of attention
during the final review.
The process of making
this space-frame had to
go through a sequence
of gradual improvements
in order to achieve an
architectural structure with
the necessary capacities
for spanning 7m*

Photo: Andr s Flajszer

TOOLS, TECHNIQUES AND APPARATUS

The purpose of this section is to highlight the role that can be played by the apparatus, that is, *‘the means whereby a specific production is made existent or a task accomplished’*.¹ The etymology of the term indicates that it embodies both an orientation towards an end, and a preparation or a making ready for the production of that end. More precisely and applied to the context of this work, the notion of apparatus refers to ‘a construction of means’, or in other words, the setting-up of a complex of resources. These are the things collectively necessary for the performance of some activity and the equipment used in doing it. No less important, it also implies the activation and directing of those resources. The title of this text, ‘Constructing Things for Constructing other Things’ explicitly refers to the diligent elaboration and making operative of the means needed for reaching certain ends.

The apparatus supports –and therefore participates in– a process of becoming. It is an infrastructure of assistance that needs to facilitate the gestures, procedures and operational sequences that make up and determine that process, and to achieve this aim it must have the capacity to support, enhance, guide, power, etc. To create an effective apparatus it is necessary to determine what the process needs and where contributions can be made to it. In other words, one has to figure out what the apparatus must have the capacity to do, and what must be provided, created, organised and so forth in order to make that possible. It determines the thing that is made with it, but conversely, it is itself determined by the very thing that is made by its means. In short, there is a reciprocity between means and ends.² The account that follows is supported by examples from the Erasmus Intensive Program (EIP) *‘Tectonics/Structures in Building Culture’*, and it describes a number of instances where tools and by extension apparatus play a substantial role in the activities of learning architecture and construction by making it at scale one:one.³

1_ Wiktionary, accessed on 14dec2015

2_ see also part 2 Construction IS, section ‘What We Talk About When ...’, chapter ‘Construction Is Objects, Relations and Mediation’.

3_ see also part 3 - Territories, section ‘Encounters’, chapter ‘Things We Do Not See.’



ill.4.55:

One of the site-specific works made during the EIP workshop 'Structures in Building Culture' in Spain, consisting in a dome made from interconnected circles in steel re-bars

Photo by EIP workshop participant

ill.4.56 & 57:

The desire to build a construction based on the repetition of identical circular parts leading to a need for control of geometrical similarity between the parts and the related requirement to be precise in their fabrication. The adjacent image shows the made to measure tool that was developed for realising the aim of a serial production of approximate identicals.

The images on the following pages (p.268 to p.273; ill.4.56 to 4.71) depict the sequence of operations that must be performed to make one circle and clarify how the mediating device assists the circle-maker

ill.4.56: photo by EIP workshop participant



ill.4.57:

Photo by author



MEANS AND ENDS

An apparatus and its assortment of tools and techniques are commonly seen as means to an end. They almost invariably refer to what assist and mediate the formative actions that produce a technical object, but not to the thing that is produced with or through it. In this sense they are considered instrumental for bringing about an intended result. They must serve the end through their capacities to help achieve it, which is another way to say that they must be useful, practical, effective, convenient and so forth. This instrumental potential for achieving a goal supposedly is their most relevant asset. The statement that *'tools shape materials that make forms, not the other way around'* is an example of this point of view.⁴ Besides being uni-directional, this way of seeing reduces tools and apparatus to their productive use, and tends to limit our role as makers to one of end-users. Framing tools as something ready-to-hand and ready to be deployed for performing actions of fabrication, presupposes that the tool already exists and not that it still has to be developed. It implicitly fosters dependence on what is made available, rather than empowering to make ones own tools and take on a more active role as tool-makers.

Tools affect what we do and what we are capable of doing, and according to Richard Sennet in *'The Craftsman'*, *'using new tools and old tools in novel ways enables us to gain a new understanding of the natural world'*.⁵ What can be deduced is that creating new tools and modifying existing tools amounts to shaping possibilities. Existing tools embody this explorative development that brought new actions within reach and before invisible things within view. Positioning ourselves inside these processes of tool-creation holds a promise of going beyond a view of means as something by which something is done, towards one of means as the manner in which something can be done. In other words, it implies a move from the question 'what' tools to use for a job, towards a question of 'how' to devise the adequate set-up, including tools and techniques, for achieving certain ends. To do so we have to make a case for their transformational potential, and for making that potential intelligible.

On regular occasions during the workshops mentioned above, situations emerged in which certain necessary tools were lacking, either because they were not provided, or because the particular made-to-measure instrument that was needed for

4_ Barkow Leibinger 2009, p.1

5_ Sennet 2008, p.195

the job did not exist yet. The absence of certain tools in combination with the specific needs for improvement arising from the situations in which activities of making are embedded, can be used as an incentive to design and fabricate them.

The primary and incredibly versatile tools at our disposal are first and foremost our body and hands. It is through and with them that sensory experience and functional skills join forces. However, they are constrained by human physical possibilities, as for instance our capacities to experience and cope with strain and pain, or the intensity of forces we can take on, or degrees of precision, fatigue, etc. Our bodily tools may place important limits on, or be inadequate for what needs to be done. But the body is only one of the sites of resistance that induce a need for more than what is available. It is not merely our bodies as such that impose limits on possibilities, it is rather the convergence of hands/body with (construction-)material, designed ends, environment, workplace and co-workers to name a few, that together set the limits and create a need for additional means. When the material changes –which happened by default every edition of the workshops– or the rules of engagement, or when desired results are revised, or combinations of these and other parameters, the necessity for tool-use and tool-making may change. Sometimes subtly, but at other times substantially.

Roughly speaking, one can distinguish two categories of tool-mediated practices across the workshops. A first one was fairly low-tech and hands-on; based on a fairly direct exchange between hand/body and the material. This applies to the wicker-workshop in Poland (flexibility, pre-tension and tools for cutting), the brick-workshop in Holland (stacking with the hands and geometrical pattern combinatorics) and the stone-workshop in Ireland (stacking, body-power and selection combinatorics). In those workshops, no additional tools were used nor needed, except the logistical tools for delivering material to the place of work of course, and the tools needed to run the prior production processes of the materials, or the processes for cultivating and harvesting the wicker. In order to concentrate on the construction processes within the workshops themselves, the latter will be kept out. For the other workshops, with concrete in Denmark, wooden panels in Belgium, massive wood in Liechtenstein and steel re-bars in Spain, the picture is different. For instance, working with steel reinforcement bars having a diameter of 6mm and a length of 6m may not seem that challenging when seen from the distance of this page, but it actually is. For this reason the creation of an infrastructure of assistance was necessary and turned out to be an interesting generative process in itself.

RECIPROCAL DETERMINATIONS

Tools are equipment for action, and their use is inherently situated '*within some worldly situation*'.⁶ Their coming into existence is determined by the actual circumstances in which the problems they are supposed to tackle, or the situations they are expected to mend, arise. In other words, from within the event-spaces of making in process. As such, a tool determines the thing that is made with it, but conversely its own characteristics are determined by the thing in the making, for the reason that it must provide capacities to help making that very thing. The creation of tools must anticipate on what the tool must do, or has to afford or make possible within a given situation. The practice of making tools is future-oriented because an existing situation deemed problematic needs modification, improvement or resolution. In so doing it must raise the quality of the outcome, the procedures, the actions and/or the conditions within which the work is performed. It can also be seen as a design issue, since: '*the aim of designers is to modify human-environment interactions and to transform them into preferred ones. Their stance is prescriptive and diagnostic. ... they do not only look at what is going on in the world (descriptive stance), they look for what is going wrong in the world (diagnostic stance) in order, hopefully, to improve the situation*'.⁷

The made-to-measure tools developed during the workshops had to fit within an ongoing work process and become integral to it. When one engages steel rods with the hands and the body as principal tools, the toughness to handle them properly can be experienced straight away. Though being flexible and pliable, the steel is stiff and hard as well. The physical effort one has to exert, hence the amount of energy one has to put into it for transforming its straight pre-given shape into curved or circular ones can be considerable. Bending the steel bars in a controlled way to achieve dimensional and geometric consistency, required the development of instruments for assisting the manipulations and guide a regulated sequence of actions. This is especially the case when a range of similars must be made.

The need to produce approximately fifty matching steel rings of about 450mm in diameter gave way to expectations and subsequent demands with respect to shaping circular form, and the regularity in their production. At first the rings were shaped

6_ Crawford 2009, p.164

7_ Findeli 2010, p.293



ill. 4.58 to 4.62:
Photos by author
student at work
Bregt Hoppenbrouwers



by hand, but the desired geometric correspondence between the rings proved to be extremely difficult to achieve, if not impossible. A fit-for-purpose jig was developed to ensure the required consistency in geometry and dimensions. The tool had to incorporate a set of other specifications as well, namely assisting the hands and the body with arresting, retaining, bending, giving form, giving dimension, and with realising the connection between the two ends of the steel rod, hence the notch on the side facing the hands, freeing space for tying both ends together.

The tool needed a capacity to accommodate the execution of a sequence of operations, and the capacity to withstand and counteract the forces applied simultaneously by body and steel. These qualities have to be designed for, and constructed into it. Without some experience of what it takes to carry out the job without the assistance of the tool, and without a sense of the intensities of stress and strain experienced while bending the steel freehand, it would have been difficult to understand the requirements for the design of the fit for purpose tool. The same applies

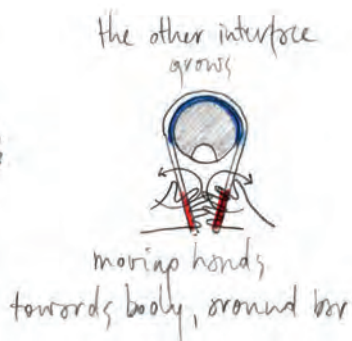
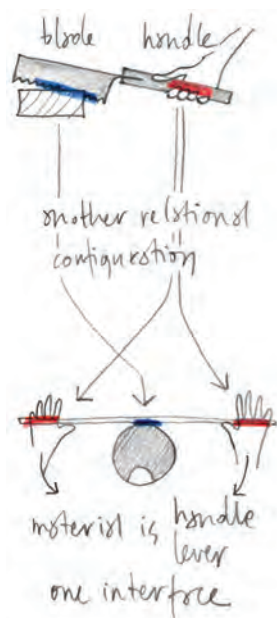


to the repetitive mistakes and the experiences failure that the tool externalises by lifting or attenuating them. The use of tools happens within event-spaces, and the same applies

ill.4.63:

The process of making a steel circle is constituted of a sequence of tool-mediated actions (see section 2, chapter Construction IS: Objects, Relations and Mediation pp.65 to 71). The tool mediates in the relationship between the steel bar that has to be shaped and the circle-maker. Remarkable and compelling in this case, is that the steel re-bar itself participates in its own shaping as an additional tool that mediates in-between the maker and the actual tool, being the circular jig

Drawings by author.



to making them. The tool is not merely an object out there, but something that needs to take a mediating position within activities of formation. Tool-design is therefore not reducible to the tool-object. It also needs to take the events into consideration within which it is put into practice, as well as the intricate dialectical relations unfolding between material, tool and body. The tool is a material articulation of the responses given to difficulties encountered during the process of making, and need a dedicated attention of their own: *'technical processes and procedures, are visibly evident in the form of the tool itself'*. They are inscribed in its fabric and structure. And as such, tools can definitely be seen as a *'means of capturing and passing on our acquired knowledge'*, and as a form of *'exteriorisation of memory'*.⁸

The tool takes a position in-between, and in this case of making circles literally at the centre, with material and body surrounding it.⁹ The mediating presence of the tool changes the handling of the steel bar by hands and body in a subtle but significant way. Without it, the body can stay put, but when the tool is present in-between, the body

ill.4.64 to 4.67:
(on both pages)
Photos by author

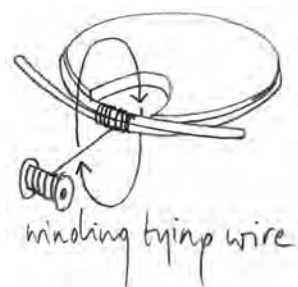


8_ Hale 2014, p.200

9_ See part 2 'Construction IS', section 'What We ..', chapter 'Construction IS: Objects, Relations and Mediation'.

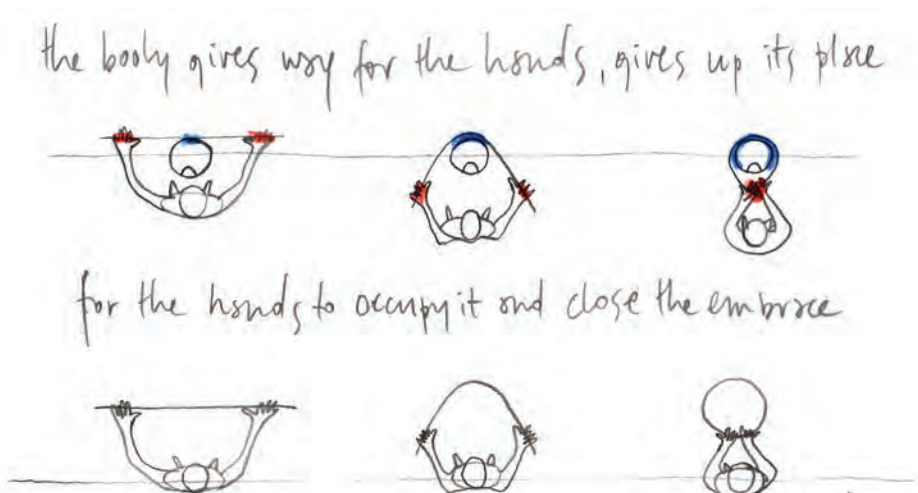
ill.4.68 & 4.69:
Photos by author





ill.4.70 to 4.73:
Photos and Drawing by author

has to make place for the hands that are performing a circular movement, surrounding the tool, whilst holding and in-forming the steel bar in coordination with the tool. It is imperative that the entire body moves, whereas in the other un-tooled case it is not really necessary for it to do so, because the steel bar can move instead. It demonstrates how a tool influences the way in which a body occupies the space around it, during the sequence of formative moves. Those movements had to be repeated over and over to make ring after ring, and eventually they defined a rhythm of fabrication.



ill.4.74:
A comparison of both situations,
mediated versus immediate

Drawing by author



ill.4.75:
In this case the shaping
of the bar is not a tool-
mediated action. Another
way of describing it is that
the body of the maker,
more in particular foot
and leg, is used as a tool.
The action is therefore
unmediated and the
relationship immediate

Photo by EIP workshop
participant

MATERIAL RESISTANCE - CONTROLLING APPROXIMATIONS

'All workmanship is approximation. There are in the world of manufacture, and not only in that of metaphysics, certain ideas of which the things we make are necessarily imperfect copies. Nothing has ever been square because nothing has ever been straight, nor has anything been flat, nor spherical, cylindrical, cubical. ... I do not think there can be much doubt how we have arrived at the idea of an absolutely flat surface when nothing flat exists. Whenever we make something flat and find it is not flat enough, we always find that by taking more trouble we can make it still flatter and so we find it easy to imagine we are approximating to a perfect flatness which it is just beyond our powers or patience to reach. Unless we accept Plato's explanation and postulate a primordial inborn memory of ideal forms, our whole notion of geometrical perfection must have been built up by this sort of extrapolation'.¹⁰

Making parts, repeatedly or not, does not amount to making the whole thing. Parts have to be brought together and connected to form a comprehensive assemblage. Euclidean geometry is effective for making lines on the basis of abstract variables that can be translated into instructions for a step by step line-construction. But activating an abstract pattern in a tangible making procedure, as described in some examples of the previous section 'Constructing with Lines', is not straightforward by definition. Abstract rules and instructions do not consider matter's materiality, nor the complexity of agencies and context, whereas *'you have to include the context in order to understand the objects, in order to make the objects'*.¹¹

The lines in Euclid's Elements of Geometry are lines without matter. All the geometries it describes, are idealised and purified abstract forms, dissociated from the matter with which they can be materialised.¹² They seem to be of the kind of abstraction that can be labelled '*purifying*' and '*reductive, negative or unifying*', where abstraction means '*stripping away of all image, figure, story, "content" ... abstraction as illusionist space from which all illusion has been removed, pure form without content*', and functioning '*through self-referential code*'.¹³ But making artefacts requires

10_ Pye 1971/1995, pp.30-31

11_ Lerup 2013

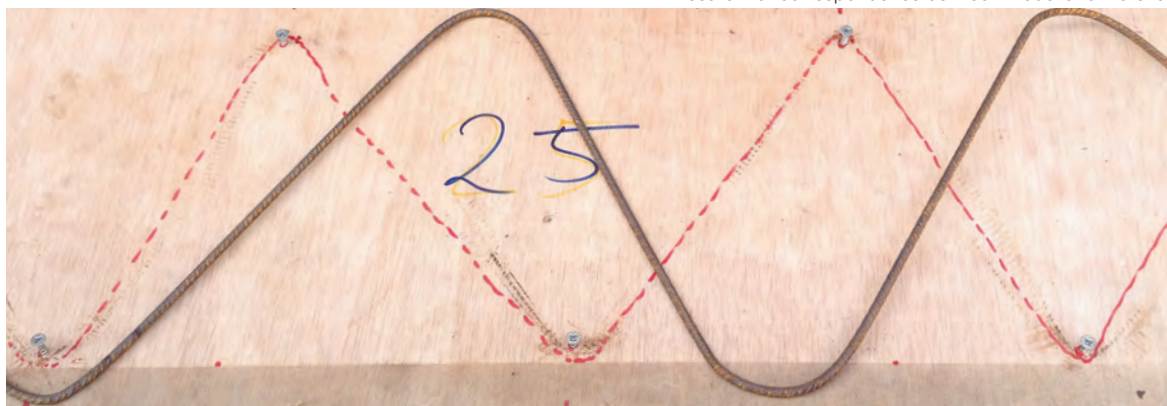
12_ See also previous section 4.I 'Constructing With Lines'

13_ Rajchman 1998, p.7, p.57 and p.8. See also Part 5, Section 5.II 'Process-Form Interactions'

a negotiation with matter, and taking care of what that matter creates as a space of possibilities and constraints. Making the linear components of a space-frame with a span of 7m out of the previously mentioned steel reinforcement bars –section 6mm and length 6m– demonstrates the extent of how the abstract models can be resisted by matter (see ill.4.54 on p.292).¹⁴ Besides shaping the linear parts, the making of the space-frame itself required an extension of the conceptual range from tool as an individual instrument, towards the notion of a spatial construction of means or the set-up of a complex of resources, i.e. an apparatus.

Although normally not part of the workshop-procedures, the students made a preliminary scale model with wire that depicted the wished-for configuration of lines. The existence of a mock-up always proves to be a tricky issue, because it introduces a tension between two conflicting ways of seeing, i.e. the model ‘for’ versus the model ‘of’. In other words, it introduces a tension between means and ends. This tension remained throughout the entire process of making. The ‘model of’ is a representation, an image to be re-produced in another mode, whereas the ‘model for’ is a relational pattern that specifies an arrangement. *‘The first way of seeing emphasises the apparent in a form, the second way emphasises the form in the appearance’.*¹⁵ Modifying the

in search for correspondence between model and material



ill. 4.76:

The first version of a tool made to gain some control over the shaping of the linear components of the structure. Several were needed, and they had to correspond geometrically in order to be combined

Photo by EIP workshop participant.

14_ This construction is one of a set of five made by students during the Erasmus Intensive Program, ‘Structures in Building Culture’ in Barcelona, Spain, August 2013, see also part 2 _ Territories, section Encounters, chapter ‘Things We Do Not See’.

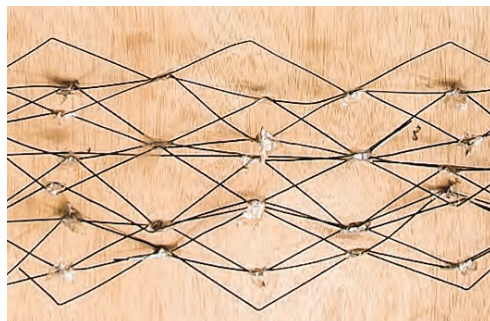
15_ Flusser 1999, p.26

16_ Pye 1978/2007, p.17. I only consider internal relations within the space-frame. The term ‘context’ is therefore limited to the parts contained within the construction system, and does not refer to the environment in which the object is situated.

shape of the steel bars from rectilinear at the start to curved as a goal, is one of the first issues that come up: sequences of pulling and pushing, bending and straightening, adjusting and readjusting, are some of the formative moves that have to be performed on and on, to shape and re-shape. It amounts to a series of attempts to achieve the conformity of the curved steel line to a pre-set model. Drawing the line is relatively easy and straightforward, even in a freehand mode, but making the steel line fit the drawn one is quite another matter. To make it more easy, one could have dropped the demand for conformity and the requirement for increased accuracy that accompanies it, but since the aim was to make a space-frame in which lines are joined together with other similar ones into a fabric of lines, that option was not feasible.

The required combination that is inherent in all constructions, modifies the setting because it creates a web of constraints. Every single line that composes the structure is not autonomous, but situated within a context of others. They are components of a system, and as such a relational reciprocity originating from arranging them together is inescapable. The lines cannot be seen on their own, but only in a relationship with others: *'Things are always together, they do not exist separately and they cannot act separately. ... Everything everywhere may be regarded as a component of a system. It is fruitless to consider the action of a thing without considering the system of which it is a component'*.¹⁶ The fairly simple given that a line has to meet one or

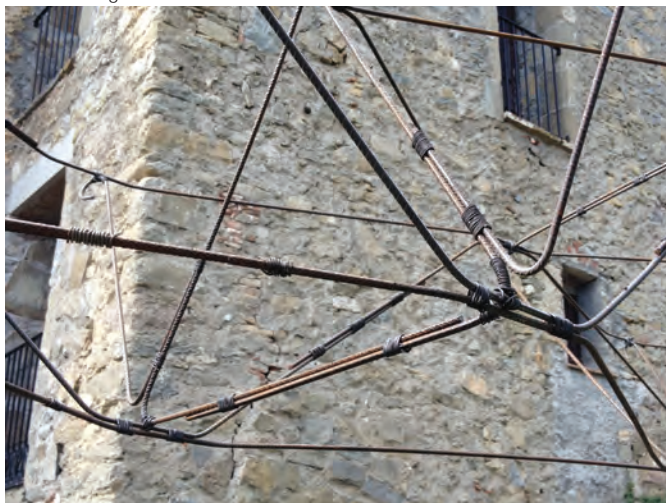
model 'of' or model 'for'?



ill.4.77:
A scale model made with thin steel wire. Compared to the steel re-bar, the wire can be bended easily, but achieving geometric repetition appears challenging nonetheless

Photo by EIP workshop participant

lines meeting - the materialised articulation of relations



ill.4.78:
A close-up of the place where the relationship between component parts must be realised in order to make them cohere and collaborate

Photo by author



ill.4.79 to 4.81:
The unregulated prototype
(left) and the laborious, very
uncomfortable way of working
on site (right) convincingly
demonstrating that substantial
optimisation was needed
regarding multiple aspects of
the construction process

Photos by author

ill.4.78: Photo by author.

several other lines in defined places, gives rise to a chain of related implications that impact on how to shape them: requirements to make the lines fit each other in specified ways; the devising of methods to ensure meeting this demand; an increased need for accuracy, and the ensuing higher degree of control over conformity of the shape to a model, and so forth. All of these requirements emerge from the context of bringing lines together in an orderly spatial and material assemblage.

This knowledge was not pre-given, but emerged as a result of making a first piece that in turn became an unintended prototype. It demonstrated that a much higher degree of control and accuracy was needed for both the fabrication of the parts, and the assembly of the whole. A thorough revision of the method for making became imperative to achieve a satisfactory result. All kinds of unanticipated problems arose that moreover are unimaginable when one is not implicated in the practice of construction, or in other words, *‘when the conception of work is removed from the scene of its execution’*. The *‘unambiguous experience of being wrong’* effectively demonstrated the unpredictability that is part and parcel of making things, and the risks of failure



conditions of work needing improvement





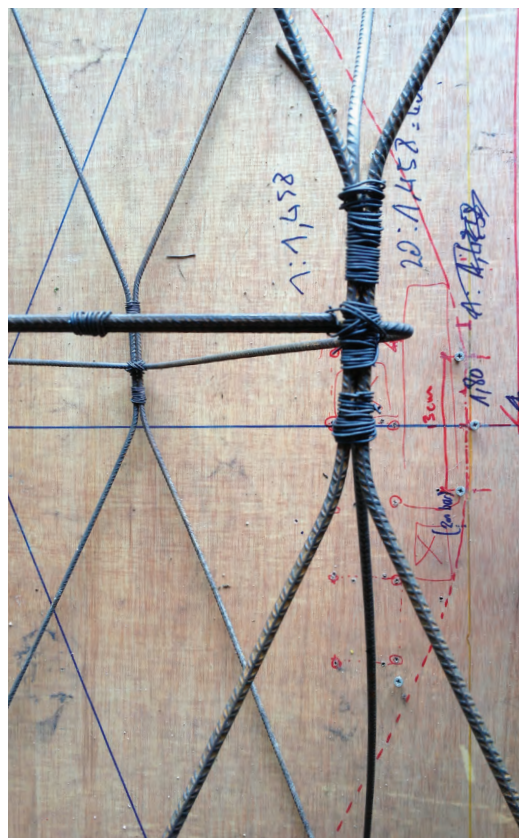
ill.4.82:
The tool created to optimise the fabrication of parts, their assembly and the conditions in which the work is done, is a fairly simple installation that spatially organises the work and provides a support for both the actions of shaping and connecting the different components that constitute the whole

On p.284 three additional images provide complementary impressions of the versatility of the set-up

Photo by author

ill.4.83:
Getting close to see the support of abstract lines, notations and other assisting devices, supporting the formation of the steel lines and their spatial combination

Photos by author



that are inherent in it.¹⁸ It also was a sign that the scale model was utterly inadequate for anticipating on what can actually be made in practice. As a consequence it lost its initial meaning as 'a model of', that is, as an image that is meant to be validated by its reproduction as a built object. This experience of an ideal shattered by physical reality proved to be frustrating and distressing for most students involved in this project, and for a few of them it took some time to get over it.

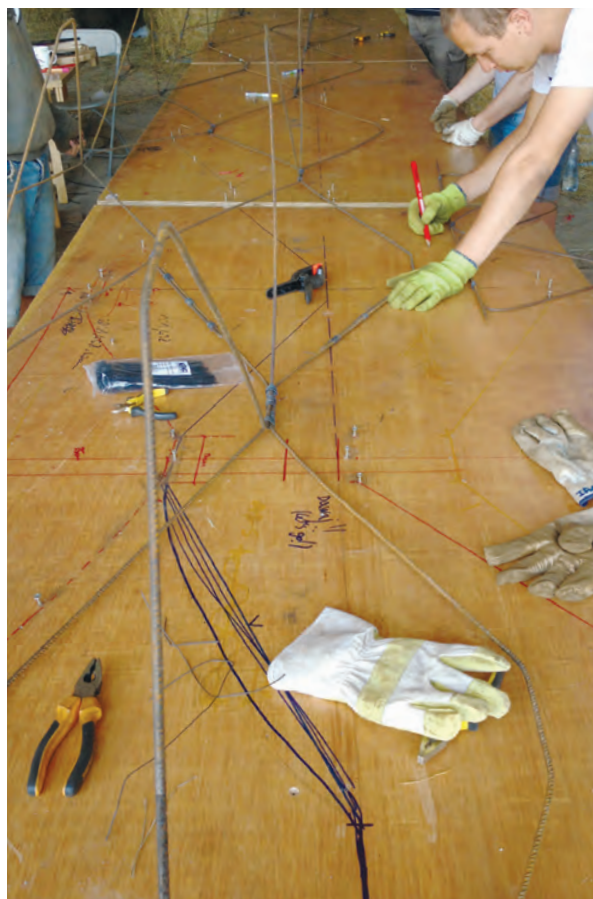
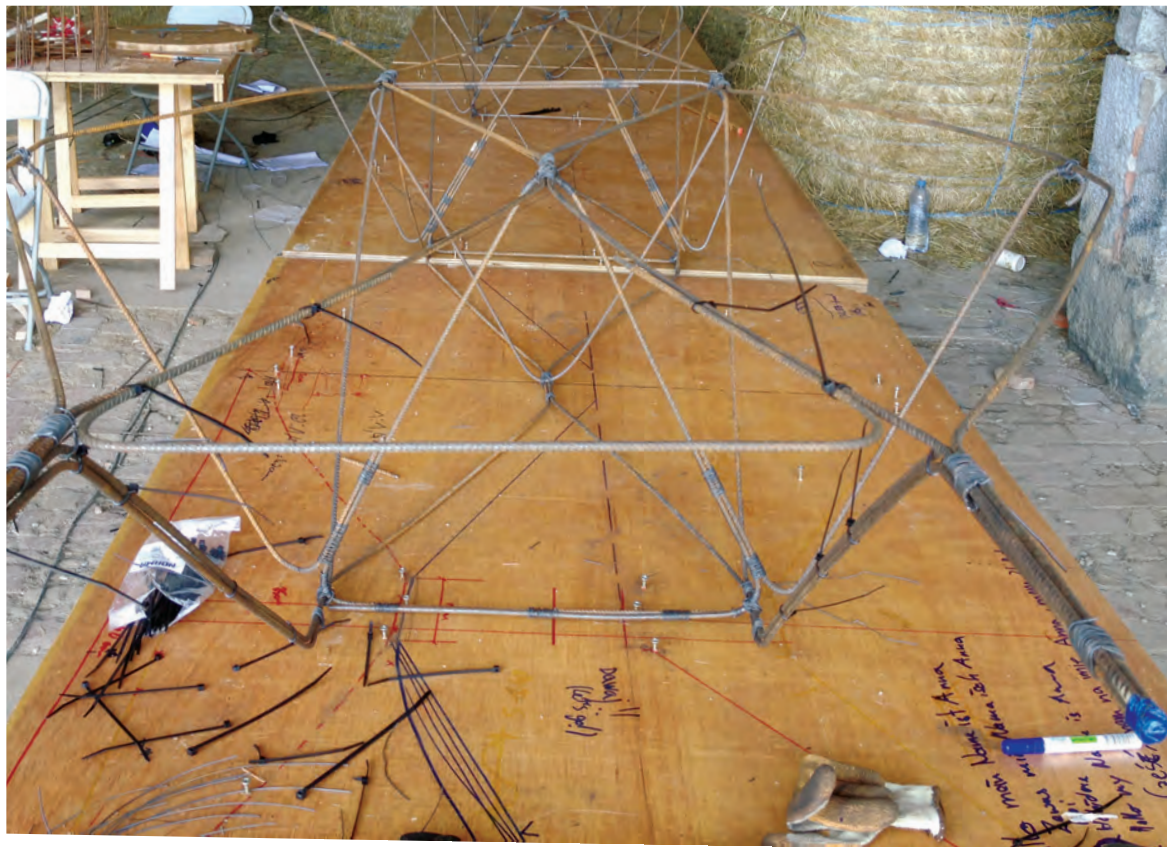
The failure led to a momentary interruption, but soon a stochastic process of inquiry and reconfigurations was set in motion. It revealed why things went wrong, and what could be done about it. There were problems of excessive deformation of the space frame (bending and torsion), defective connections, divergent curvatures of component lines, and displaced meeting zones between them. All these shortcomings were first identified as internal to the space frame as a construction system, but they actually were not entirely. Seeing the problems as essentially internal to a system isolates that system from the environment in which it comes into being. The reconfiguration of the project that emerged from the failure progressively demonstrated to all those involved, that a number of its causes were situated in the relational set-up between persons-acting, means, expectations, goal, contexts of activity and '*activity as dialectically constituted by them*'.¹⁹ The defective prototype can be understood as a materialised synthesis of a range of problems that had to be identified and dealt with in due course.

The outcome of the search for adequate ways to cope with the impediments and proceed, challenges the definition of a tool as an instrument at the scale of the hand. A project-specific spatial installation was made to fabricate the space-frame at full scale. It was a huge table providing a supporting surface of about 8m by 2m. On top of it, the components could be shaped and the entire structure assembled. The spatial configuration that was created by means of the table-tool, engendered a qualitative change in the system of relations between the diverse actants involved, and became instrumental in achieving the aim, i.e. making the space frame. However, its presence also transformed both the final artefact and the process of making on several levels :

- a. the level of context through a re-organisation of the place where the work is done and by a division between the site of fabrication and the building site;

18_ Crawford 2009, p.204.

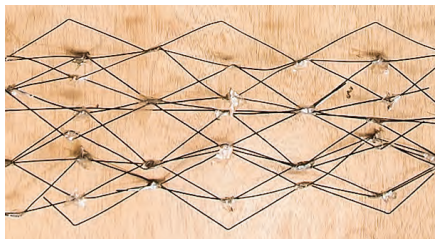
19_ Lave 1988, p.20



iii. 4.84 to 4.86:
Photos by author

- b. the level of persons acting together, i.e. in relation to each other, through re-organising the workspace. All projects have to be realised in collaboration, and devising ways to work and make things together is of chief importance. Making is a social activity with common aims and within shared conditions. The tool-table-apparatus allows to organise the work around it, simultaneously or not, sometimes independently and at other times in coordination;
- c. the level of procedures: the planar surface of the table made it possible to shape two linear elements at the same time and to assemble the whole subsequently.
- d. the level of control of conformity to a standard: on the table top a template was drawn of the intended shape of one line. Soon it was complemented by another drawn line next to it, for visualising both the latter's presence and the meeting with it. The template was modified in comparison to the initial template and redrawn according to subsequent approximations that gradually improved the line's shape in accordance to the requirements of the whole.
- e. the level of precision: fulcrum points allowed for more precise bending; the flat surface allowed for more precision when assembling and realising the connections, which in turn made the whole more accurate and consistent.
- f. the level of persons acting and ergonomics: the surface of work that moved up from ground-level to table height substantially increased the comfort for those performing the work.

The specific topic of the component-lines, highlighted at the start of this chapter, necessitated a mediation between the prescribed abstract line and the tangible line that the steel affords. In the realm of 'ideal as perfect', both would have to become clone-like. But the ideal line is attainable only within an abstract realm. In abstract modes matter-related constraints are absent, and as a consequence matter becomes more pliant, more transformable, a more passive actor that does not resist, and does not intervene. In the realm of 'ideal as concrete material construction', the abstract model has to be approximated. The shaping of the steel lines is a mediation, in the sense that it refers to recursive attempts to bring abstract and concrete geometry closer together, and it expresses the degree of accuracy that is demanded. But it is also a matter of matter, because the latter will put up a degree of resistance to fit the model. The tangible line in steel will always be approximate, to a certain extent imprecise or inexact. It can show a resemblance with the model used as a reference, but cannot be equated with it. The question is how much deviations one is willing to accept, as compared to the unsullied ideal, and how it can be ensured that the disparities remain

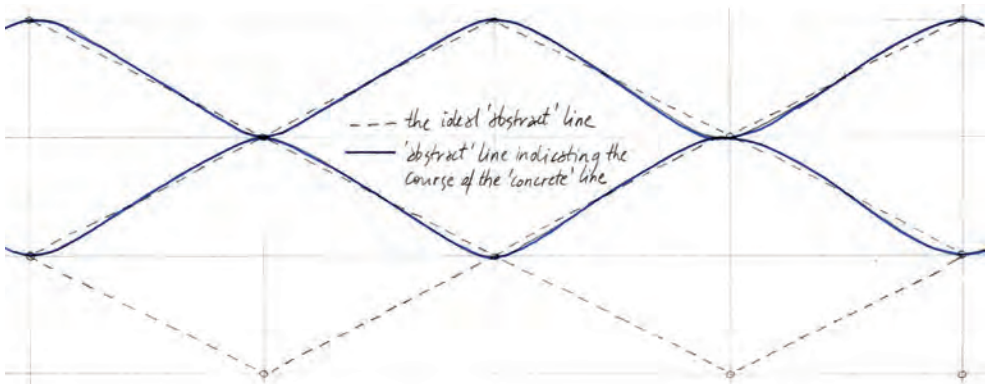


ill.4.87:
Photo by ELP workshop
participant

a 1st approximation

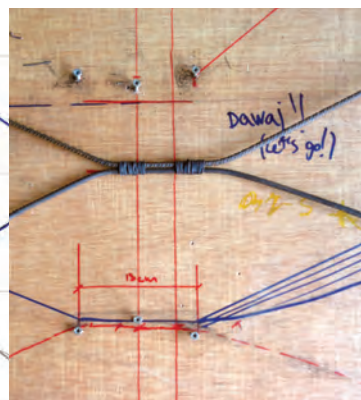
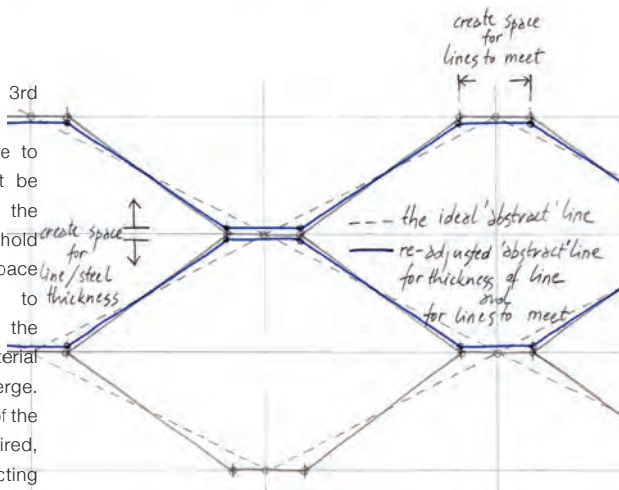
the sharp corners that we are allowed to make with the intelligible line and to a certain extent in the scale model made with steel wire, is unattainable for the 6mm thick re-bar. The form has to be re-adjusted and made less sharp, more soft and round.

ill.4.88:
Drawings by author

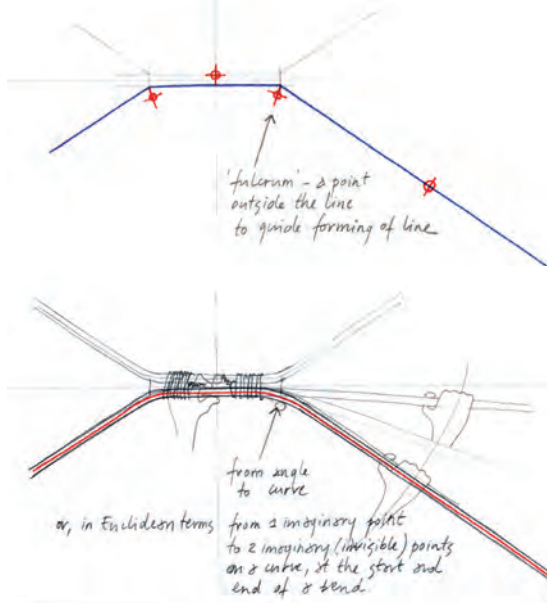


a 2nd and 3rd approximation

Lines meet and have to cohere. Space must be provided to unite the lines, to make them hold together. And space must be provided to accommodate for the dimension of the material where lines converge. Two re-adjustments of the geometry are required, again subjecting the initial 'abstract' form to necessary transformations.



ill.4.89:
Photo by author



a 4th approximation

'A straight-line is (any) one which lies evenly with points on itself'. Euclid's definition may apply for the drawings, but does it for the steel lines? The (form) of the line is defined by points outside of its course, lying right next to itself, rather than on it. These points embodied by screws act as jigs that hold and support the line firmly when force is applied to it by the hands in an attempt to modify it from straight to curved.

All corners are curved instead of sharp, and they are all more or less unique due to variations in leverage (as the hand's position always differs), fluctuations in the intensity of the applied force, varying support positions of the jiggig screws, opposite bending directions, etc.

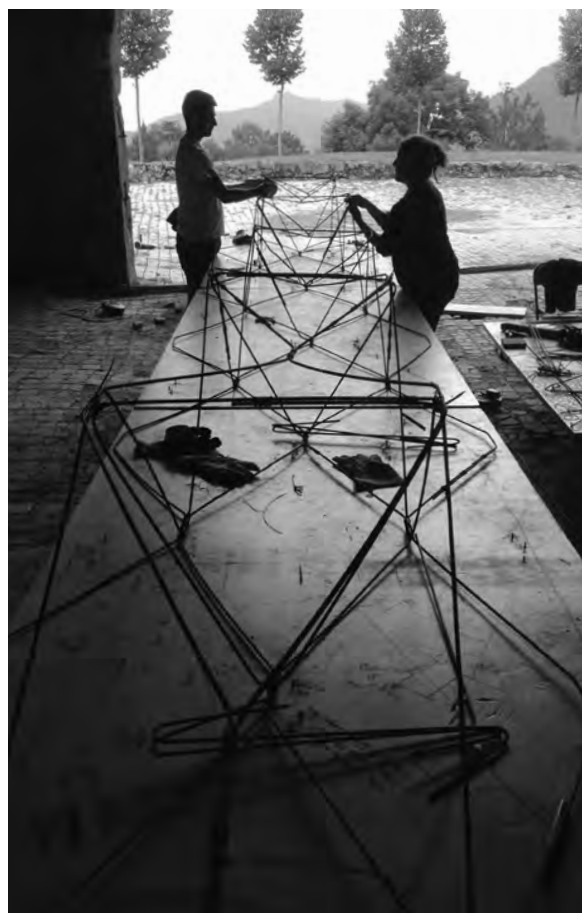
within an acceptable range. This requires a more or less relative evaluation whether the deviations have to be judged as defects, or as expressive features that give indications about the course of a process, the actions performed, a type of assembly, a method of constructing, or in short, materiality.

‘The intended design of a thing and the ideal form of it may be, but are not necessarily, two quite different things. The ideal form is the most highly regulated form, and more highly regulated still than that. It is conceivable but not attainable: the perfect cylinder, the perfect rectangular prism, the perfect sphere. ... the modern engineer’s intended design, and the architect’s, very often are conceived in terms of ideal forms: flat planes, straight edges, perfect cylinders, arcs or circles. This can happen because these are the forms which can be communicated with least trouble. Fully to describe the form of a rough-hewn billet would take any draftsman a matter of weeks’.²⁰

The post-constructed drawings on the facing page show the intended and wished for geometry of the lines for the space frame. They give an indication of some of the adjustments and re-adjustments to the shape of the lines that were required as a consequence of material and construction. They also represent the drawings of the ideal abstract lines traced on the surface of the table with the valuable assistance of Euclidean geometry and its extensive range of associated practical methods. They formed the background for shaping the steel bars that escaped full control, but whose stiffness and strength makes it possible to hold the line we want ... approximately.

The tool-table-surface was both specialised and versatile. It had a capacity to be more than one thing: it was a model –template, reference– a surface to work at and upon, a jig and a place. The table-tool is defined by its surface, but also by the space around it, where one stands and works from, looks, observes and listens. It is also the place to interact and collaborate with others, and in this respect it strongly influenced the work as a social activity. It was a mediating device that made it possible to learn construction at a level of complexity that can be considered architectural.

20_ Pye 1971/1995, p.50



ill.4.90 to 4.93:
The choreography of making

Photos by author



ill. 4.94 & 4.95a&b:
The unregulated and regulated prototypes

Photo below by author
Photos right by Andr s Flajszer





ill.4.94: Photo by author.



ill. 4.96:
From uphill the extent
of the area occupied
and appropriated by the
infrastructure to keep
a construction process
running becomes almost
palpable. It spreads out
across the interstices
between the small
wooden houses of the
village that was one of
the two locations for the
EIP workshop 'Tectonics/
Structures in Building
Culture' in Liechtenstein

Photo by author



ill. 4.97:
Boots on the ground:
A view upon two of
five self-installed work
stations, a storage for
material and another
for tools

Photo by author

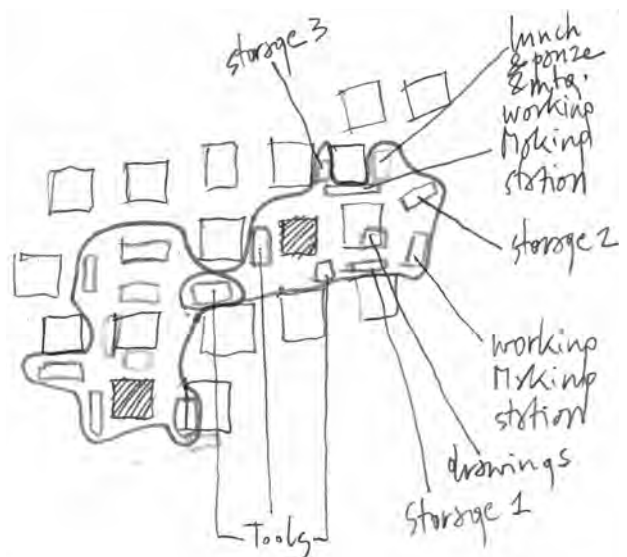
SITUATED APPARATUS - TOOLED PLACES

From an architectural perspective, the regard for context is primarily framed in terms of capturing the spirit of a place, and what that place affords as possibilities and imposes as constraints for hosting an architectural artefact. But places also need to accommodate the multiple sequences of a building process, and therefore need to have the capacity to be instrumental for architecture's realisation. The necessity to understand what a local environment affords, is part and parcel of attending to a building site as an event-space. The place needs to be organised according to the requirements that the construction work sets; amongst others the accessibility for people and materials, the logistical operations of delivery, loading and unloading, spaces for the storage of new and waste materials and for moving them to the place where they are used, cabins for tools, workers and meetings, one or more cranes, etc.

Building sites are dynamic places inhabited by many that together form heterogeneous collectives having both shared and conflicting concerns. Building sites are time-places of making, but also of appropriation, nuisance and disruption. In the organisation of the work power-relations play a role; collaboration is crucial, but tensions, conflicts, hierarchy and the use of some kind of force are also part of the everyday, even though they can be masked by the protective blanket of the idea of a collective endeavour, and the presumed and hoped for positive change it will bring to place, community, city; etc. The sites where construction takes place, and the many

ill. 4.98:
A complex relational
system nested within and
superimposed on another
complex relational system.
The hatched squares are
the actual building sites
and the amorphous outline
defines the space needed
to feed them

Drawing by author.





ill. 4.99 to 4.101:
Photos by author



other sites that serve it, are social environments where people live and work together, with each other and with their environments; and they are places of collective agency. Architects and engineers are part of the actors active in those places, but they are actually more akin to visitors than inhabitants. Their position is markedly more remote and comfortable than for those who perform the laborious tasks standing with their feet in the mud while attempting to drive nails through boards that shape a form-work or while binding re-bars together with steel wire.

In common practice, organising a building site and truly participating in it, is not part of the tasks assigned to architects, but during the EIP workshop in Liechtenstein it imposed itself as an issue to the architecture students nonetheless. Even though the period of occupation of the place was less extended than is usually the case for a regular construction site, its importance and potential to affect work and environment could not be overlooked and needed the student's care and attention. In a tiny village on a mountainside, two small week-end houses needed to be designed and built in massive wood. The building sites were cramped, and there was no other





alternative but to occupy the available space in-between the existing houses. Large stacks of wooden beams, numerous boxes with tools, and different workstations sprawled along paths, gardens, terraces and accesses in need of a place that made sense in accordance with the location and organisation of the construction work. Many different places were inescapably appropriated and re-organised to make them fit into the sequences of fabrication and the logistical tracks that connected the different rooms for different doings. Organising and shaping the place requires learning to read its capacities and limitations, and maybe most important of trying to figure out how not to impede too much on a life that goes on and does not intend to stop around it. An organisational response can help facilitate the work, but conversely it can also make things more difficult. A place can get in the way and become a hindrance or mess up the desired smoothness: wet, windy, muddy, slippery, sticky, dusty and noisy.

From the students it demanded an ability to situate and select good spots for workstations and the storage of materials and tools. They also had to anticipate on the processes that would unfold within the village and the inconvenience or even outright annoyance they would cause. The small village was inhabited during the entire time of the ongoing workshop, and although the inhabitants were hospitable, the nuisance was often challenging for them too. All this proved that places where construction happens are also nested in the midst of, and hosted by complex environments and communities, regardless of whether the latter like or not, and the sites can also be contested and lead to conflictual relational dynamics. They are not pristine and smooth, and they actually never are, except maybe in the safe abstract spaces of architectural discourse or the photographic images that accompany this text for that matter. For both students and tutors it was a way to experience, learn and/or be reminded of the fact that the construction processes by which architecture comes into being, are not devoid of both gratifying and troublesome implications that remain unaccounted for in the textbooks about construction technology. These require an understanding, empathy and presumably also a generosity that is difficult if not impossible to learn in a classroom, but can probably only arise when one is exposed and affected in the field, on the ground.

ill.4.102:

A muddy and slippery slope required an intervention to keep the process from stalling. The response took the form of an infrastructural lifeline for enabling the movements back and forth, and up and down between the building site and its support zones

Photo by author

DOUBLE EXPERIENCES - MAKING (and learning) COMPLETED IN USE

Conceiving and making the operational apparatus needed for constructing architectural artefacts is usually not associated with the architect's tasks, but rather with the tasks of those in charge of the practical execution of the construction work on building sites. Doing it nonetheless proves to be both pedagogically relevant, and potentially creative and imaginative. Through direct physical engagement within a construction practice embodied experience of materials and material processes can be acquired and developed. It facilitates a more comprehensive understanding of the real life implications that design-choices can have in a practice of construction; it involves *'the ability to see one's actions sedimented in the solid residues of technical practice'*.²¹

But there is more to it, and this more comes to the fore by means of the position that the apparatus, and its assorted tools and techniques, take within the processes and actions of actually materialising an architectural artefact. A built work comes into existence through a complex set of initiating actions that are situated behind the work, where our share as architects participating in these initiating processes is situated too. Once the work is completed, our engagement normally ends, and we separate ourselves from both the work and the subsequent recursive processes of use.

Apparatus and tools –their conception and making– can be seen as an intermediary project nested within another project it has to serve. Means and ends have to be reconfigured, namely, the apparatus/tool that is supposed to be a means, will be an end in itself for a while, since it has to be brought into being and put into practice first, in order for the main process in which it is situated to proceed. In *'The Case for Working with Your Hands'*, philosopher and mechanic Matthew Crawford argues that this putting into practice, *'completes [the] activity of making ...'*, and *'... gives it social reality. ... the maker's activity is situated within a community of use...(that) provides running feedback that can be picked up in the course of ... activities'*.²²

Besides being made for an instrumental use within the construction processes of the workshops described above, the apparatus is actually itself also 'being used'.

21_ Hale 2014, p.201

22_ Crawford 2009, pp.186-187

23_ Hale 2014, p.201. See also ...

There is a mutuality that yields information back and forth, between the making for use and the using itself. This allows for evaluating its effectiveness, performance and shortcomings in action or practice, and it sets the scene for improvement. The relation with regard to the self-made instrumental artefacts changes, simply because the maker's position has changed from the space behind the work, defined by initiating actions or actions of making, to the space in front of the work, marked by recursive processes or processes of use. The development of tools or a more comprehensive apparatus that is at the service of a larger process of constructing an architectural object at scale one on one, makes it possible to experience both sides, before and after, both creation (projective) and use (feedback) within one and the same process. The main takeaway is captured by Jonathan Hale's comment on a statement by Karl Marx that 'highlights two complementary forms of creative experience, which seem to result from the process of making: *'firstly the experience of the maker in taking up and transforming a raw material into an object of use; and secondly the experience of the user in taking up an object consciously shaped for human interaction. ... The symmetry between the process of constructing and both inhabiting and interpreting architecture'*.²³

5

PROCESS and FORM

5.1

CONTEXT

The wall ... was an act of technology. It was beautiful, but not because of any masterful intellectual planning or any aesthetic supervision of the job, or any added expenditures to 'stylise' it. It was beautiful because the people who worked on it had a way of looking at things that made them do it right unselfconsciously. They didn't separate themselves from the work in such a way as to do it wrong. There is the centre of the whole solution.¹

INTENTIONS

'The roots of architectural understanding lie in our architectural experience: our room, our house, our street, our village, our town, our landscape'.²

This fifth part consists in a detailed examination of the interaction between two distinct ways to frame construction, i.e. as dynamic process or static form. The subject is situated in the context of an introductory course in architectural construction and a matching made-to-measure construction-exercise conducted with starting students in architecture at the start of their first year in architectural education. A premise of the course was to provide preliminary guidance before engaging the extensive technological and scientific knowledge considered necessary for addressing architecture's materialisation. The intention was to give a panoramic overview of the disciplines and their specific agendas, the methods, the subjects, the overall concerns and problems; a map making navigation possible in the vast and diverse territory covered by architectural construction. After finalising the introductory course the students had to be ready to start their actual curriculum, consisting of more specialised courses organised following the traditional disciplinary demarcation lines.

I also wanted to clarify that architecture is not autonomous but situated within an intricate web of relations, interactions, interconnections, reciprocal influences and dependencies in line with Jeremy Till's '*Architecture Depends*'.³ When things meet, something supposedly happens in this meeting, that is, a give and take in which one defines, modifies, constrains and/or enables the other and vice versa. I hoped to incite an awareness that architects cannot control everything and that it is important to acknowledge this; be it not necessarily or primarily as a defect to be resolved, but also as a potential for the emergence of something other, that in turn provides an expanded dynamic range. Finally, the aim was to make the subject insightful and accessible for anyone interested, and not just the architectural specialists. This last clarification is meant as an indication of the general level of questioning that I had in mind, and not necessarily a reference to the public I wanted to address.

1_ Pirsig 1825/1995, p.274

2_ Zumthor 1998/2010, p.65

3_ Till 2009



Aïssa Logerot - Extensions

ill.5.1:

. A table is an object for everyday dwelling activities and exemplifies a recursive architectural and cultural pattern that can be used in a wide variety of ways in a plethora of life situations. It is familiar and common, and therefore suitable as both object (form or structure) and subject for engaging the world of architectural construction in both practice and theory. The table that is visible in this image is at the centre of a construction-exercise that was performed with first bachelor students in architecture in the context of an introductory course in architectural technology and construction

Photo by A. Logerot

LIFE SITUATIONS and TYPICAL INCIDENTS

‘... the architect’s materials, our materials. We know them all.

And yet we do not know them. In order to design, to invent architecture, we must learn to handle them with awareness. This is research; this is the work of remembering. Architecture is always concrete matter. Architecture is not abstract, but concrete. A plan, a project drawn on paper is not architecture but merely a more or less inadequate representation of architecture, comparable to sheet music. Music needs to be performed. Architecture needs to be executed. Then its body can come into being. And this body is always sensuous.

All design work starts from the premise of this physical, objective sensuousness of architecture, of its materials. To experience architecture in a concrete way means to touch, see, hear, and smell it. To discover and consciously work with these qualities - these are the themes of our teaching’.⁴

The picture on the left shows the object around which the assignment revolved: a table bearing a low-edged and fruit-filled woven basket on its top. The presence of this common use-object and its content may seem trivial, but it informs on the scene’s scale and size is suggested. It is one of the units by which an environment can be described.⁵ It also notifies that the table is in use and incorporated in real-life situations. In the abstract context of architectural construction-technology, real-life connections are absent most of the time. This implies that one is cut loose from the world in which construction’s problems are situated, and where its solutions have to do their work. In construction-technology-textbooks this tangible and sensible world is either inexistent, or veiled, or referred to in generalising terms. But providing suggestions of its existence by means of photographic images is merely a surrogate and not enough. Actual life-situations also need to be presented in the practices of learning, so they can be experienced. Construction is an abstract concept, but also an assortment of tangible activities in event spaces, and it can be dealt with accordingly.

In the essay ‘Architecture Is Its Own Discipline’, David Leatherbarrow opens with a cogent statement from André Gide: *‘If I had to teach a child geography, I should start with the plan of his garden, it seems to me - as Rousseau did - with the space that*

4_ Zumthor 1998/2010, p.66

5_ Gibson 1986, p8



Aïssa Logerot - Extensions



ill.5.2 & 5.3:
The table in the image on p.308 is one variation of a furniture concept called "Extensions" conceived by French designer Aïssa Logerot. The images above show two additional possibilities, i.e. a bench and a narrower version of the table

Photo by A. Logerot

his pupil Emile can embrace, with the horizon that his own eyes can see; then I should project his curiosity beyond the limit of his vision'.⁶ It expresses a concern for the person who is learning, and the related necessity to create a context for that learning that starts from, and keeps connections with the learner's past experiences and with the environments in which life unfolds. In his essay Leatherbarrow makes propositions for rethinking the three traditional disciplinary and teachable skills that, according to him, architects should master: architectural projection, -reflection and -construction. For each of them Leatherbarrow develops specific made-to-measure arguments, but he makes Gide's words resonate most with his propositions for rethinking architectural reflection. I reckon that it is also the domain where his personal expertise is situated. He argues that the real task of reflection within the discipline [of architecture], is to witness and comprehend the emergence of ideas and buildings from the cultural context that endows them with significance. This context is identified as the '*structure of the life situations that buildings accommodate and symbolise*'.⁷

By being constructed, architectural projected form is brought into existence and therefore in a relational and situational proximity to people and places.⁸ As soon as the actual building processes start, architecture ineluctably moves into the sphere of tangible (real-)life situations. Besides, the processes of construction are themselves assortments of particular life situations unfolding in time and place. This implies that the concept of a '*structure of life situations*' can also be used as a conceptual basis for architectural construction and for supporting a more explicit and intense connection of construction(-learning) with activities in context. Moreover, these can

6_ Leatherbarrow 2000, p.84

7_ Leatherbarrow 2000, *ibid.* p.95

8_ See also part 2 - 'Construction IS', section 'Patterns of Interaction between Process and Form'.

also be supported by the notion of an *'ensemble of typical incidents'* occurring within those real-life situations.⁹ This re-framing provides a possibility to move beyond the curtailment of construction by formal propositions, rules and norms. This can be supported with Leatherbarrow's argument that: *'just because theories and projects arise out of the world in which we live does not mean they are sufficient expressions of it; [because] such an assumption deprives the figures of their ground, as if flames could be understood apart from combustible materials'* (ibid. p.95).¹⁰ By analogy, a roof cannot be understood without the rain it captures and diverts or the sun it transforms into shadow. Leatherbarrow adds that *'situations such as these are not only matters of fact or of personal experience, nor is this structure the same thing as a law, a pattern, or a set of ideal norms'*.¹¹

Architectural construction processes exhibit patterns of (typical) events and situations too, and apprehending their ramifications can more adequately and appropriately be achieved from a position of involvement in the processes themselves. However, and in contrast, the predominant cognitive approach to architectural construction is extrinsic and conforms to a statement made by Stan Allen: *'Detached from the operational sites of technique, theory stakes a claim on a world of concepts uncontaminated by real world contingencies'*.¹² When immersed in a territory, the conditions that hold within it in relation to time, place, environment, matter, and the social, can be experienced, including how these affect activities, possibilities and results. This applies to the apprehension of both theories and practices. The metaphor of territory is used here to indicate an extensive domain of knowledge and experience that needs to be explored and mapped. One position is unlikely to be representative for the others, and acknowledging those positional differences requires an active engagement with domain or field. Jane Rendell describes it in following terms: *'so what about geography? 'the ability and desire to make connections with new things depends on position. Recent feminism makes a strong argument for understanding knowledge as situated - that we know things differently depending on where we are. First in one place then in another, we are both stationary and in motion. I think it is easier to make connections with another when in motion, when you are out of your place'*.¹³

9_ Leatherbarrow 2000, p.95

10_ Leatherbarrow 2000, ibid. p.95

11_ Leatherbarrow 2000, ibid. p.95

12_ Allen 2009, p.xii

13_ Rendell and Wells in Hill 2001, p.158

Within event spaces one can gain awareness that forms —projected and built, abstract things and tangible objects— emerge from, or are the product of (generative) processes, and this is irrespective of these being processes of design or building. Once produced, it is also within processes that forms/things/objects are used or put into practice and that their workings can be asserted. In contrast with to the duality form/process employed here, philosopher Nicholas Rescher argues (on the basis of Leibniz's theories), that *'A process ontology ... greatly simplifies matters. Instead of a two-tier reality that combines things with their inevitable coordinated processes, it settles for a one-tier ontology of process alone. It sees things not just as the products of processes (since one cannot avoid doing) but also as the manifestations of processes; as complex bundles of coordinated processes. It replaces the troublesome ontological dualism of thing and activity with an internally complex monism of activities of varying, potentially compounded sorts'*.¹⁴

Architecture students are experienced inhabitants of their architectural environments, and their experience is based upon interactions with the materials and objects that populate them. The knowledge associated with this is personal and individual, but also common and shared amongst many. I often experienced that students, once they had entered a classroom or auditorium, seemed to leave this close connection behind them, and replaced it by the consideration that they knew nothing about those subjects. It goes without saying that students who are starting their studies in architecture do not know and master the specific disciplinary paradigms, content and methods, and still need to acquire them. But this 'not knowing' can also be an asset, and is not by definition an impediment. The openness it provides can be a space to forge alternative, and sometimes unexpected connections.

Anyone walking through the door of a classroom for her or his first course in construction, does so with more practical knowledge of concrete material situations than the majority thinks or is aware of. It therefore makes sense to appeal to this latent repository of existing tacit understandings, and to activate it from the outset. It is more constructive to start from what is known, rather than from what is not. It is more empowering and gives people the capacity to start acting with the things that have to be learned. Every starting student has learned to write, to draw, to read, to calculate,

14_ Rescher 2000, p.9

and to make things and use them, at least to a certain extent and at some point in her or his life. One of my primary assumptions for the introductory course of construction in architecture is to trust those skills, even when these are underdeveloped.

I started from a recursive architectural and cultural pattern, exemplified by an object for everyday dwelling activities, i.e. a table. It is familiar and common; known from home, school, bars and restaurants, libraries, eating, meeting, writing, cooking and more. When the students received the assignment, each of them was sitting at one, and would subsequently use it to start working. My presumption was that when I uttered the pattern's name, the large majority would be able to fathom what kind of thing I was talking about. Besides, the probability was very high that all of them had experience in using them, and almost certainly in a wide variety of ways. I deemed it perfectly suited as both an object (form or structure) and a subject for engaging the world of architectural construction in both practice and theory.

The choice for a table was also pragmatic besides being strategic, since it was based on the availability of a qualitative specimen from French designer Aïssa Logerot. She created a table with a construction that is as simple as it is ingenious, and it can be made with very simple means. It afforded for a hands-on approach that did not require specialist knowledge and tools. Finally, it is a construction that is closely adapted to the human body, and its everyday uses involve a physical proximity that is also at play in the processes of making it. My aspiration was to create a learning environment for making the architectural object at real-life scale, i.e. 1:1, with conditions that would encourage students to find out for themselves, and where they would be able to experience the implications of their choices. It can be framed in terms of the creation of a context for learning by and from construction, i.e. from inside, rather than learning about construction from without.

Anthropologist Tim Ingold argues that it is wrong to think of learning as the transmission of a ready-made body of information, prior to its application in particular contexts of practice, which actually is the habitual way of dealing with construction in architectural education. He adds that we learn by doing, in the course of carrying out the tasks of life: *'In this the contribution of our teachers is not literally to pass on their knowledge, in the form of a ready-made system of concepts and categories with which to give form to the supposedly inchoate material of sensory experience, but rather to establish the contexts or situations in which we can discover for ourselves much of what they already know, and also perhaps much that they do not. ... This is what Jean*

Lave (1990) means when she says that learning is a matter of understanding in practice rather than acquiring culture'.¹⁵ An additional connection to support the emphasis on doing and on taking part in processes of becoming, is the concept of expanded Action Spaces described by Otto von Busch in '*Post-script to Fashion-able, a Methodological Appendix to Activist Design Research*'.¹⁶ The concept of action-spaces is akin to what Jane Bennett refers to as event-spaces, or the arena where stuff happens, a theatre of operations.¹⁷ These spaces are immersive, and their style of structuring is, following Deleuze and Guattari, assemblage; ad-hoc groupings of diverse elements, of vibrant materials [inhabitants] of all sorts: human and non-human, energies, materials, tools, in addition to routines, skills, practices and norms, etc.¹⁸ Agency is distributed across an ontologically heterogeneous field and it is collective/congregational.¹⁹

Any practice or process takes place within an action space, which is an emergent domain of distributed potentiality related to our abilities to interact with the world, offering hands-on opportunities for using and controlling one's bodies and skills to try [new] solutions, to explore [new] ways to do things. Here, skill is not only a matter of ability, but also one of curiosity and sharpened attention. It is also about taking an inquisitive look at the adjacent fields and a form of probing attention or awareness by questioning, distance and reflection: '*knowledge as the curiosity of inquiry involved in the acquisition of knowledge*'.²⁰ The aim is to intervene into a system or situation, not to be a passive observer, distant and non-participative, and it is bound up with a dual commitment to both study a system and concurrently collaborate with others in changing it.²¹ In education it is an approach that focusses on problem solving and intervention in reality rather than silent reception, memorisation and repetition.²² It encourages people to get hands-on, to start immediately and to develop a pragmatic praxis through experiments along the way.²³

15_ Ingold 2013, p.13

16_ von Busch 2008/2012

17_ Bennett 2010, p.23

18_ von Busch 2008/2012, p.22

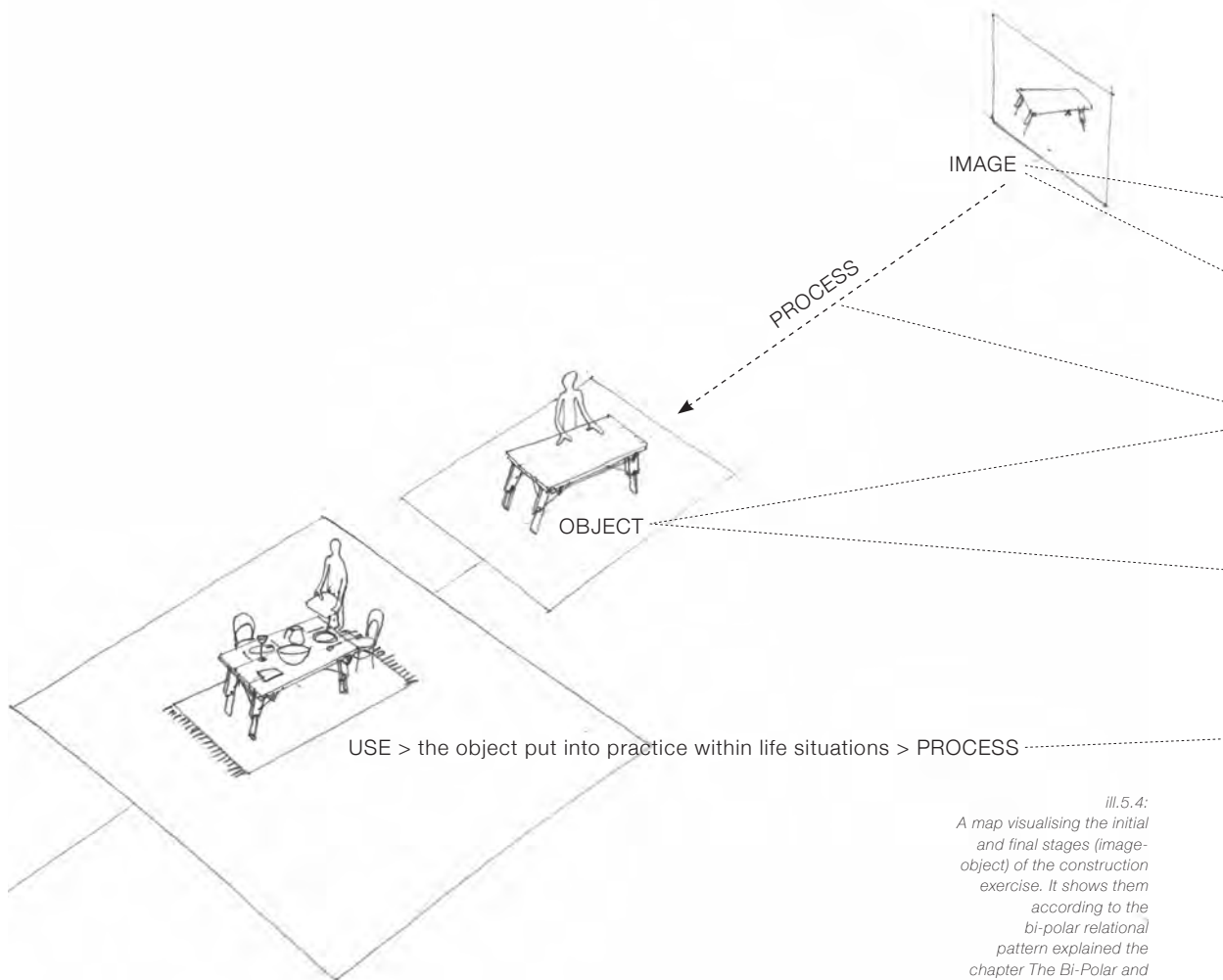
19_ Bennett 2010, p.21

20_ von Busch 2008/2012, pp.24-25

21_ von Busch 2008/2012, ibid. p.34

22_ von Busch 2008/2012, ibid. p.36

23_ von Busch 2008/2012, ibid. p.51



USE > the object put into practice within life situations > PROCESS

ill.5.4:
A map visualising the initial
and final stages (image-
object) of the construction
exercise. It shows them
according to the
bi-polar relational
pattern explained the
chapter *The Bi-Polar and
Hermeneutic Relational
Patterns of Construction'*
and 'Time-Form'
(pp.89 to 100) where
this specific diagram
already appeared'.
From here onwards it
will be developed as a
cartography of happenings
in construction's event
spaces and its converging
and diverging trajectories

Drawing by author

PROCESS (n.) _ TWO DEFINITIONS

1.

A process is a conceptual scheme (an abstraction of the second level).

The concepts we call processes are characterized by the following features:

1. A process is an action which we see as a sequence of constituting sub-actions.
The states of the world resulting from sub-actions are referred to as stages of the process. Thus we see a process as a sequence of its stages.
2. As is true for most concepts, the stages of processes are abstractions limited in space, i.e. they refer to certain spatially limited part of the world.

Very often processes have the following additional feature:

3. The process has *definite initial and final stages*.

Furthermore, there is an abstraction from the initial stage called the input, and an abstraction from the final stage called output, of the process. For example, both stages may be some structures of objects, and some of these objects may constitute input while others constitute output. We then speak of the process as transforming the input into the output. Also, there are processes which have a definite initial stage, but may or may not have a final stage, i.e. a process may be infinite.

Processes often are contrasted with objects. The most important feature of objects [i.e. form] is, by definition, their *constancy* with respect to certain cognitive actions. The concept of a process, on the contrary, represents an ongoing *change*. The most usual way of speaking of objects and processes is a criss-cross between the two concepts: a process, the stages of which are objects not identical to each other.

On a smaller time scale we observe constancy with respect to some cognitive actions, which gives us the reason to speak of it as an object. On a larger time scale, this is a process, and we say that the object is changing. One can see from this definition that process is a very general concept. An object may be seen as a special kind of process where there is no change.²⁴

24. Turchin 1991 Source: <http://pespmc1.vub.ac.be/PROCESS.html>, on the website of the Principia Cybernetica Web. Author: . Accessed on 30 November 2017).

2.

_ 'A process is an actual or possible occurrence that consists of an integrated series of connected developments unfolding in programmatic coordination: an orchestrated series of occurrences that are systematically linked to one another either causally or functionally. Such a process need not necessarily be a change in an individual thing or object but can simply relate to the general condition of things, for example a change in temperature or in the purchasing power of money. A [natural] process by its very nature passes on to the future a construction made of the materials of the past. All processes have a developmental, forward looking aspect. Each such process envisions some sector of the future and canalises it into regions of possibility more restrained in range than would otherwise, in theory, be available. The inherent futurity of process is an ex-foliation of the real by successively actualising possibilities that are subsequently left behind as the process unfolds.

_ Processes develop over time: any particular [natural] process combines existence in the present with tentacles that reach into the past and the future. Just as there can be no instantaneous vibration or drought, so there is no instantaneous process. ... Moreover, processes will always involve a variety of subordinate process and events, like the process of creating a book involves its writing, production and distribution. Process is mereologically homogeneous: a part of a process is itself a process, as a part of space is spatial or a part of time temporal. ... Furthermore, not only do processes come connected, but so do their aspects. Even as in ordinary experience a person immediately focusses on only some features of a larger complex whole, so in science we focus only on some features of the coherence we study and leave the others aside by an act of abstraction. Nature's processes stand connected with one another as integrated wholes. It is we who, for our own convenience, separate them into physical, chemical, biological, and psychological aspects.

_ A [natural] process is not a mere collection of sequential stages but inherently exhibits a structure of spatio-temporal continuity. And just as the static complexity of a set of photographs of a flying arrow does not adequately capture the arrow's dynamic motion, so the conjunctive complexity of a process's description does not adequately capture its trans-temporal dynamics. Accordingly, the successive stages of a [natural] process are not a mere juxtaposition of arbitrary, unconnected factors (like passengers assembled by mere chance on a ship or plane). They are propositionally united by a systemic causal or functional agency under the aegis of a lawful regularity of some sort'.²⁵

25_ Rescher 2000, pp.22-23

PROCESS - FORM INTERACTIONS

INSTRUCTIONS [the assignment] & EXTERNAL CONSTRAINTS

‘Make the table represented in the picture, at real-life scale (1:1), and within the limited time frame of six weeks. Go through the whole process that is needed to bring the object into existence, and produce all the necessary information that will enable you to do so. This means that you have to take the appropriate actions personally and assign to yourselves the different roles for reaching this result. Once that is done, the table must be usable as a table. Using is something you will have to do too, meaning that you will have to become its user, besides being its maker, and you will have to evaluate both your making and using’.

‘During the process you will have to be attentive to what you do, for what happens when you do it, and for how you can improve what you are doing, that is, become better and reach more qualitative outcomes. This also applies to what you need, the means with which and by which the work is performed. You have to keep track of both what goes wrong and works well. Keep the mistakes as a reference for modifications and improvements, and as a basis for comparison and calibration. Register what you do and how you do it, or in other words fix it for a future repetition of the generative process’.

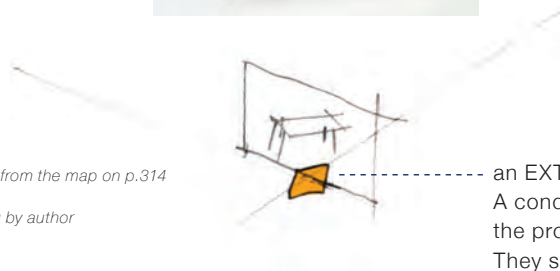
ill.5.5:
Photo by A. Logerot



a state of organisation, i.e. a (static) form supportive of and participating in typical (dynamic) life situations.

ill.5.6:
excerpt from the map on p.314

Drawing by author



an EXTERNAL constraint

A condition inserted at set moments during the process without prior notification. They simulate the presence of an outside world in which forces operate that architects do not control, but to which they nonetheless have to respond, since they affect the circumstances in which the work is realised. It introduces a certain degree of contingency, which in turn is one of the inherent features of practices/processes of construction.



ill.5.7:
The set of seven photographs
available to students at the
start of the assignment

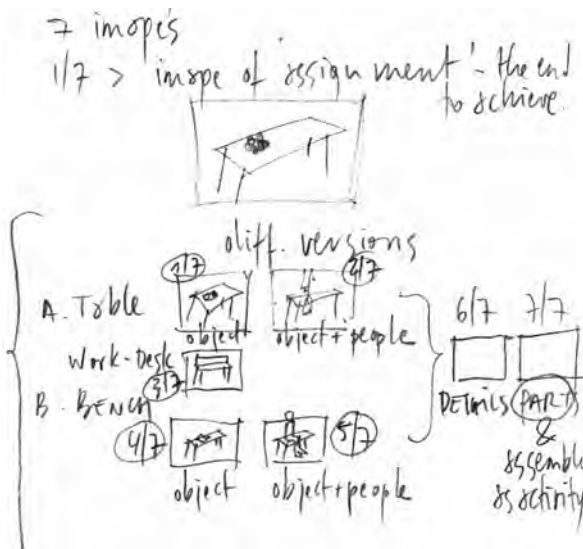
Photos by A. Logerot

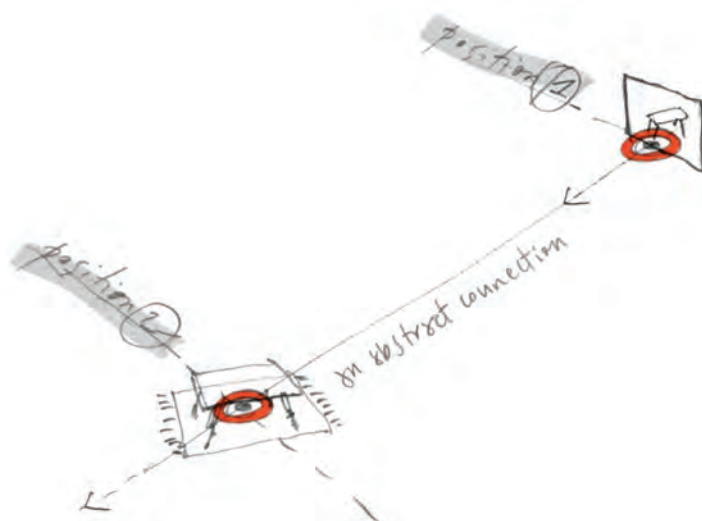


IMAGES AS MODELS

The point of entry is a cliché in a twofold meaning of the term, both a photographic image and an architectural commonplace stating that architects don't make buildings but images of buildings. The images frame particular points of view upon the object under scrutiny, and act as indications of set moments in the trajectory of its becoming. In this case they also depict something that has already been made, rather than something as yet to be made. In other words, the thing that is represented in the photographs has already been the subject of both a design process leading to a projected form, and a fabrication process leading to a built form. Design and fabrication were thus embedded in a now completed and remote trajectory performed by designer Aïssa Logerot and an unknown craftsman. No information is available about this generative past, apart from a set of seven photos that show the table and some of its alternative configurations (desk and bench) at different moments in time. The process carried out by the students starts from these images. They precede their making process and function as guiding models.

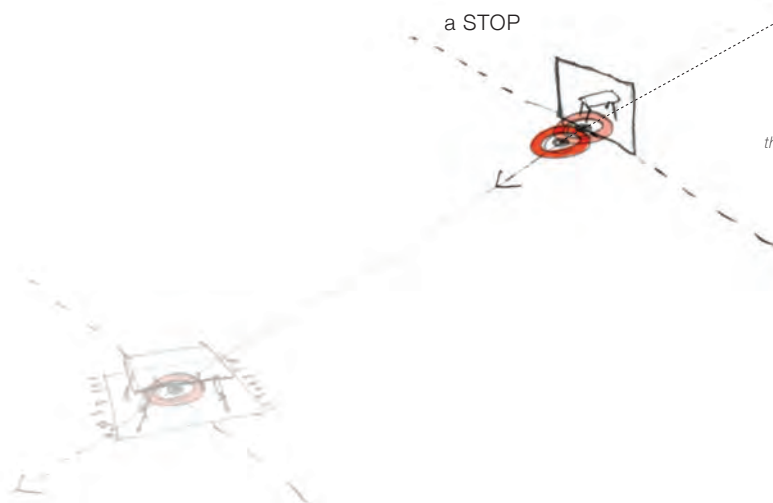
ill.5.8:
Structuring the set
Drawing by author





ill.5.9:
the first schematic version
of the map according to
architectural convention
that prioritises the bi-polar
relational pattern between
process and form (p.91).
It shows the initial stage
as a node associated with
the abstract representation
of the table, and the final
stage (the presumed aim
and end) visualised as
a node identified by the
table as object on the
surface of the floor. Both
can be seen as temporal
moments connected by
temporal movement, with
the latter symbolised by an
apparently simple linear and
uni-directional trajectory that
connects point of departure
with a point of destination.
The hocus-pocus happening
in-between both states
is commonly termed a
construction process

Drawing by author.



ill.5.10:
The third map
and
the first bump in the road

Drawing by author.

FROM IMAGE TO PROCESS / MOMENT TO MOVEMENT

The assignment sets the imperative to define and follow an itinerary that leads from the initial stage, a framed and abstract image of a table (position 1), towards the final stage, i.e. the table as a concrete physical object present in a specific place (position 2). As a consequence, the first issue the students face, is to figure out how to proceed and move in the direction of the goal. How to do this is not given in advance, and there is no direct and obvious procedural link between the table in the image, and the table that has to end up on the surface of the floor. There is only an abstract, and intangible line between two nodes on a for the time being invisible map.²⁶

Although the implicit demand is to move forward towards an end, the first and paradoxical thing to do is stop to develop a script for future action. The black box of an as yet unknown process has to be given a content and an organisational structure. What emerges here is a necessity to complement the focus on 'what', with a consideration of 'how': *'The difference ... is not in the 'what', but in the 'how' - ... not ... 'the means by which' (machine model ...) but 'the manner in which', ...not ... 'functions' but ... ways of being, something only living things can have'*.²⁷ 'What' relates more to what can be designated and to properties with a high degree of constancy, whereas 'how' connects to action and thus with process and change. Combined they signify both the way in which something is done and by what means. The absence of a pre-defined method implies that no instructions can be drawn from it and no pre-conceived systematic procedures can be activated. An adequate way to act and do things has to be developed from within the process that just started, and following the requirements it imposes. Tim Ingold also refers to this as *'following the materials'* and *'shifting the focus from ready-made objects to processes of generation and dissolution ... attending not to the materiality of things, but to materials-becoming-things'*.²⁸ He refers to Gilles Deleuze and Félix Guattari who argue that the essential relation, in a world of life, is not between matter and form but between materials and forces. It is about the way in which heterogeneous materials, ... mix and meld with one another in the generation of things.²⁹

26_ The interactions between process and form and how to map them is addressed in part 2, 'Construction IS', section 2.II 'Patterns of Interaction between Process and Form'.

27_ McGilchrist 2009, p.3.

28_ Ingold 2011, p.179

29_ Ingold 2011, ibid. p.210

KNOW BEFOREHAND

In *‘Walking the plank: meditations on a process of skill’*, Tim Ingold describes a productive and transformative process: *‘Like going for a walk, sawing a plank has the character of a journey that proceeds from place to place, The journey does have recognisable phases - of getting ready, setting out, carrying on and finishing off - and these lend a certain temporal shape to the overall movement. These phases are not, however, sharply demarcated’*.³⁰ The first stage, i.e. ‘getting ready’, is the one the students are situated in now, and in which they need to create the appropriate conditions for ‘setting out’. The preparatory and anticipatory orientation involves some overall conception of the task to be performed - of what has to be done, how to do it, and the tools and materials required: *‘This conception covers an assortment of factors that are only loosely connected and serves to guide the work rather than strictly to determine its course. Charles Keller, a pioneer in the anthropological study of cognition in practice, aptly calls it an “umbrella plan”, an idiosyncratic constellation ... of stylistic, functional, procedural and economic considerations’*.³¹

At this point I inserted an external constraint by asking the students to make such an umbrella plan. Here again I gave no preliminary input on the content, only the requirement that it had to contain information about what to do and how to do it, or in other words, a script that organises actions to be performed in the future. This resulted in a written list that in some cases was complemented with sketches of the table’s parts. The results of this first attempt demonstrated that most of the students had the capacity to both give a sensible structure to the process that lay ahead, and to identify several crucial moments, operations to perform, actions to undertake, requirements to be met and outcomes to achieve. However, for most the descriptions remained nonetheless overly simplified.

In general terms they identified:

- That the process consists of several stages, and not just one;
- That these stages are of a different kind, and therefore have to be made distinct, named, defined and ordered;
- That different types of information and means are needed;

30_ Ingold 2011, p.53

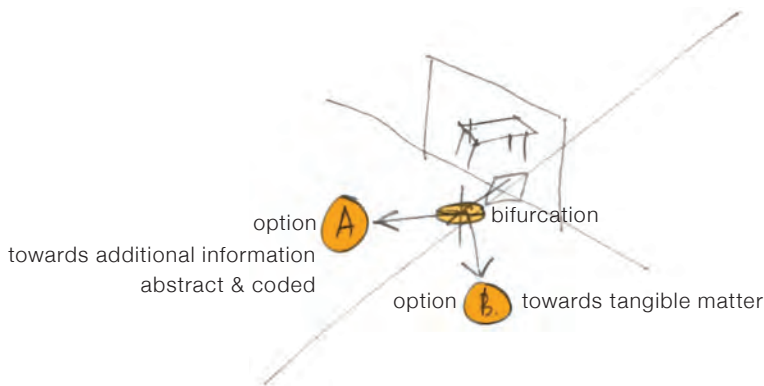
31_ Ingold 2011, ibid. p.54

- That a process takes time to develop, and that consequently one has to take a temporal context into consideration, to which a structure and a duration has to be assigned;
- That the process and its sub-processes will be continuous at certain times, and discontinuous at others, which is to say that certain phases need others that precede or follow them, i.e. that there is some kind of sequential hierarchy;
- That there is a need for a degree of control of information, primarily with regard to dimensions and geometry.

What happened in fact, is that they unintentionally identified construction as an instrumental set of actions, i.e. a process organised as an assortment of operations.

During the discussion and feedback that followed their first attempt to script a future performance, a twofold question emerged within the group: Where can we find both the dimensions and the drawings of the table? As a response I inserted two additional external constraints. The first was that I would provide dimensions nor drawings. The second was that I agreed with designer Aïssa Logerot that nobody would disturb her to ask for additional information, and that in any case she would not provide any if asked for. What she did provide was a very brief written description.

At this moment the mood changed, because until then most of the students still assumed that this data would be provided to them, and not that they would have to produce it themselves. As a consequence, attention had to shift towards how to generate the necessary information. A dilemma arose that led to a reconsideration of the way in which to proceed, that is, either directly start making the physical object with the limited information that is available, or create more elaborate descriptions in abstract code first. Is it possible to take the material in the hand and start making the table at once? In other words, is it possible to engage the world of matter, forces and impacts immediately, or does one have to produce additional information first, before bringing



ill.5.13:
map nr.5 reconnects with the third map where the first bump in the road was visualised. At this stage the presumed linearity of the path forward, is called into question, because it confronts the students with a bifurcation and the necessity to make a strategic choice about which path to take in order to move on

Drawing by author

in the materials? In principle, both options are possible, but a general awareness soon grew amongst a majority of students that there was a troublesome issue pending. Due to an acute lack of information about the object that had to be constructed, the making would certainly be rendered difficult.

The main source of the dilemma is the presence of the photographic images showing an object that needs to be replicated in another realm. The assignment in combination with the images sets a requirement of conformity of the end-result to a model, which actually matches the generally accepted idea of the precedence of image: *'The actual work of fabrication is performed under the guidance of a model in accordance to which the object is constructed. This can be an image beheld by the eye of the mind or a blueprint in which the image has already found a tentative materialisation through work. In either case, what guides the work of fabrication is outside the fabricator and precedes the actual work process ...'* (Arendt 1958/1998, p.140).³²

The model functions as the reference with which results can be compared and against which they can be evaluated. Consequently, future actions need to be framed in such a way that a certain level of predictability and control is guaranteed within the processes of construction. The extent of these measures still must be defined, but what is already certain is that they have to ensure correspondence between model and outcome.

Summarised, the issues that unknowingly emerge at this stage are a need of:

- conformity (to a model) and the issue of replication.
- control, and therefore a power to guide actions.
- prediction, i.e. knowing beforehand.

Within the specific context of this exercise, the choice in favour of producing additional images containing the necessary information, more specifically dimensions and descriptions of geometry by means of drawings, seemed more practical and efficient, because they facilitate the fulfilment of the requirements mentioned above, that is, conformity, control and prediction.³³ It is the path that in the end a majority of students chose to follow. Those who did not, changed their approach soon after experiencing that achieving accuracy in making the actual parts without those references was not obvious after all, although not by definition impossible.

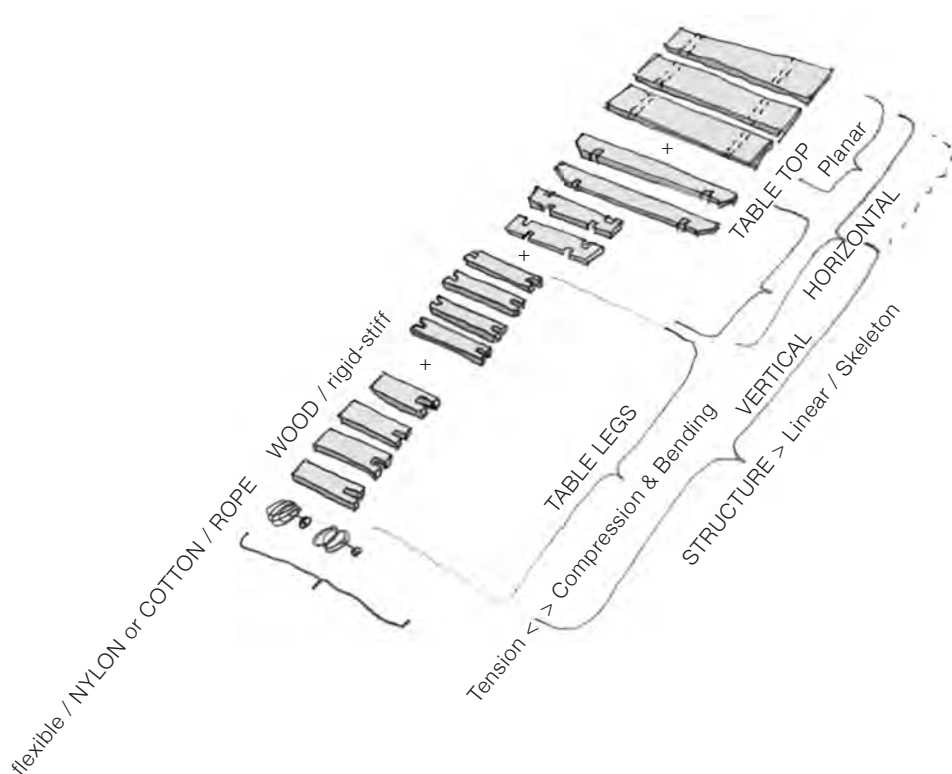
32_ Arendt 1958/1998, p.140. See also part 2 Construction IS, section 2.II Patterns of Interaction between Process and Form, chapter 'The Bi-polar and Hermeneutic Relational Patterns.

33_ The option to engage the material directly is used in the already mentioned Erasmus Intensive Program 'Tectonics in Building Culture', where the use of abstract descriptions and/or representations was deliberately blocked. See part 2_Territories, section Encounters, chapter 'Things We Do Not See', and part 3_Constructing With, section 'Constructing Things for Constructing other Things'.



ill. 5.14:
the component parts
of the table and the
presencing of the
process of assembly of
pre-fabricated component
parts, that by the same
token points at a temporal
organisational structure.

Photo by A. Logerot



ill. 5.15:
A graphic overview
and organisation of the
component parts of
the table according to
spatial and technological
properties/categories

Drawing by author

WHOLES AND/OR PARTS

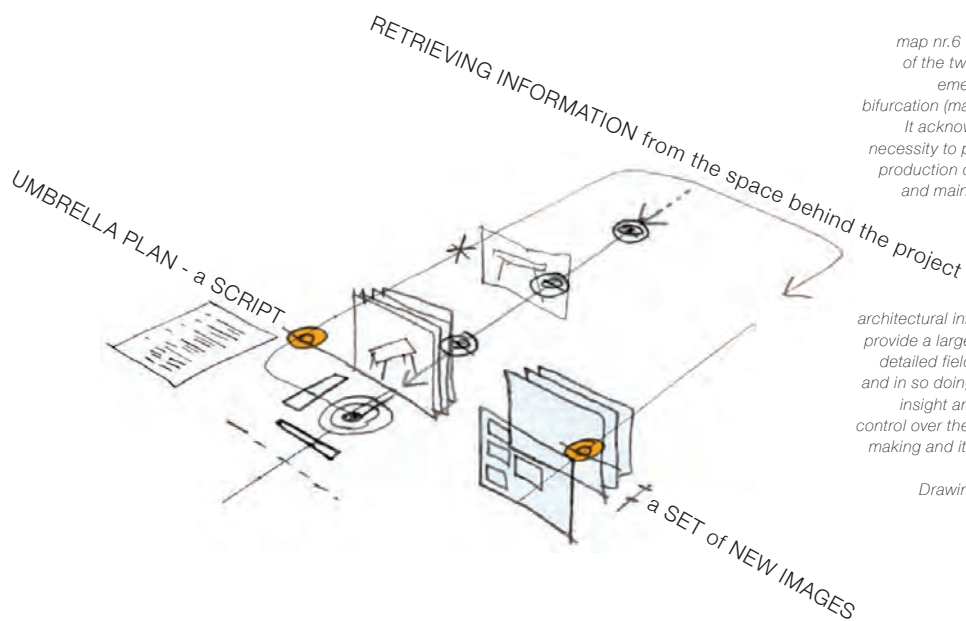
Another topic emerging from the umbrella plan was the predictable issue of parts and wholes. The first descriptions of the process that contained drawings, showed parts only, and surprising or not, never the whole. The whole was already pre-conceived as something that is the result of the assembly of components that can be identified separately rather than together; and as something that is the result of an additive process, that is, the outcome of assembling pre-made parts. When questioned about this, the recursive answer I received, was that to make the table, knowledge of its component parts was needed. Questions about how parts need to relate to each other and fit together were not put forward as matters of concern, nor were those of their specific positions and the implications of the roles they have to play within the whole. Naming some parts legs and others table top seems to imply those roles, positions and orientations anyway, and therefore unknowingly point at the existence of both internal and external relations.³⁴ But this is debatable, because those names refer to general concepts and do not automatically make the specifics of a situation intelligible.

Prioritising parts and disregarding the whole hints at a predominance of an analytical approach and the pre-supposition that a framing in terms of individualised entities is adequate for understanding a whole.³⁵ But *'analysis destroys the object'*, whereas it is exactly this whole that has to be created.³⁶ The priority granted to a parsed understanding of reality revealed itself repeatedly during the entire process, although for the attentive participant or observer there were already signs of contradiction or calling into question during the follow-up actions of dimensioning and drawing, and that would be the case many times over during the process. The focus on parts and their name-based identification, points at a pre-existing background scheme concerning the organisation of information following object categories and properties.

34_ 'Internal' refers to the relations within the discrete system named table, and 'external' in turn refers to those with context/place and use. This does not imply that both can be considered independently from each other.

35_ Here the term 'whole' refers to the object, but in construction 'whole' must refer to more than the artefact. It has to include the event spaces or *'the arena where stuff happens'* (Bennett 2010, p.23), including the material and environmental conditions, the materials and tools, the living and non-living actors, etc.

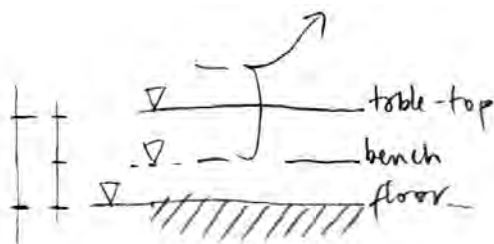
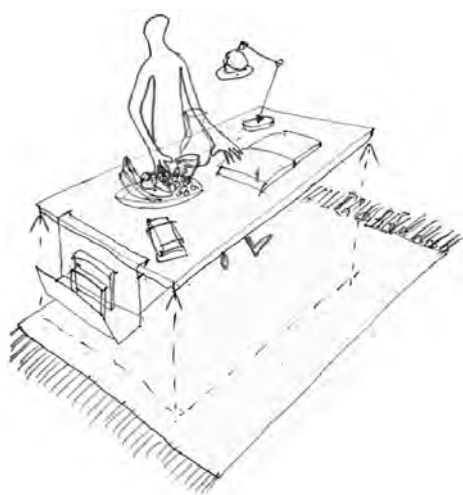
36_ Serres 1990/1995, p.30. See also De Landa in part 1 Preface, section 'Way of Working': *'... analysing a whole into parts and then attempting to model it by adding up the components will fail to capture any property that emerged from complex interactions, since the effect of the latter may be multiplicative (e.g. mutual enhancement) and not just additive'* (De Landa 2000, p.17).



ill.5.16:
map nr.6 depicts one
of the two directions
emerging at the
bifurcation (map5, p.326).
It acknowledges the
necessity to prioritise the
production of additional
and mainly graphical

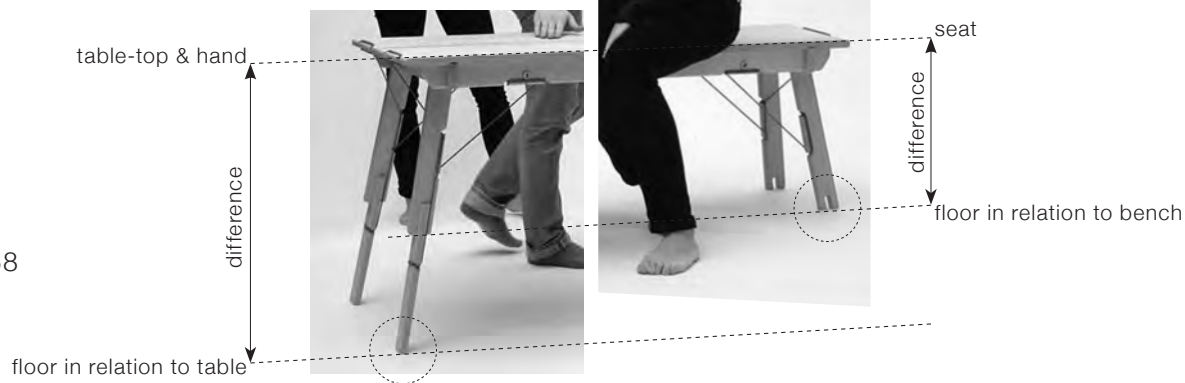
architectural information to
provide a larger and more
detailed field of visibility
and in so doing gain more
insight and means of
control over the process of
making and its outcomes

Drawing by author



ill.5.17:
The procedure used to
retrieve the dimensions
of the table on the basis
of its relationship with the
type of use and some
aspects of the context in
which it is situated and
made operational

Drawing by author



CREATING (new) INFORMATION BY MAKING (new) IMAGES

In this mode, architecture... brings about its construction not directly by means of materials but by means of a projected use of materials, or, is mediated rather than being immediate.³⁷

The term images is used here as an analogue for the descriptive sets constituted of (abstract and codified) graphic documents and written instructions made by architects and engineers alike, prior to the actual acts of building on a site. It also connects with a chapter entitled 'Knowing the World by Making Images of It' in David Leatherbarrow's previously mentioned essay 'Architecture Is Its Own Discipline', in which he identifies the making of prospective and descriptive images as one of the architect's specific skills.³⁸ These provide a unique way to make things visible that otherwise remain hidden and/or do not exist yet. The fact that these images must be brought together in networks of mutually dependent images automatically implies that they cannot function individually but always in relation to each other: '*Architectural understanding means grasping a network, weave, or matrix of figures, each partial but all mutually dependent*'.³⁹ Besides the need for internal interconnectedness within the descriptive set, they also have to be pertinent and instrumental externally for the activities of making the artefact they describe.

The creation of architectural images that possess a capacity to in-form a process of making goes together with specifying metric and geometrical information. In this case, the information is immanent in the history of formation of Logerot's actual project, but not directly accessible. It has to be retrieved, starting from the situations depicted in the photographs. These show contexts where the object is put into practice as table, desk and bench. These concepts pre-suppose a more or less specific spatial arrangement and a positional relationship between surfaces, i.e. a usable surface lifted from the ground and maintained at a finite distance above it. The difference in height referred to here, and the arithmetical value assigned to it, is closely connected to the specific relationships between the object, the users and the uses that can unfold on and around it.⁴⁰ It is also the least uncertain reference to start dimensioning the object,

37_ Gregotti 2010, p.87

38_ Leatherbarrow 2000, p.87-91

39_ Leatherbarrow 2000, ibid p.88

40_ Note that 'difference' always points at a relation because situated in-between. In this case it is not in the object, but in the relationship between the object and its context. 'Information is news of difference' (Bateson)



ill.5.18:
The inexorable multiplicity
and diversity of outcomes
resulting from the
idiosyncratic character of
the different composition
of each construction team

Photos by author

even though the associated value is intrinsically relative. It can fluctuate within a range because it is dependent on the context, defined by the relations described above and the interpretation of those who fix it (in this case the students). One can use one's own body as a means to define it, or other objects in the environment serving similar purposes, or a furniture catalogue, or a handbook with metric data for architects, etc. but in every of those cases, the metric value is dependent on something extrinsic and therefore prone to variation.

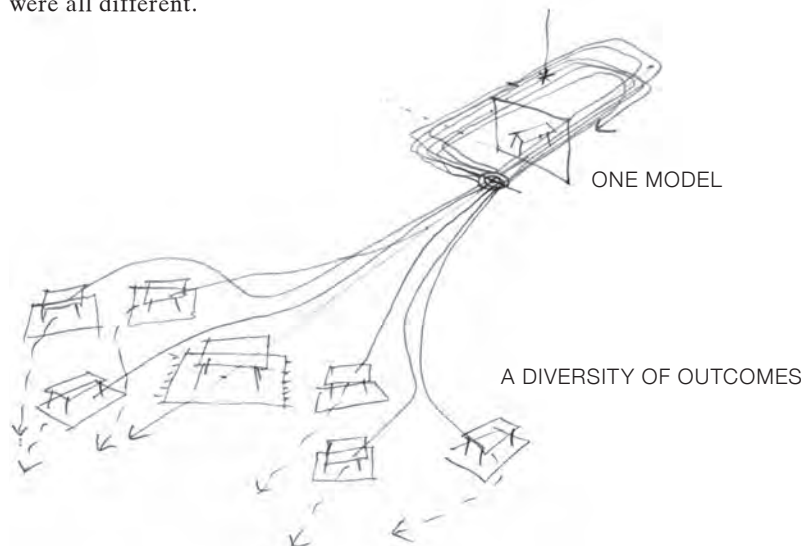
The students were organised in groups of four, and although they started from the same image with the unspoken intention to make the same thing, they ended up with divergent outcomes. Groups composed of different people prompt distinct interpersonal dynamics, capacities and choices. From group-specific event-spaces and actions, in combination with the contingencies of a practice, a more or less idiosyncratic context of creation with its corresponding conditions emerges. As a consequence, every constructed object has its own particular (hi-)story, and becomes a '*unique, singular individual*' situated in place and time: '*To avoid reification we must instead focus on the historical processes that produce those products... Assemblage theory, ..., avoids taxonomic essentialism through this manoeuvre. The identity of any assemblage at any level of scale is always the product of a process ..., and it is always precarious, since other processes ... can destabilise it. For this reason, the ontological status of assemblages is always that of unique, singular individuals*'.⁴¹

When the dimensions of the table and its parts are deduced starting from different arithmetical values for the distance between table-top/seat and floor, this ultimately leads to a series of tables with different sizes. The specific choices are not entirely random and arbitrary, but there is nonetheless a degree of freedom that leads to variations that can hardly be predicted. The general fact that these divergences will exist can be foretold, but the particular way in which they will be expressed is not. This signals that a process of construction is not entirely predictable when it contains divergent sequences of actions and events, based on divergent interpretations and choices.⁴² For this fairly straightforward reason it cannot be reduced to replication. Within the process there are other sources of divergence, such as environment and external influences, capacities and skills of the student-constructors, type of materials,

41_ De Landa 2006, p.28

42_ Bateson 1979, p.49-50: '*Divergent sequences are unpredictable*' '*... Under tension, a chain will break at its weakest link. That much is predictable. What is difficult is to identify the weakest link before it breaks. The generic we can know, but the specific eludes us*'.

tools, etc. The final results displayed an overall family resemblance, but the diversity was undeniable too. Organising collaboration in different teams led to bifurcating paths of becoming and at their conclusion to as many individuated entities, which in turn were all repetitions in difference of one pattern. They were all the same, yet they were all different.



ill.5.19:
Drawing by author

This dual identity indicates that each individual object is a singular materialised articulation of an ‘*abstract body-plan*’ that defines the structure of a space of possibilities.⁴³ The body-plan is a map that specifies potential and yet to be realised relationships among parts of an assemblage.⁴⁴ On this account, making the new series of images involved a transformation of the photographs as models ‘of’ into coded diagrams that work as models ‘for’ subsequent action. This implies that they must be enabling, i.e. make controlled and goal oriented actions possible. According to Stan Allen, architectural diagrams are graphic assemblages that must have a generative capacity—including the one of being reproduced at a distance from the author—and are syntactic rather than semantic, more concerned with structure than with meaning.⁴⁵

Two amendments to Allen’s assertion are needed here. First, the term ‘reproduce’ is potentially troublesome and confusing, because it unknowingly places the emphasis on the diagram itself, rather than on the actions that it must induce and support. The diagram must not be reproduced but activated by putting it into operation

43_ De Landa 2006, p.29

44_ Allen 2009, p.51

45_ Allen 2009, *ibid.* pp.50-51.

in an event space. The second is that the opposition between the terms 'syntax and semantics' and 'structure and meaning' can also lead to misconceptions. They are indeed distinct, but in the action-spaces of construction process they are closely connected and cannot be framed following an either/or-logic

A complicating issue in this case is that the photographs the students have to use are surfaces filled throughout with evenly distributed subject-matter, or in other words they are subjected to the law of the all-over. Although they are sources, the information they contain is not given but has to be tracked, retrieved and re-produced in other modes; transformed from surfaces into lines, numbers and words. The conversion from continuous surface to instrumental diagram involves a process of selection and production of particular kinds of information articulated in alternative modes. The aim is to modify the field of visibility and increase the degree of power to direct the process of construction, i.e. the level of control.⁴⁶

At this stage another external constraint was added, namely that each individual group-member had to draw her/his complete individual set of drawings at scale 1:2 or 1:5, thus including measurable/controllable dimensions. Each set consisted of the conventional parallel projections (sections, side views and top-views) and in some cases a perspective drawing, all drawn by hand. A number of noteworthy observations can be made on the basis of this first part of the process:

1- In the majority of cases the drawings within one individual set did not cohere. They were initially made independently from each other, which for instance led to the problem that the length and width of the table in the top view was different from those in the lateral views. On top of that, within the groups there was often no correspondence between the sets of the different group members, which in fact means that each one of them described another variation/version of the projected object. To make them aware of the consequences, I asked them whether they intended to make four tables, which of course was not the case. I could have skipped this question to let them experience the problems themselves during the subsequent phases of the process. From a point of view of learning this may presumably have been better, but due to time-constraints I decided

46_ Evans 1997, p.199: *'It makes it possible to see some things more clearly by suppressing other things: something gained, something lost. Its power to represent is always partial, always more or less abstract. It never gives, nor can it give a total picture of a project, so in consequence it tends to provide a range of subject-matter that is made visible in the drawing, as opposed to all the other possible subject-matter that is left out of the drawing or is not so apparent from it'*. See also part 3 Territories, section 3.II Encounters, chapter 'Tectonic re-visions'.

otherwise. The compatibility between drawings imposed itself as a requirement that needed to be met in order to avoid contradiction later on, during the process of making. The fact that architectural images are indeed partial but also mutually dependent, and that they need to function as a network, weave, or matrix of figures, emerged from the process of making the drawings and bringing them together. The in-set and cross-set contradictions validated the crucial requirement of verifiable inter-relations. It also provided the valuable feedback that calibration and adjustment are necessary, and that a new process must be activated to adapt and improve through re-doing. This doing again is essential, since *'there is no possibility of correction in the single act'*.⁴⁷

2- A hierarchy emerged in the relation between parts and whole, namely the graphic description of the whole has to be given priority over the more detailed description of the individual parts. In other words, the whole is necessary for providing the context in which the parts can be defined and situated in relation to each other.

3- Once the distance between floor and seat/table-top is set, there are two methods to determine the dimensions of the table, i.e. the graphical approach and the numerical one implying calculation. The latter is the one that most students favoured intuitively. Apparently they had learned to place more trust in numbers and calculation than in the revelatory capacities and accuracy of the drawing. But in fact it actually is the most complicated, slowest and most susceptible to errors. They eventually had to abandon it because too cumbersome. The most practical and effective way to do it, is through a gradual graphic translation of proportions extracted from the photographs. Paradoxically it is also the most accurate method, even though it is based on an incremental approximation rather than on mathematical exactitude.

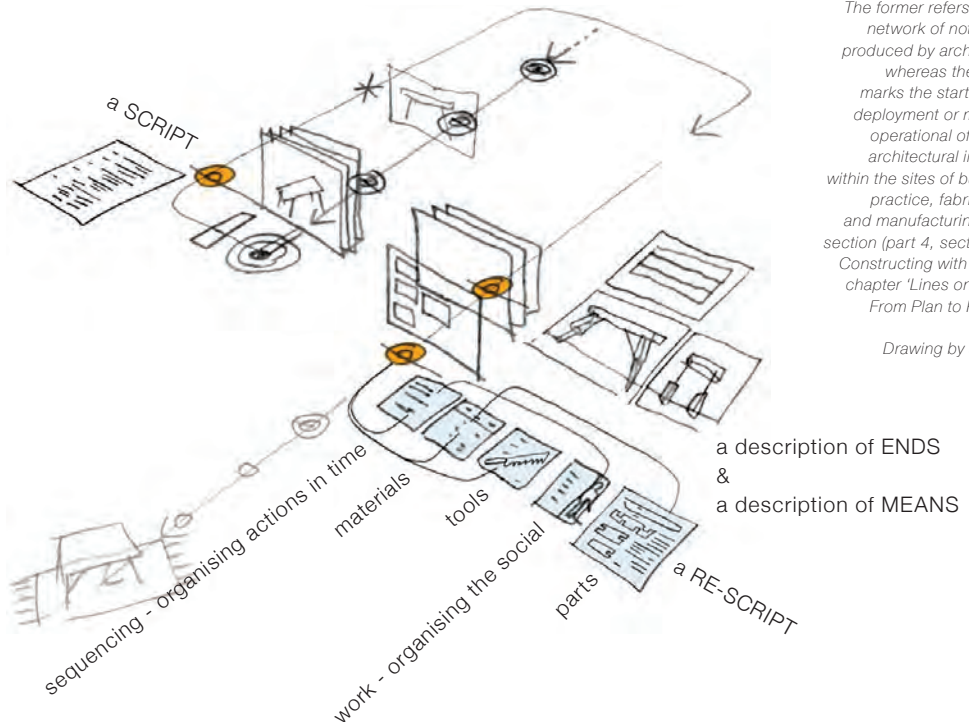
4- Following from the previous, drawings and dimensions emerge concurrently in a dialectical relationship. This implies that both are mutually dependent for their coming into being in a discontinuous going back and forth, and from this follows that it is counterproductive to address them separately and sequentially.

5- The drawings produce additional information on top of what is already made available in the photographs, but paradoxically they also reduce the represented objects to their outlines. They do not aim at complete descriptions but rather focus on specific aspects. In so doing they unknowingly insert the issue of redundancy and the rule of parsimony in the process, or in other words how much and what kind of information is needed in order to be able to control goal-oriented actions.

47_ Bateson 1979, p.211

Tim Ingold argues that *'drawing is an immensely powerful tool of observation and ... it combines observation and description in a single gestural movement'*.⁴⁸

In this case too, making the drawings cannot be simplified to a mere reproduction in another mode, based on the distanced contemplation of a world of objects, nor is it the translation of objects into mental images or coded abstract representations. They are the result of the intimate coupling of the observer's attention with actions in the environment. It amounts to an intensive search, and a simultaneous gradual transformation of what is found into something new that does not exist yet. *'To observe is not so much to see what is out there as to watch what is going on. Its aim is thus not to represent the observed but to participate with it in the same generative movement. ... One has to enter into it to join in the processes of its production ...'*.⁴⁹



ill.5.21:
Map nr.7 puts the emphasis on the distinction between the description of ends and the descriptions of means. The former refers to the network of notations produced by architects, whereas the latter marks the start of the deployment or making operational of those architectural images within the sites of building practice, fabrication and manufacturing (see section (part 4, section 4.1 Constructing with Lines, chapter 'Lines on Site - From Plan to Place).

Drawing by author

RE-SCRIPTING AND ORGANIZING CONVERGENCE

The production of the new graphic and arithmetical information creates another hinge-point between the abstract world of architectural description and the material realm of construction process and its performative actions. However, what is somehow under control by means of the new images is geometry, spatial relations and measurements. What actually needs to happen within the follow-up process is still either unclear or altogether unknown. For the process to become intelligible and manageable, answers must be given to a number of additional questions: What do we need to do? What kind of stuff do we need? How much of it do we need? When do we need it? Where will we get it? How will we get it? How will we move it from the place where we acquire or extract it to where it is needed? How will we transform it to make it fit the descriptions? And ultimately once again: How will we organise this complex of actions in time and space? A more elaborate script must be made to get a hold of what has to happen in the period from now onwards until the end-result is reached. It involves a thorough revision, expansion and detailing of the initial sketchy umbrella plan. Within a process of making, disparate trajectories need to converge: information (descriptions and instructions), a script (organisation and choreography of actions), place or the location in which things can happen, materials, tools, parts, people (roles and responsibilities), financing, procurement and logistics (the movement of stuff), etc.⁵⁰ This coming together is always intentional and the conditions to make it happen must deliberately be created. It pre-supposes a purposeful and methodical organisation that applies as much to the overall process as to the nested sub-processes.

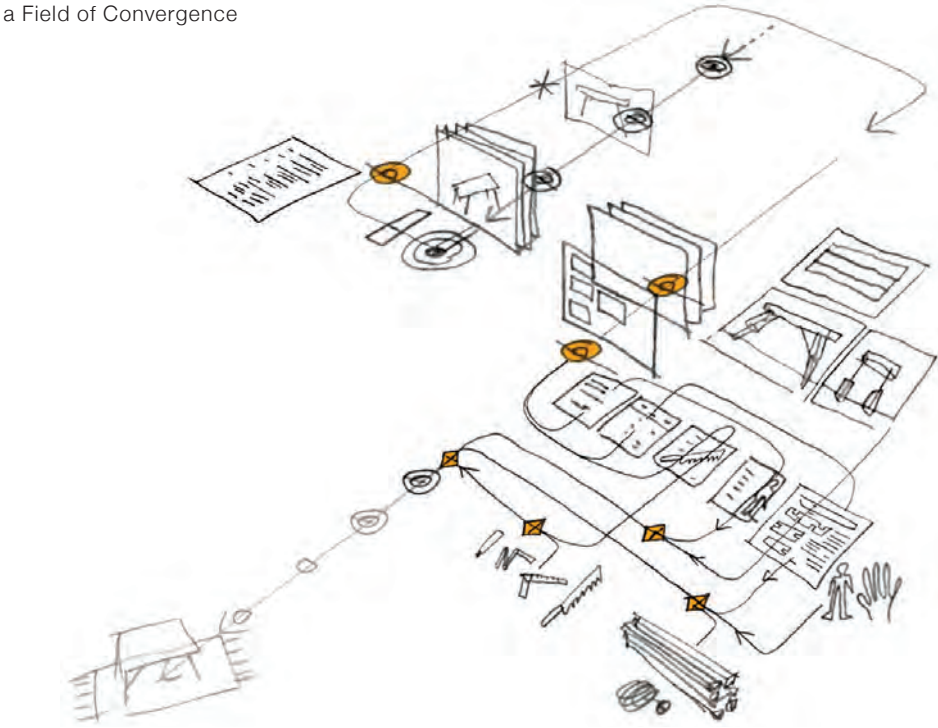
Architectural drawings are an instrumental input into a process and an abstract anticipation on the yet to be realised output of that same process. Both properties are necessary but not sufficient. They need to be complemented with other enabling things. For instance, the wood upon which the drawings have to be re-enacted and from which the parts must be extracted, the tools to perform the re-tracings and subsequent transformations, a place in which the action can be performed, supports to unfold the

48_ Ingold 2011, p.222

49_ Ingold 2011, *ibid.* p.223

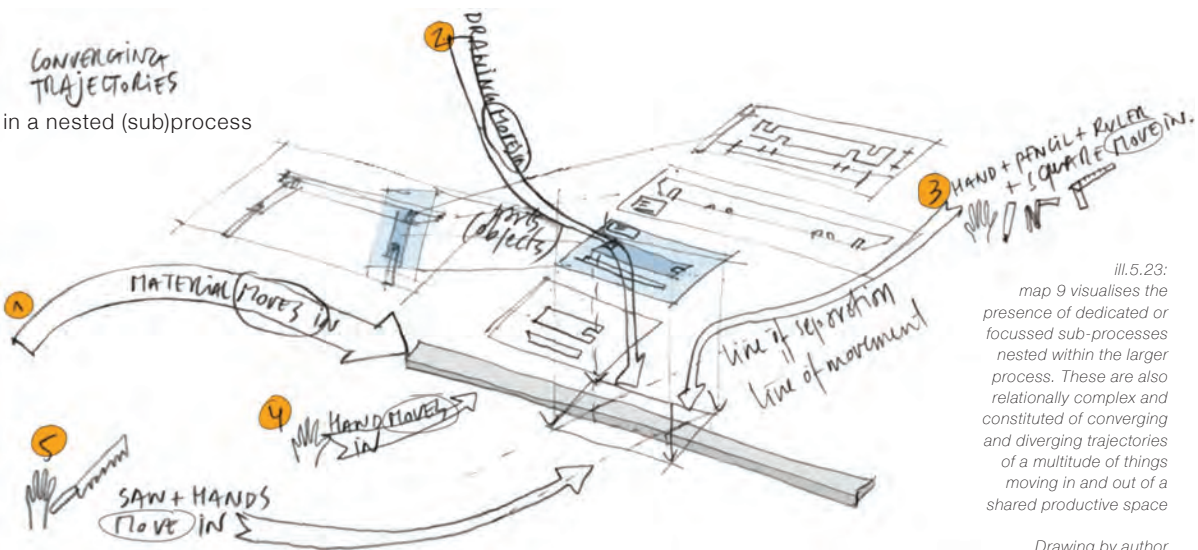
50_ Anstey 2012, p.55: *'It would be productive to think of architecture as the art of getting things moved about from one place to another, at a rather slow speed, with the intention that they will stay for a while and create value. An art of placing, or displacing material'*.

a Field of Convergence



ill.5.22:
The first aspect depicted in map nr.8 is the move from the description of both ends and means towards the actual creation and provision of those means, that is for instance going from a list of tools to obtaining the tools themselves.
The second aspect is the organisation of the convergence of those means where the making takes place. In other words, it is tantamount to organising and executing a logistical operation.
A third but in the map implicit point of attention is the organisation of the place(s) of work and the tasks each group member needs to perform or the role they need to play.
The complexity and extent of the initial assignment grows gradually and substantially, although the actual making of the table and its parts did not start yet

Drawing by author



ill.5.23:
map 9 visualises the presence of dedicated or focussed sub-processes nested within the larger process. These are also relationally complex and constituted of converging and diverging trajectories of a multitude of things moving in and out of a shared productive space

Drawing by author

actions upon, instruments for measuring and drawing, jigs to guide the tracing of lines, saws, hammers, chisels, etc., not to mention the group of student-constructors who together form a social space that must be activated and managed.

Allen identifies architectural projects as '*virtual constructions*' and architectural drawings as assemblages of abstract spatial and material notations that can be decoded to effect transformations of reality.⁵¹ He adds that the drawing can as convincingly be described as a script, a score or a recipe: a set of instructions for realizing a building.⁵² This however is implausible, because it implies that the drawing provides ordered instructions on how to perform a work and about the type of actions to undertake. Architectural drawings and models are indeed instrumental, but in the majority of cases they describe no more than what has to be achieved, and not how to do that. When considering the cases in which architectural notations do provide a structured arrangement of actions, they are still models for operating and not the operations themselves, and that actions are conceived here in terms of a sequence of states (of organisation), a sequence of positions occupied at successive times, and not as flow or movement.⁵³ They are also still extrinsic, abstract and reductive, and consequently cannot replace the actions within a theatre of operations where their implications can be felt.⁵⁴

It is not because we expect notations to work in a certain way that they actually do when put into practice. The move from inscription/instruction to performance is a move from a static realm to another, where things come together in complex choreographies within shared action spaces, and where other rules apply because of different circumstances of performance and changes in interpretation and instrumentation. In Allen's terms: '*In the passage from drawing to building, the real and the virtual will always be present in some unpredictable mixture*'.⁵⁵ Simply stated, the input is known because deliberately made for the purpose, and the output can be forecasted (because both are states of organisation). The event-spaces in-between however, with their transient spheres of influence, remain opaque as long as they are not activated and participated in.

51_ Allen 2009, p.76

52_ Allen 2009, *ibid* p.41

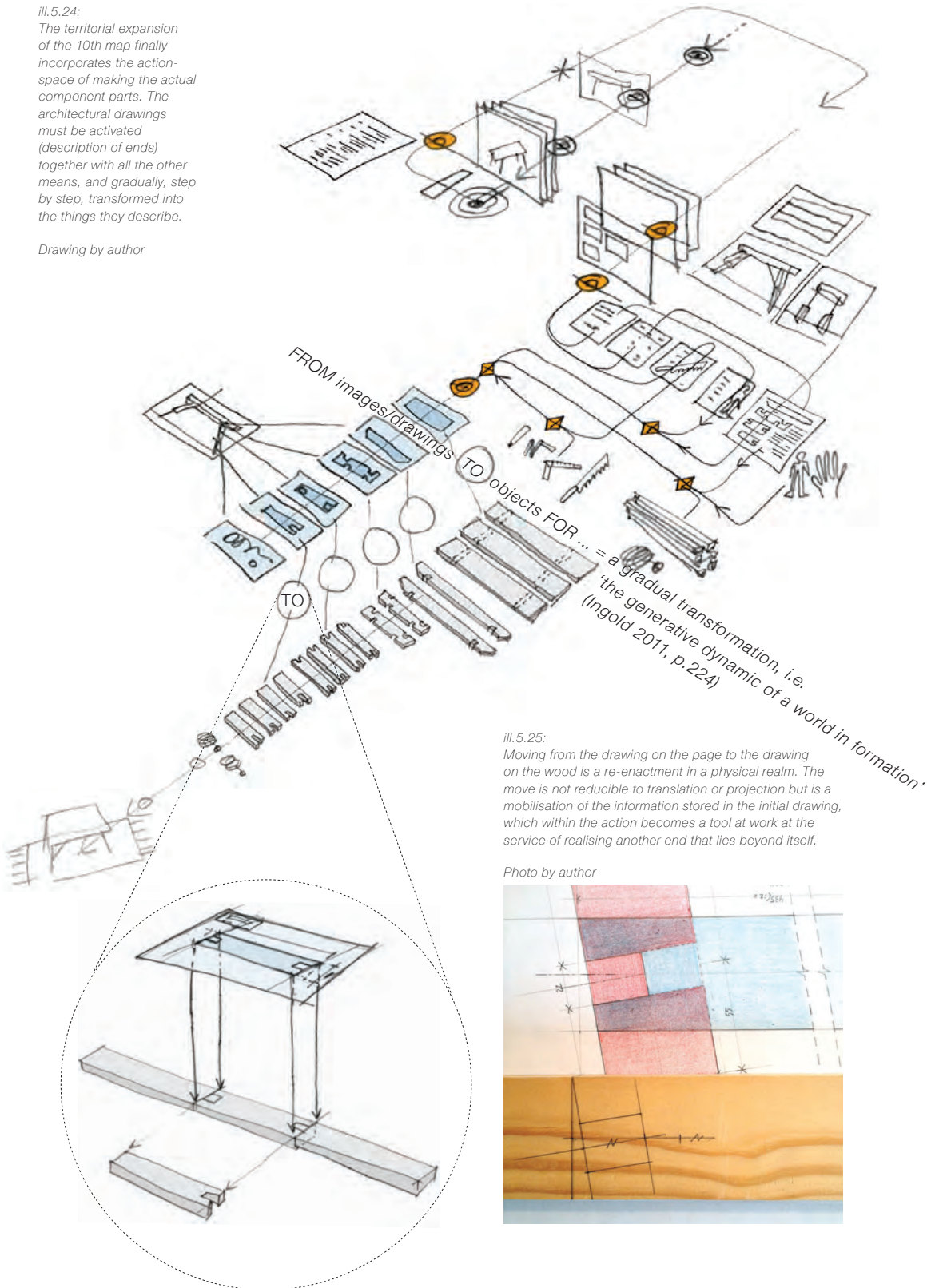
53_ Bortoft 1996/2013, p.286.

54_ Bortoft 1996/2013, p.214. Extrinsic in the sense of formulated in terms of something other, '*i.e. separate from the phenomena... Extrinsic explanation is the mode ... typical of theory-based science. But through attention to the concrete, i.e. to the phenomena ..., we ... encounter the qualities of the phenomena without any concern for their supposed ontological status as dictated by a theory. ...it is when we experience qualities that the relationships among phenomena begin to appear, and the phenomena thereby become mutually explanatory*'

55_ Allen 2009, p.45

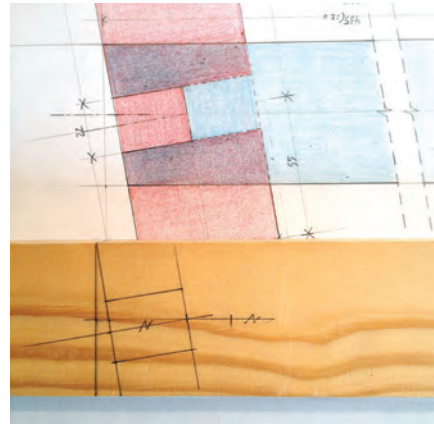
ill.5.24:
The territorial expansion
of the 10th map finally
incorporates the action-
space of making the actual
component parts. The
architectural drawings
must be activated
(description of ends)
together with all the other
means, and gradually, step
by step, transformed into
the things they describe.

Drawing by author



ill.5.25:
Moving from the drawing on the page to the drawing
on the wood is a re-enactment in a physical realm. The
move is not reducible to translation or projection but is a
mobilisation of the information stored in the initial drawing,
which within the action becomes a tool at work at the
service of realising another end that lies beyond itself.

Photo by author



MAKING AS PROJECTION and MAKING AS GRADUAL TRANSFORMATION

The drawings show the ends to achieve but do not indicate how they can or should be transformed into the objects they depict. The invisible process of transformation underpins Tim Ingold's argument that the generic view of making interprets the movement from drawing to object in terms of projection: *'It is a view that understands making as a project, by which an idea, already framed within the imagination, is realised in a material substrate pre-prepared to receive it'*.⁵⁶ This argument is in accordance with others like Robin Evans, who argues that the space that links image and object is deliberately modelled on projection.⁵⁷

At first this appears to be confirmed by the action of transferring the drawing on the page by tracing it onto the outer surface of a piece of squared timber from which the part will be extracted. This operation unknowingly suggests that the drawing slides without noticeable change from one support to another. What actually happens instead of the projection of a forecasted model upon the surface of the material needing transformation, is a re-enactment consisting of a sequence of actions of inscription that re-trace the drawing upon the new surface.⁵⁸ The apparently simple transfer of the drawing from page to wood is more complex than what the simplified abstraction of making as projection suggests. The temporal space in-between an initial and final state is not empty but a process punctuated by actions and operations, most of which need preliminary ones themselves. The latter is also a reason why a construction process is discontinuous. The question is then what happens during the time in-between code and part, between signifier and referent.

Tracing the drawing on the wood is only one stage of the movement that leads from an image of the part to the part itself. First, the nature of the image transforms from a graphic representation (on the page) describing geometry and dimensions, to marks that indicate places where certain actions will have to be undertaken. Due to the transfer to another support the lines of the drawing acquire additional and/or different meanings altogether by becoming part of another context. From outline initially connoting outer limits (0&1 - see drawing on p.344) the meaning slides to a

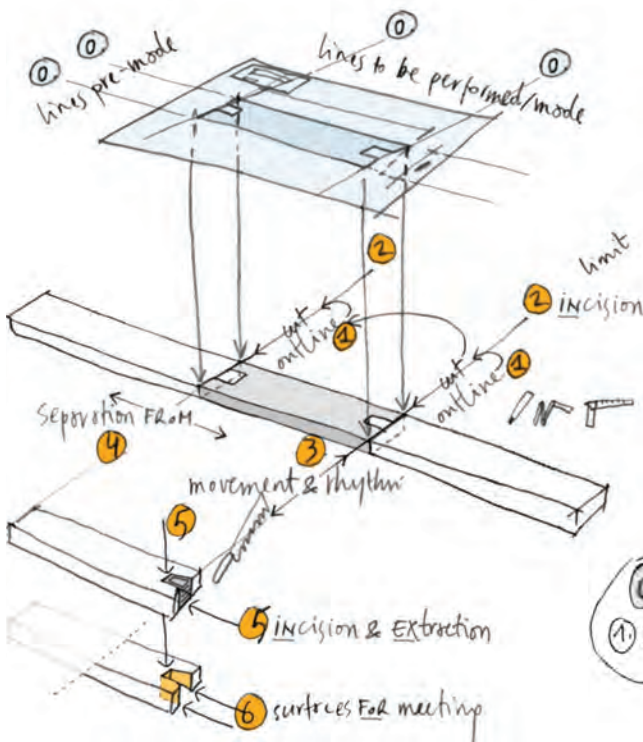
56_ Ingold 2011, p.177

57_ see also part 2 'Construction IS, section 2.I What We Talk About When We Talk About Construction', chapter Construction IS: Making, C.3- Interpretation.

58_ see also part 4 'Constructing With', section 4.I 'Constructing with Lines'.

Multiple and gradually changing meanings of the lines through discontinuous and rhythmic sequences of actions.

- 1.- outline / outer limit - boundary / end - edge - side
the line is an abstract line / a line from point to point - node to node - coordinate to coordinate
- 2.- line of inscription ON the substance - matter - material
- 3.- line of incision - cut IN ...
- 4.- line of separation - away FROM ...
- 5.- line of movement FROM ... TO ... / forth and back
- 6.- line of/FOR meeting WITH ... referring to where the line goes towards, i.e. another line, another context, another belonging, a new togethering with something outside of itself.
- 7.- line of (incremental, gradual, ...) adjustments



lines in discontinuous sequences of actions

- ① outline
line of outer limit
- AND ② line of inscription ^{fabric} ON the substance
- AND ③ line of incision - cut ^{on} IN something
- AND ④ line of separation - FROM
- AND ⑤ line of movement ^{from to} back and forth
- AND ⑥ line of meeting ^{and} surfaces ^{on which} ^{& rhythm develops} WITH
- prepositions

① = in the drawing
① > ⑥ = meanings unfolding and gradually becoming visible and present = i.e. emerging in and from the process.

ill.5.26:

Map nr.11 provides another perspective on the nested sub-process depicted in map nr.9 on p.340. It highlights the discontinuous sequences of actions that are carried out to extract a part from a piece of wood and the choreography of movements from line to line to surface. From the outset and with each movement, the lines guiding actions and operations gradually acquire new meanings in accordance with the newly created relational situation, which is confirmed by the change in prepositions.

Drawing by author

line indicating the place where an incision within the wood must be realised (2), and a line along which a parallel rhythmic movement back and forth will be made by a saw and the hand/arm/body that drive it (3), to subsequently become an area where first a separation will occur (4) and subsequently an extraction (6) after additional incisions were made (5). During the process the out-line represented in the drawing transforms into outer surfaces that will function as interfaces for parts to meet other parts or an outside world, for instance a floor. The prepositions mentioned in the drawing on the left, i.e. on, in, from, to(wards), for, with, etc., express those relationships at work between things and their gradual modification in time. Jane Rendell refers to prepositions as ‘transformational messengers’.⁵⁹ For instance, the line of incision is the place where the saw will meet the wood and will then penetrate it, or in other words, be within it for a while, until the moment when the cut will be fully made and one section of the squared timber will separate from the other, in order to later on be related to or come into contact with something else. Making and/or construction manifest themselves as ‘generative movement/activity’ and are definitely not reducible to merely projection.⁶⁰

All of this implies an activation of the drawings, that is, bringing the drawings into use as tools within the practice of making the thing that is described by them.⁶¹ The meaning of the concept ‘bringing into use’ must be interpreted in the same way as Tim Ingold does: *‘Instead of thinking of use as what happens when we put two, initially separate things together —an agent with certain purposes or designs, and an instrument with certain functions— we can take it as the primary condition of involvement of the craftsman, with his tools and raw materials, in an environment. Tools are not so much used as brought into use through their incorporation into an accustomed ... pattern of dexterous activity. Intentionality and functionality are not pre-existing properties of the user and the used, but rather immanent in the activity itself’*.⁶¹ At this stage the status of the drawings changes; from being ‘working drawings’ they must become ‘drawings at work’. It amounts to mobilising the projected information that is arrested within the drawings.⁶² They are no longer ends in themselves, but have to become

59_ Rendell and Wells 2001, p.136

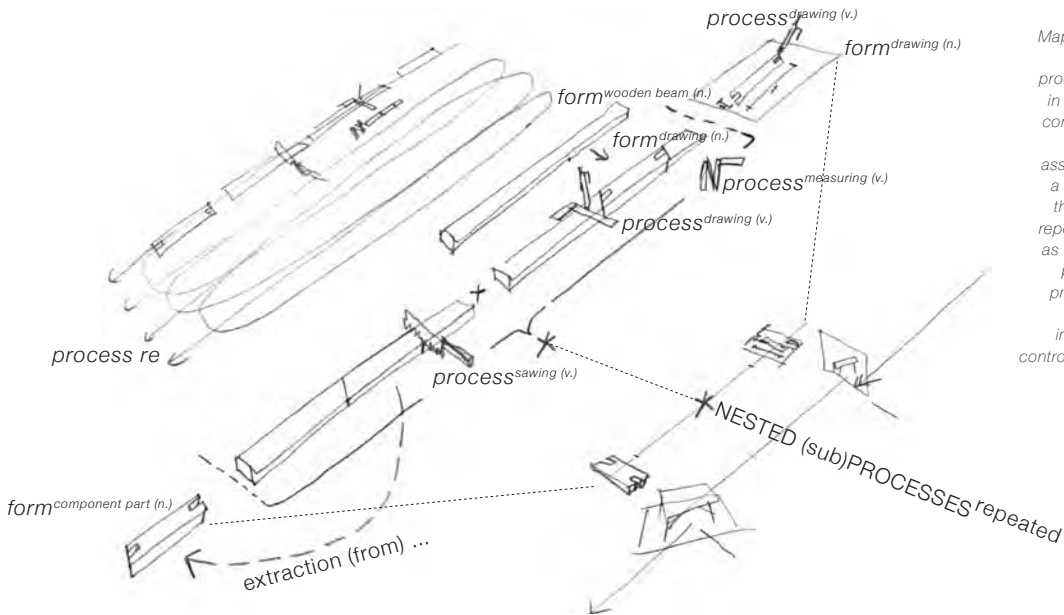
60_ See also part 2 ‘Construction IS’, section 2.1 ‘What We Talk About ...’, chapter ‘Construction IS Making - motif M.3 ‘Potentiality of Becoming’: The process is not as simple as giving form (active) to matter (passive, but the core is a ‘process of transformation, which Gilbert Simondon calls a process of becoming.

61_ Ingold 2000/2011, p.352

62_ Evans 1989, p.19

operative instruments for achieving other ends. However, the information the drawings presumably contain -that is, their potential meanings- is implicit and virtual, and has to be made explicit and actual.

The meanings are not unambiguously given but gradually emerge from or are revealed through use within the context of a process, and they are dependent on those who read and interpret the drawings (in this case the students as makers), and the context within which this happens. The process of construction and its gradual unfolding becomes a means for gaining access to the multiple potential meanings that drawings can contain, and that would otherwise remain hidden due to the lack of a context within which they can be revealed.⁶³ When drawings are predominantly seen as ends in themselves, this generative capacity is kept inoperative and as a consequence cannot be experienced and learned. In many cases the drawings were initially seen as



ill. 5.27:
Map nr.12 is yet another view on the nested processes incorporated in map 9 and 10. Each component has its own production process associated to it, and for a set of identical parts the process has to be repeated as many times as there are parts to be produced. The serial production of identical parts requires the introduction of quality control and calibration into the process

Drawing by author

ends, and not used as geometric models for making the wooden parts, not as control tools for judging accuracy, nor as references for calibrating. This became particularly noticeable in the fact that no preliminary tests or so-called prototypes were made to test the inter-relation between drawings and wooden parts, and the production of the entire series of parts was started at once without this preliminary preparation phase where potential complicating issues can be expressed.

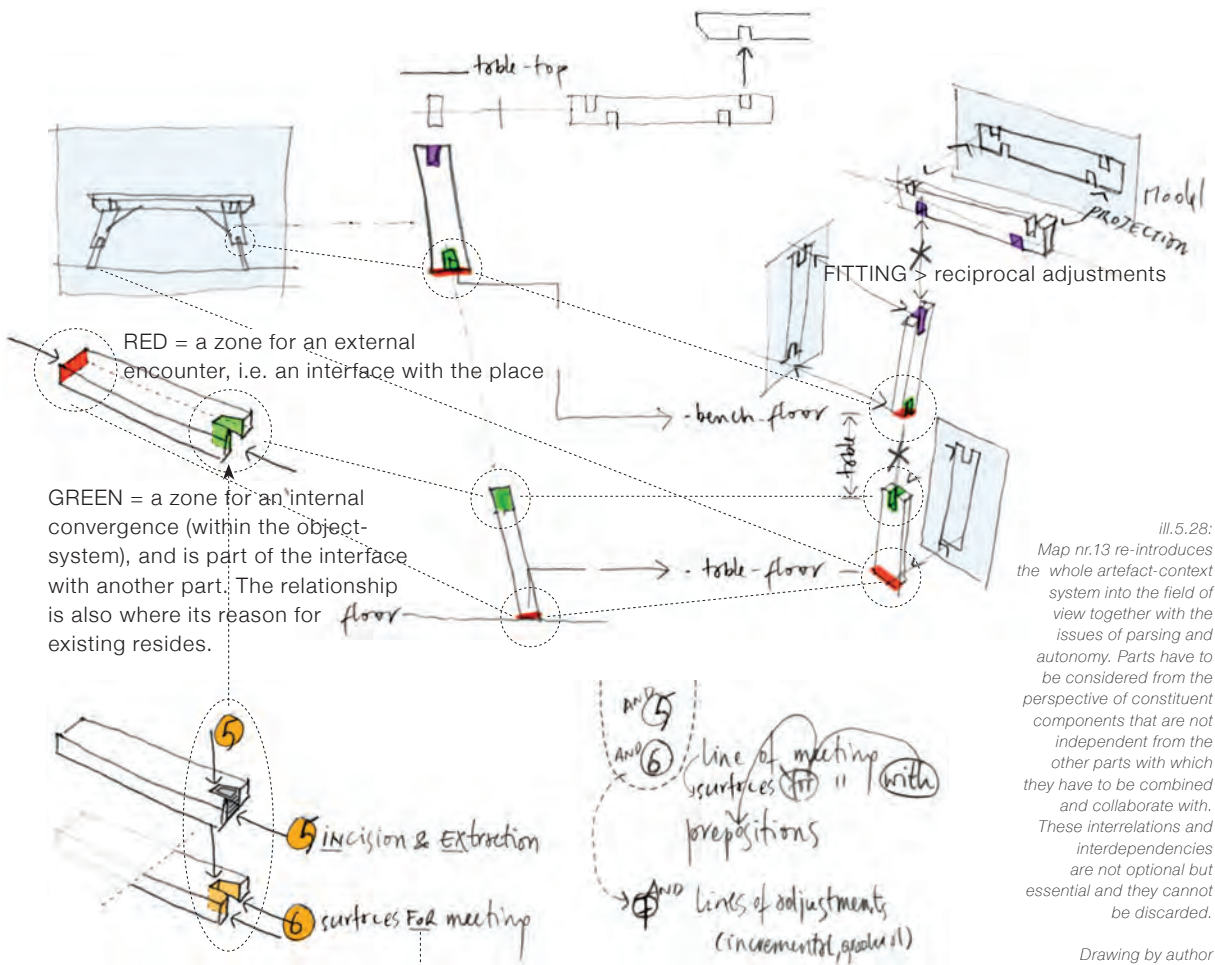
63_ See also part 3 _ Constructing With, section 'Constructing with Lines', chapter Lines on Site.

But the drawings have to inform the process, and through it also the object that is produced by its means. Conversely the process also and reciprocally informs the drawings, and it does so in two distinct ways. First by providing a framework for the interpretation of the drawings themselves, and second by means of feedback.⁶⁴ Using the drawings for the purpose of making the object provides indications on how the drawings actually help to perform the necessary actions in that specific practice. When the students made their drawings, they reckoned that those would be usable for realising the goal without notable problems, i.e. that they were finalised or finished. However, this was not always the case, and sometimes the inadequacies and/or incompleteness of the drawings led to difficulties during the process of making. For instance, most sets consisted of drawings at scale 1:2 or 1:5, including for the individual parts. When the actual production of the parts started a need for drawings at scale 1:1 quickly emerged in order to avoid the errors made due to re-scaling in action when transferring/re-enacting the drawing on the page to the part (see above), and to make it possible to do a check-up of the geometry by placing the part on top of the drawing, which actually is a kind of quality control.

Regardless of the frustration it caused, this finding was nonetheless crucial, because it disclosed flawed assumptions, showed where adjustments were needed and improvements could be made. The shortcomings of the drawings when brought into operation incited many to take a step back and start re-drawing, which demonstrated their capacity to perform what Bateson refers to as *'perfecting adaptive acts'*.⁶⁵ Improvement is fully dependent on a prior execution of actions from which feedback about shortcomings in a process can be sourced. Construction includes incremental rectifications and adaptations achieved through recursive gestures, and both the implications and importance of this would be excluded from the process of learning without participating in the process of formation.

64_ Leatherbarrow 2000, p.89: *'Architectural drawings are not only instrumental but interpretative, or biased toward the 'hidden' and constitutive depth of the world we inhabit, which is also its potential'.*

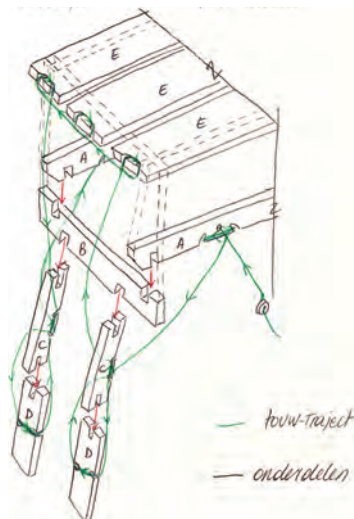
65_ Bateson 1979, p.211



ill. 5.28:
Map nr.13 re-introduces the whole artefact-context system into the field of view together with the issues of parsing and autonomy. Parts have to be considered from the perspective of constituent components that are not independent from the other parts with which they have to be combined and collaborate with. These interrelations and interdependencies are not optional but essential and they cannot be discarded.

Drawing by author

'FOR' refers to a new context, a new belonging, a new togethering with something that from the perspective of the individual part is outside of it. Through incision and extraction the part is hollowed out in order to create the capacity for meeting, containing and collaborating with another component part, together with which it will form a new thing; in this case an element bearing the name table leg. Hence, 'FOR' also connotes 'at the service of ...'.



ill. 5.29:
The exploded view of constituent parts is a cartography of relations in the first place, i.e. more than an overview of instructions for assembling the pieces of the puzzle

Drawing by
Tatiana Darnovsky
student participating in
the course

SEPARATE vs. TOGETHER

At the end of the generative sequence from drawings to material parts, the latter can be considered completed in themselves. This has to be taken quite literally, i.e. finished from the point of view of the individual entities. From the perspective of the collective however, they are not necessarily. The aim is not to produce a collection of independent components but an integrated whole in which the parts are assembled and put into operation together. Within the realm of the drawing the way in which the parts meet is indicative and limited to an abstract representation of principles. As such they possess no intrinsic necessity nor noteworthy implications. In the tangible world of matter and forces however, the way in which things touch, connect, interact and work or act together is of vital importance and cannot be ignored in any way, because assemblages/constructions are dependent on it for their coherence and integrity. In drawings things cannot come apart, and relationships remain theoretical. For physical objects/structures however, operative relations are existential necessities.

Joining parts has both generic and specific aspects: on one side the abstract principles of technology that appear applicable in a similar way across situations; in this case a variation of the principle of the cross lap wood joint; and on the other side the particular conditions in which parts have to be made to fit together, that is, where, how and why this particular part has to be adjusted to one or more other singular ones. In that case the general principle must be transformed into a kind of made to measure.

David Leatherbarrow argues that a distinction must be made between past practices of construction that are defined by '*the putting together of materials*' and contemporary practices based upon '*the joining together of elements*'.⁶⁶ In his description they appear as entirely different approaches. This may very well be, but the main point is not exactly that. The putting together of materials and joining together of elements refer to ways in which one proceeds and work is organised. They therefore denote method. But this however is something altogether different than what I allude to above, namely the more general class of joining or togetherness things, which is a fundamental requirement, and not a method to be implemented. Not less important, it denotes an overarching concept of construction as a mode of togetherness,

66_ Leatherbarrow 2000, p.97.

oriented towards bringing things together in collectives, congregations, assemblages, constructions, structures, wholes or any other name assignable to them: *'the principle of togetherness is not ... just resting together [but] is also movement and encounter ... [of] things all at once. Togetherness binds all things ...'*⁶⁷

Drawing the whole, subsequently drawing the individual parts, and then actually making them are challenges in themselves, but the nature of the work and its implications differ. Drawing a line with a pencil on a page is 'easier' to control than the making of an incision in the fabric of the wood. In turn, controlling the quality of the cut when making it -aligned, planar, parallel, or in other words, regulated- is way more difficult than both drawing the line and starting the incision. When making the drawings on scale many students claimed that this was hard to do, but once involved in the actual process of making the parts themselves, they shifted their position and argued that making the real stuff was actually more complicated than making drawings. Reasons for this are amongst others: that one has to consider several issues simultaneously; that some materials and tools are more recalcitrant than pencil and paper, meaning that they in-form backwards in other ways and are also harder to handle; that the physical making is another kind of bodily activity; that issues of control and precision are of different nature, etc. This kind of experience might affect how those performing the actual work on building sites and workshops are appreciated and addressed, but that is an as yet unchecked speculation

Little by little the complexity increases and the risk for errors follows along. The issues that emerge relate to the distinction David Pye makes between the workmanship of risk and the workmanship of certainty: *'If I must ascribe a meaning to the word craftsmanship, I shall say as a first approximation that it means simply workmanship using any kind of technique or apparatus, in which the quality of the result is not pre-determined, but depends on the judgment, dexterity and care which the maker exercises as he works. The essential idea is that the quality of the result is continually at risk during the process of making; and so I shall call this kind "the workmanship of risk": an uncouth phrase, but at least descriptive. It may be mentioned in passing that ... the care counts for more than the judgment and dexterity; With the workmanship of risk we may contrast the workmanship of certainty, always to be found in quantity production, and found in its pure state in full automation. In workmanship of this sort the quality of the result is exactly predetermined before a single saleable*

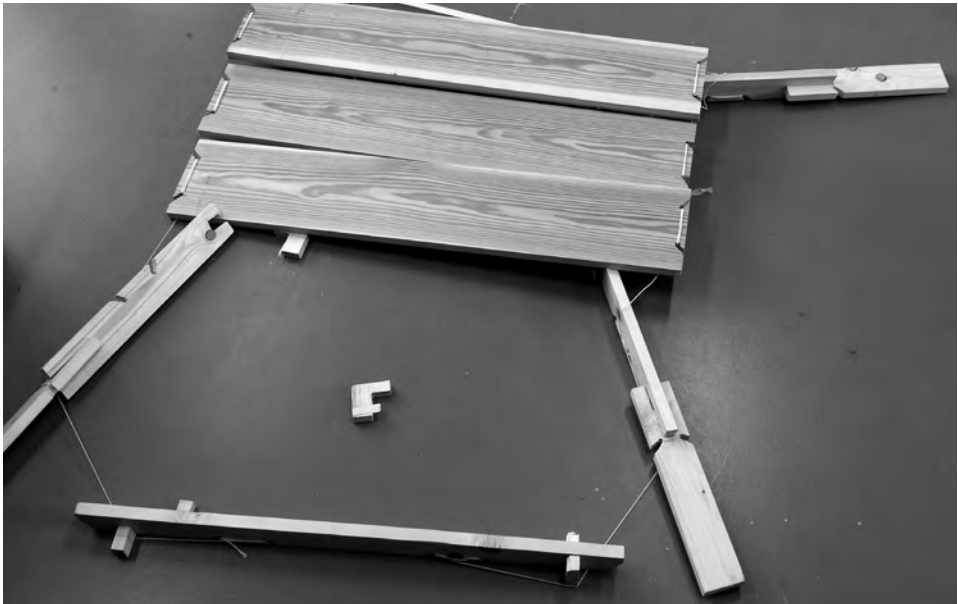
67_ Ingold 2011, p.221. Geographer Torsten Hägerstrand is referred to as the source of the concept of togetherness.

thing is made'.⁶⁸ Besides the increasing laboriousness of what has to be performed, an additional challenge is to keep the actual joining of parts in check. Rather than keeping the components separated and independent from each other during fabrication they need to be brought together at set moments to test the mutual fit and ensure that the requirements created by the reciprocal dependence are addressed. The principle of the cross lap wood joint demands -and also entirely depends upon- neat and precise mirroring extractions from each of the parts in order to realise the reciprocal reception. When the spaces for insertion are shaped separately and in the absence of the partnering parts, the likeliness of things going wrong increases. The reason is that the mutual fitting cannot be tested, and therefore the corresponding feedback in process is also lacking. A repeated consideration of the reciprocity between parts, i.e. parts being a context for other parts, cannot be postponed until the moment of final assembly, but must be take care of during the production itself. It is again a token of the ultimate interconnectedness between whole and parts. A unilateral or unbalanced consideration of one of both at the expense of the other is bound to fail, as many of the students experienced the hard way during what they hoped would be the final montage.

The last set of construction-process-actions to be performed relate to putting/ joining all the component parts together to create the actual table. In so doing the latent (virtual) capacity for relations that the parts possess, is transformed into actual and active relations within the whole, and with the milieu in which the table is situated. The connection is realised by sliding the wooden parts into each other. However, these wood-connections are still not secure in one specific direction of loading, namely axial pulling or traction (they only work in compression), meaning that the parts do not posses the capacity to stay together or cohere in a number of situations and when subjected to certain uses. To avoid an inadvertent dismembering of the table when the wrong kind of force is applied to it, for instance when lifted up, flexible and soft threads need to be added to provide the necessary tensile (re-)action. What is at stake goes beyond the connections and the sustained integrity of the structure in time. It also affects the method of assembly in the sense that the table can best be assembled upside-down, then tied together with both strings to finally be lifted and placed on its legs. The reason is that approaches that provoke a pulling of some sort at this stage are either difficult to execute or not feasible, as many students only found out by doing.

68_ Pye 1968/1995,p.20. See also part 4_Constructing With, 4.II Constructing Things for Constructing Other Things, and part 3_Territories, 3.II Encounters, Queer Bricks. David Leatherbarrow's distiction between putting together of materials and joining together of elements is also related to this issue.

Throughout the temporal sequence of the overall process new situations and information recursively emerge, requiring consequent evaluations and responses. Existing information has to be re-situated in a modified context, must be applied, re-framed and in some cases modified to respond to changing conditions. In the midst of novelty-emergence, existing skills and knowledge are called into question. This leads to a necessity to expand them and learn new ways, which in turn demands capacities to adapt and be resourceful.⁶⁹ This is another indication of why it is relevant to consider process as a domain to get involved in and enquiry about.



*ill. 5.30 & 5.31:
The implications of
quality requirements,
control, precision and
interconnection,
or a lack thereof*

Photos by author



DIALECTICAL RELATIONS BETWEEN FORM AND PROCESS

'Construction not as a state to achieve, a construction, to be completed once and for all, but rather as ... a process of inquiry into what happens when one constructs. A process of placing things into configurations and inquire into what happens from the resulting arrangements'.⁷⁰

First, a recapitulation: Initially and by means of a process of planning, observation, drawing, measuring, calculating, etc. the necessary information was produced and fixed for future use. After that, a complex process of making/formation that consisted in an array of nested sub-processes and multiple converging and diverging trajectories brought a tangible built object into existence, i.e. the actual table. In this productive process the previously created information was put into practice as a set of instruments, which provided feedback on whether they actually function when used and how they do it. Once the table exists as a singular object, it can itself start its participation in the multiple events of life, and be subjected to the manifold range of anticipated and inadvertent uses that can be made of it.

Once the table exists, it can be put into operation in multiple ways, and in so doing, the experience gathered in action through participation in the event spaces of making situated behind the work (upstream/past) can be connected with the implications that this historic process can have for subsequent happenings in time, that are set in the space in front of the work (downstream/future). The itinerary of learning does not stop with finalising the object, but has to be carried on by performing additional (inter-)actions with it. The most straightforward and accessible one to go into is the space of inhabitation where the table is set, used and misused, maintained, repaired, and so forth. In order to provoke a participation in this domain and make it integral to the exercise, I asked a volunteer from each group to do the theoretical part of the final examination of the course at the table of their making, or in other words to unknowingly apply the grime of life by actually using it for a while, rather

69_ See part 2_Construction IS, section 2.II 'Patterns of Interaction between Process and Form', chapter 'The Dissociation between Process and Form'.

70_ Pye 1968/1995,p.20.Rajchman 1998, p.80

than merely keep on looking at it from a safe distance. It is a way to move beyond the thing made and get feedback through active engagement with it. Utilizing the table facilitates an evaluation of the object's capacity to do what is usually expected from it, that is, whether it can fulfil its so-called function and whether it does some other things too, including undesired ones.⁷¹ When the object has been 'well made' the probability is high that it will be able to perform as expected and wished for. If not, all kinds of problems come to the fore that are an indication that something went wrong during the prior process. The emergence of this information through use, provides feedback and the possibility to identify the places where more care was needed and where improvements can be achieved. The hypothetical implications of abstract disciplinary concepts like for instance strength, stiffness and stability turn out to be very real and palpable when the object becomes part of a situation in which it is subjected to physical forces and impacts that result from activities and other objects.

It also, and not in the least, demonstrates why certain requirements must be met, and to what kind of consequences a lack of adequate knowledge, attention or poor judgement can lead. A number of the issues that came to the fore were for instance: the brittleness and (lack of) hardness of the wood; the lack of tightness of the (cross lap wood) joints between the wooden parts, leading to hinging meetings and rocking tables; the use of the wrong type of rope, a lack of tying and loose knots; table legs having different lengths and/or inclinations, etc. In some cases the outcome was dramatic, like splitting parts or total breakdown of the system. Those tables appeared too fragile and were actually not usable. At the same time there were others that worked perfectly, and therefore showed that it can actually be done. The latter may seem trivial or obvious, but is actually critical.

The presence of the different outcomes with their diverging properties and behaviours, makes it possible to compare and organise an exchange on what is needed to achieve good qualitative results. It provides the context for the students to explain their choices to each other as peers, and why/how they made them, meaning that they can share the knowledge they acquired in action. On top of that, general (theoretical) principles can be explained in direct connection with their application and the learner's actual experiences, which aids the assessment of their relevance. The splitting, brittle wood thematically points at properties of materials, relevant distinctions between wood

71_ See Pye's comments on function in part 2_Construction IS, section 2.1 Construction IS Making, Making motif M.2-. Qualities / Properties and Capacities

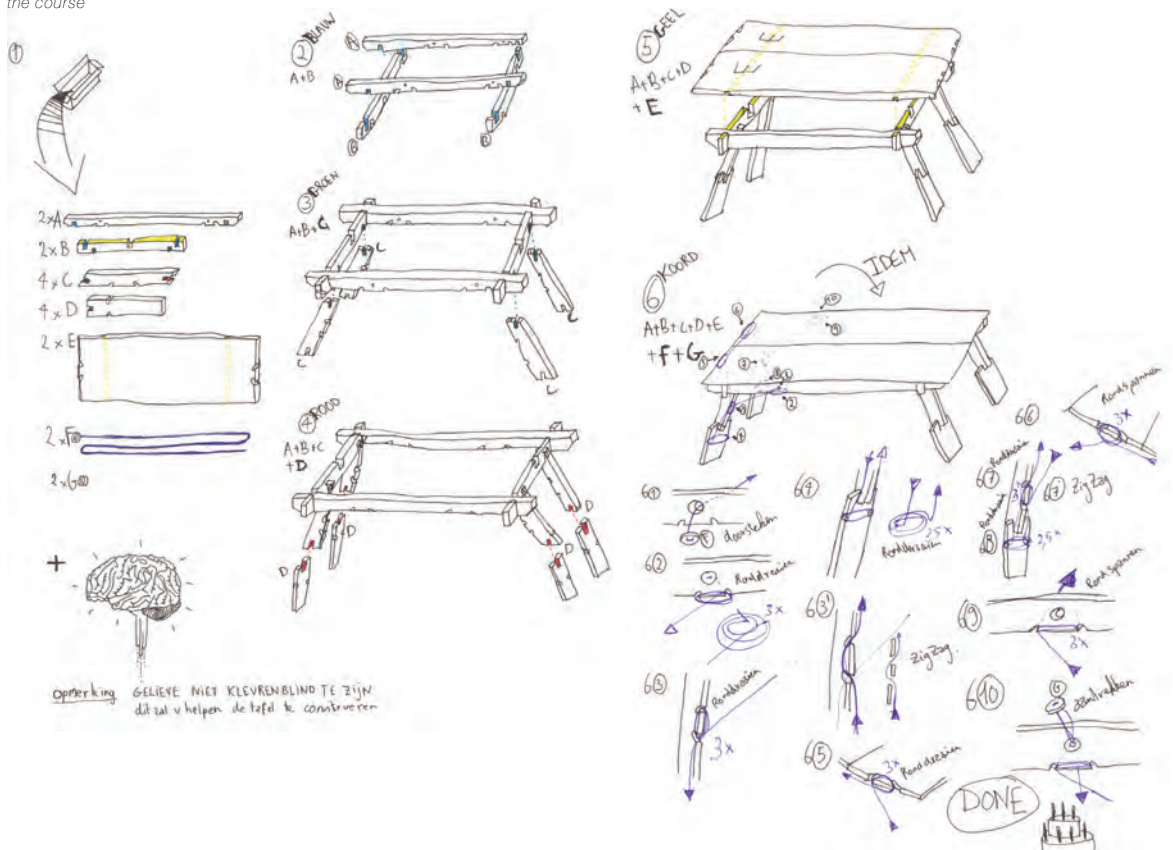
types and structural strength among others; the hinging parts to the importance of realising secure connections between components and the need for internal coherence of the system; it is also evidence of the relevance of controlling tolerance, achieving the necessary degree of precision, and of the essential requirement of structural stability; The principle of the cross lap joint in combination with the tie rope reveal that forces have directions, that these are dependent on the way in which loads are applied and that these are also defined by circumstances; that a number of situations need to be anticipated upon to guarantee consistency and security; etc. This overview can be expanded in this specific case, and others can be presented through alternative cases.

Besides the actual use of the constructed object, another set of actions paves the way towards changing levels of generality, abstraction, and mediation. The first task stayed close to the process they went through for making the table. I instructed them to make an enabling guide or manual for future makers, to incite them to share their own experiences and transform them into something that can be instrumental for others, that is, to come up with knowledgeable information that goes beyond what is, and is oriented towards future action. It stimulates a reflection on the process, unknowingly requires to re-focus on the script, and to formalise specifications and

ill.5.32:

One of the proposals for an enabling construction manual, describing the sequence of assembly leading from individual parts to a table

Drawing by Anton Parys student participating in the course



A diagram of a trapezoidal frame structure. The top horizontal member is labeled with a normal force N . The two vertical side members are labeled with shear forces V . The two diagonal members are labeled with axial forces N . The bottom horizontal member is labeled with a normal force N . The frame is supported by a pin support on the left and a roller support on the right.

Deze handleiding bevat de instructies voor de constructie en montage van de tafel.

54. I $\frac{1}{2}$

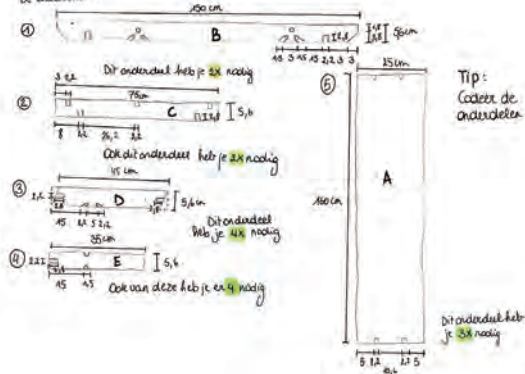
- Houten vloeren met dekkende
- Tegen van de muren
- Gevels
- Zonnepanelen
- Buiten (van 1,5 cm)
- Potten en bakken
- Vrij de ruimte
- Wandlatten
- Wanden

STAP 1

LET OP: Reep Raut dat nóg genoeg is en maak sectie 11-56.

Wij gaan op het roost de onafhankelijke tekennen. Zie dat de tekening op beide flanken van het roost staat.

De onderdelen:



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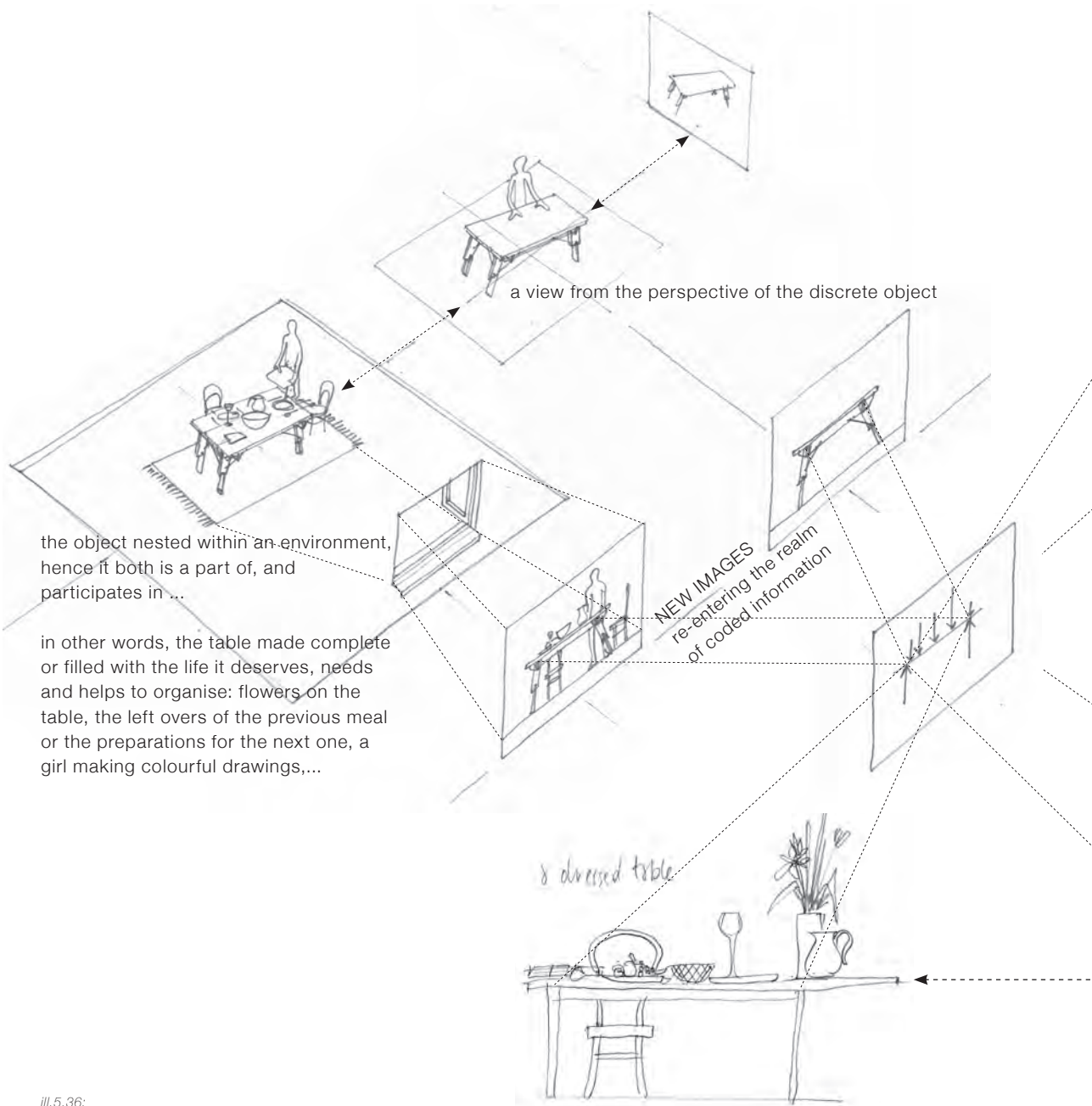
*Drawing (ill.5.33) top left
by Laura Vanderdonckt
Drawings (ill.5.34) bottom
(left & right)
by Sophie Leemans
students participating in
the course*

instructions needed for organising, performing and realising a work. As a consequence one has to face questions related to what a model for operating needs to contain or what and how much has to be described in order to reach the adequate levels of predictability, repeatability and control. Amongst other things this requires an interpretation of the principles of parsimony and redundancy, as well as the degree of precision and detail that is needed to ensure conformity to the model. An additional issue is related to how a process can be captured and represented, knowing that a manual can only contain forms, i.e. scattered information fixed in multiple guises; it is a graphic, metric and verbal apparatus describing ends and means that must enable the makers to re-produce the object, but ultimately needs to be made operational in an event-space. The process itself cannot be presented, only its organisational structure or ordering of moments along the process-lines can be.

The transactional domain between process and form can also be engaged by means of the instrumental substitutions of the thing itself for one or more of its representations inherent in architectural notation. A typical example of the generative capacities of coded diagrams are those of architectural engineering that are made specifically for understanding and conceiving the load-bearing structures that architectural constructions cannot do without. The drawing made up of lines and arrows is an abstract diagram that is both reductive and operative. It provides the possibility to both map and navigate across relations between architectural hardware and multiple uses that can be made of it and in doing so also act upon it.

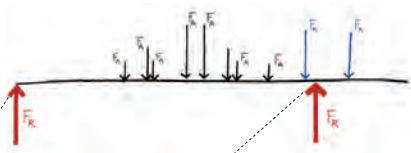
It manifests itself as a simplification but has an impressive potential for variations and ramifications. When the diagram is the representation of something that already exists, it is reductive and purifying and an example of *‘abstraction as a process of extracting pure or essential forms, emptying a space of its concrete contents...’*. The reduction and purification consists in a movement away from material support, and the particularities of real existence.⁷² It is oriented towards increasing levels of generality and based on what things have in common. But a diagram can also be looked at as a complexifying and operative abstraction. The complexifying abstraction is *‘concerned not with extracting information from things ... but rather with finding within things the delicate, complicated abstract virtualities of other things. Such abstraction doesn’t entail independence or transferability from material support and doesn’t operate according*

72_ Rajchman 1998, pp.7-8 and p.56



ill.5.36:
Photos by author





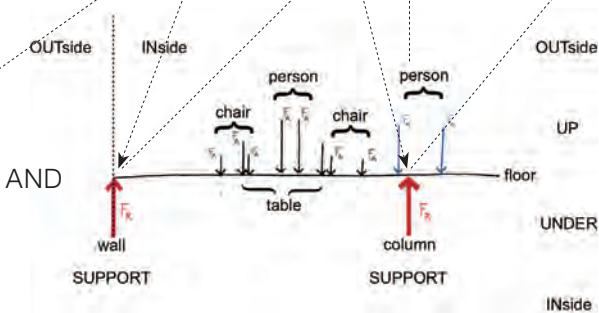
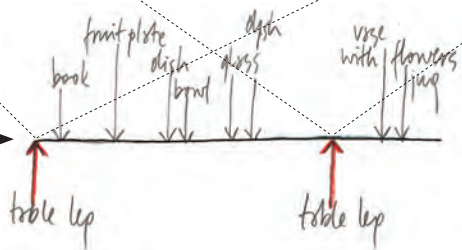
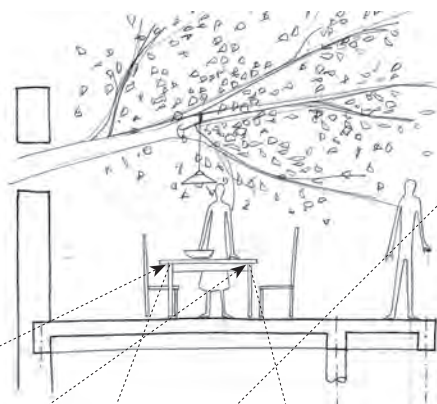
ill.5.35:

The 14th and for the time being final map of the series extends over the surface of three pages (pp.360 to 362), and consists in a combination of photographic images, diagrams, drawings and the web of interconnecting lines and arrows. It is part of sustained attempts to find complexifying rather than simplifying approaches for visualising, organising and understanding architectural construction and architectural technology. It is based on the combination of multiple modes of articulation and notation that provide access to different points of view, for instance those associated with specific disciplines or other categories of knowledge and practice.

It relates diagrams, formulas, metric information and concise definitions with poetic ruminations; interconnects places, typologies and morphologies by using the multi-directional and both generalising and particularising capacities of abstraction.

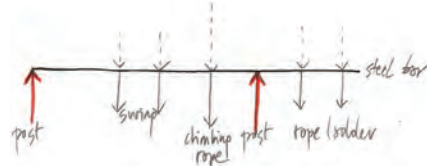
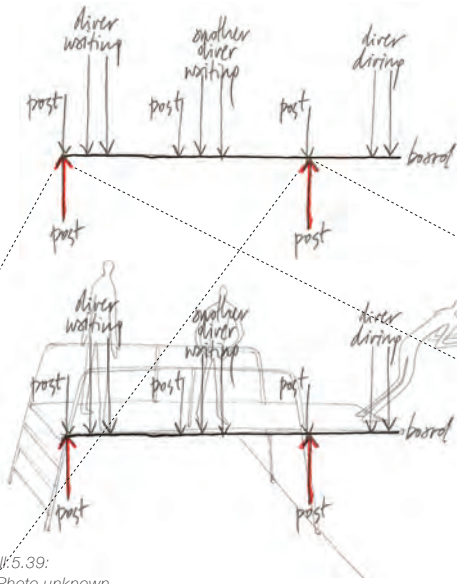
Drawings by author.

diagrams for mapping forces/impacts,
for anticipating performance on the
level of the load-responding parts, for
shaping and dimensioning
AND
potentially,
diagrams for mapping (multiple) uses

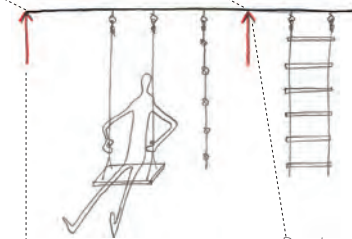


ill.5.37:

Photo by A. Dewes / S. Puente - La Casa del Ojo de Agua
in The Architectural Review 1132, 1991



ill.5.39:
Photo unknown



ill.5.38:
Drawings by author.



ill.5.40:
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ill.5.41:
Photo unknown



ill.5.42:
Photos by author.

to a logic of simulation'.⁷³ In that case, the configuration specified by the diagram, 'is a description of potential and yet to be realised relationships among elements, ... a map of possible worlds', anticipating new organisations rather than merely being simplified graphic representations of already existing objects or systems. 'The diagram is not simply a reduction from an existing order. Content is not embedded or embodied, but outlined and multiplied'.⁷⁴ They define the structure of a space of possibilities,⁷⁵ and affirm 'spaces of construction and of what can yet be constructed with it' (Rajchman 1998, p.7).⁷⁶ Stan Allen emphasises that in architecture, the diagram is a graphic assemblage, and notational by necessity, since it must be reproduced at a distance from the author. [Its] variables include both formal and programmatic configurations: space and event, force and resistance, density, distribution, and directions.⁷⁷

The diagram drawn with lines and arrows is a composition of symbols that denote concepts used within a community of knowledge and practice.⁷⁸ Again, it defines a specific 'field of visibility' that expresses potentially meaningful content in a particular mode. 'It is not a neutral vehicle transporting conceptions into objects, but a medium that carries and distributes information in a particular mode'.⁷⁹

In architectural technology the arrow is identified as a vector. This is an individualised entity that is depicted in mathematical terms by a number of fixed quantifiable and geometrical properties, and given additional meaning by applying labels like force and load. On the one hand the symbol is reductive, because it unifies things on the basis of a limited number of shared characteristics, regardless of whether it concerns the living or the non-living. But the purified vector-space merely hides differences, and it can also be apprehended as a capacious and abundant repository. The arrow has the capacity to be an orange and a brick wall, a person and a vase with flowers in it, a pile of books and a pile of dishes, wind and snow, a heap of sand, a

73_ Rajchman 1998, pp.7-8 and p.73.

74_ Allen 2009, p.51

75_ De Landa 2006, p.29

76_ Rajchman 1998, p.7

77_ Allen 2009, p.51 and p.50

78_ In the 'Typology of the Sign', Charles Sanders Peirce, explains that a symbol is a sign that denotes its object solely by virtue of the fact that it will be interpreted to do so. The symbol consists in a natural or conventional or logical rule, norm, or habit, a habit that lacks (or has shed) dependence on the symbolic signs having a resemblance or real connection to the denoted object. Thus, a symbol denotes by virtue of its interpreter. Its sign-action is ruled by a habit, a more or less systematic set of associations that ensures its interpretation.

source: <http://en.wikipedia.org>, accessed 11 may 2013.

79_ Evans 1997, p.199.

cabinet containing clothes, and many more. In Wikipedia the definition of force starts as follows: *'In physics, a force is any interaction that, when unopposed, will change the motion of an object'*. The key word in the sentence is 'interaction', which presupposes the presence of at least two things that are engaged in a mutual relationship.

Whether force is identified as that which is exercised by a vector or an orange, the baseline is that it is not independent but necessarily situated within a shared environment. The graphic construction with arrows and a horizontal hairline provides information about certain aspects of this context, for instance position, proportion and magnitude, but how these can be realised, at what scale or with what kind of materials remains open. This implies that the horizontal line in-between the arrows can be a wooden table-top from a table in a suburban house near Brussels; a floor and roof of a house in the Mexican jungle; a circular hollow steel bar to hang a swing in a garden somewhere; diving boards for both artificial and natural swimming pools; and a gantry crane in Göteborg's archipelago materialised with rectangular hollow sections painted in a striking blue colour. In all of those cases the line denotes an inter-face that mediates between the arrows underneath and on top of it, but each individual manifestation is situated within a different environment and event space, materialised differently and responds to specific demands and expectations. Putting the diagram in practice within a defining context makes a specific meaning emerge that would otherwise remain latent. It is precisely the total absence of context and other kinds of information in the abstract diagrams that provides the opportunity to move around and connect things that seem totally unrelated, except for the syntactic relational structure that can thus be both result and generative source of alternative connections in an expanded territory.

The aim is to achieve a more comprehensive understanding of construction in architecture, and not to inverse the hierarchy that usually puts theory first, by another that places practice first. Such an inversion would merely confirm the existing troublesome dichotomy and not correct, revise or mitigate it. For an increased understanding of what is in the balance, Stewart Brand's noteworthy interpretation of both aspects is useful as a starter: *'To completely re-understand buildings would require both of the fundamental approaches to knowledge - observation and theory. I called them look first and think first. ... I ... explained that there were two types of people in the world - those who deal with something new by really looking at it, devoid of preconception, versus those who prefer to form hypotheses first and then study the thing to see which ideas were right. Both are honourable and productive. With look*

first new perception changes understanding, with think first new understanding changes perception'.⁸⁰ What is missing here, is that the transactions between the two so-called fundamental approaches must be taken into consideration as well, to uncover how they intermingle and mutually affect each other.

Gregory Bateson emphasises that *'the zigzag sequence of steps from form to process and back to form (or the zigzag dialectic between form and process) is a very powerful paradigm for the mapping of many phenomena'*, and that *'it is clear both that structure [i.e.*form] may determine process and that, conversely, process may determine structure [i.e.*form]. 'It follows that there must be a relation between two levels of structure [i.e.*form] mediated by an intervening description of process'*.⁸¹ He claims that this can be applied to mental and biological systems, and to perception, and finally that learning and evolution can be modelled on the paradigm as well. More similar relations obtain on a more abstract level between speciation and variation, between continuity and discontinuity, between number and quantity, etc.

The approach to look for is one that has a capacity to emulate the zigzag sequence that Bateson refers to, that is, an organisational structure that instigates an active reciprocity between architectural construction in terms of form and architectural construction in terms of process. The discontinuous evolutionary progression from process to form to process to form, and so forth, or in other words, the recursive, alternating and generative interactions between process and form, provides a conceptual framework and a context for action, that is, construction as time-form.⁸¹

80_ Brand 1994/1995, p.211. Brand does not use the term practice, but observation instead. However, in the context described above, the argument remains intact when the meaning of the word observation is extended to encompass practice, or even when it is entirely replaced by it. Observation is a practice, both terms refer to process and action, and additionally also to ways of (inter-)acting with an in the world around us.

81_ Bateson 1979, p.210 and p.212

82_ See part 2_Construction IS, section 2.II 'Patterns of Interaction between Process and Form', chapter Construction as/IS a Time-Form; and part 2_Construction IS, section 2.I Construction IS Making, Construction motif C.3; and section 2.II 'Patterns of Interaction between Process and Form', chapter The Bi-Polar and Hermeneutic Relational Patterns of Construction.

6
EXIT

In the stretch of time that I have been working on this project, I have noticed or at least got the impression that there is a renewed and increased attention for architecture as a material practice. In my view it also seems to correlate with what I would call a revived sensitivity for the quality of execution of architecture's material fabric, also expressed by a forwarding of craftsmanship and material artistry as capacities that architects need to have. I believe this view is consistent with the tectonic tradition and the pervasive focus on architectural detailing. At the same time, architecture and architectural construction are increasingly confronted with a wide range of intricate issues that defy straightforward solutions: the extraction and exhaustion of finite resources; the disruption of environments; pollution and the production of waste; energy consumption and global heating; etc. These come on top of the traditional technological topics and their fit for purpose responses. But in contrast with the strictly dedicated methods and solutions for clearly delineated problems that have been developed in the past (and currently still are), contemporary conditions require integrated responses that are complex and multi-layered rather than autonomous, simplifying and dispersed. What is at stake in general terms is whether it is possible to adequately tackle the many exacting contemporary issues demanding consideration in architectural construction, if we keep developing strategies and solutions based on the reductionistic premises and principles used before, and remaining in use today? In my opinion this is very unlikely, because they do not provide sufficient and satisfactory answers to the wicked problems that we are facing. Moreover, some problems persist in the technological solutions proposed to tackle them, or they bring about new problems that in some cases turn out to be as big or bigger than the initial problems. By the way, this recursive emergence of new problems is something from which there is probably no escape, and maybe that in itself is not by definition a problem.

I am convinced that in order to tackle those wicked issues or to start doing so, it is necessary to look into the epistemological, cognitive and conceptual groundwork or support systems upon which the thinking about and the working with architectural construction is based. I believe that the field of visibility and possibility must be expanded and to make this possible, conditions need to be created from which now concealed and overlooked capacities of construction for architecture can emerge. This Ph.D. research is situated within this context, and it is where I hope its contributions

and proposed pathways for the future can be found. My conviction is that this particular problem space within architecture is in need of attention, articulation, and inquiry. It is also the context where I think a (re-)positioning of construction in architecture and architectural education must be provided. In this research I both argue for and contribute to this area of concern by instigating more complex, less reductionistic and more contextualised perspectives on construction that are also centred on process, relations and shared agency.

Below I review the areas of inquiry that I discerned and prioritised. I also assess some of the findings and propositions for attending to them. Taken together they are identified as ‘problem and potentiality spaces’. My point of view was and is that of the generalist rather than the specialist, and that of an intuitive designer than a rational technician or engineer. It should be noted that this is not in any way a value judgement. I developed informed responses from those perspectives, and by putting associated capacities, tools and methods in practice. I believe that the issues at stake are design problems that can be addressed with an assortment of (at times speculative) scenarios that go through recursive iterations. There are no strict unquestionable rules to obey and the register is open and inclusive. The conceptual principles of the methodology I used are described in the chapter ‘Way of Working - Making Connections’ in part 1_Preface, in which I draw attention to the principle/paradigm of ‘connections’. It designates both an attitude (a style of thought) and an approach (a way of doing), and revolves around the forging of relations for making synergistic combinations with emergent properties. It is a mode of practice that is empiricist, pragmatist and experimental, and that takes place within existing, already occupied and soiled material and conceptual ‘local environment-worlds’, where it uses the material that is available there. The emphasis lies on making and things in the making; on processes rather than states.

PROBLEM & POTENTIALITY SPACE 1 _

moving from autonomy towards situatedness
from the individual to the collective
from analysis/separation to construction/togethering

It is necessary to address the predominant analytical take on construction, and upend/amend it by means of an increased attention for, and emphasis upon the collective and its distinct capacities. The response consists in the development of a

number of arguments and methods that support an increased recognition that things/ objects are ultimately and inexorably situated in a context, and that entities mutually affect each other in shared time, space and place. I oppose the idea that the world of construction must necessarily be (re-)presented and conceptualised as being composed of entities and categories separated from each other with surgical precision, and that subsequently are put together by means of an additive process that leads to supposedly seamless, unproblematic compositions. I therefore propose a move away from separation and independence (of for instance siloed domains of knowledge). This does not mean however that one has to cancel analysis altogether, since this would be counterproductive due to its operability and effectiveness in producing certain specific instrumental outcomes and perspectives.

I oriented my search towards the exploration of an expanded field and the instigation of more comprehensive approaches that I regard as syncretic, rather than synthetic. In my opinion, construction amounts to an amalgamated hybrid of diverse, both collaborating and counteracting forces, agents, agendas, materials, sites and so forth, and it (i.e. construction) is neither smooth nor clean. I consider that it is necessary to frame construction in these terms, and the ways in which we deal with it need to reflect this state of affairs. This research (cor)responds to this idea of a miscellaneous mixture. The analytical approach is very helpful at times, but the images of thought produced by its means depict a neat, ordered, uniform and controlled environment that does not (seem to) fit the contingent nature of a complex material reality, that is, the world of actual forces and impacts, dust and scratches, kicks and bumps, digs and dumps, moist, downpour, mud and frost, dynamic air pressures, gusts of wind, and so forth almost endlessly.

The knowledge created by using the very effective analytical tools seems to make things more simple, but in fact it makes them more complicated, because the relation/connection with architecture's abundance of expressive possibilities remains implicit, and the multiplicative effect of complex generative combinations is invalidated. The nearly undisputed attention given to architectural detailing (strongly embedded in architectural construction and tectonic discourses), is an epitome of the pervasive character of the analytical take on things, because it favours the part over the whole and thus assigns more value to a component of the system than to the entire system.

The relation between analysis/separation and construction/togethering is a (nested) problem space in itself. It can be detected in sections 3.II Encounters, chapter 'Generative Interactions and Emergence', 4.I 'Constructing with Lines', and finally in 5.II 'Process-Form Interactions' where movements are made back and forth from the practice of making an actual table towards more abstract, codified and theoretical realms. A sense of relational complexity and connection between a rational, techno-scientific outlook on one side, and a material, designerly, and maybe more intuitive on the other, is maintained by means of a combination of the multiple modes of representation and expression that are part and parcel of architecture's toolbox. It is a hybrid way of working that articulates a network of divergent interpretations and materialisations, and creates a sense of interconnected possibilities that range from abstract and codified, to tangible and actual.

In 3.II Encounters 'Generative Interactions and Emergence', I provide pointers towards the multiplicative effects inherent in the reciprocal relation between architectural artefacts and their environments; where these can be found, how they can be recognised, and how they mutually affect each other. It is a specific area of inquiry that highly depends on a will to pay close attention, and it captures the crucial need for a generosity that assigns value to often apparently minor occurrences. I believe that this approach can potentially help to mitigate the defensive attitude that is characteristic of many dealings with construction technology in practice and education. The label 'agent of destruction' applied to water is an expressive example of this.

Section 4.I 'Constructing with Lines', focuses on the transactions between the realm of abstract codes, generic principles, instructions, diagrams, rules, formulas and the like on one side, and the performance of actions in a material world on the other. The former are often thought of as presenting accurate descriptions or models to regulate and control reality, but as I show in the chapter, the correspondence is not straightforward or simple. This part also indicates that this transactional domain provides access to a more rich repository of interpretations and material possibilities, and also that one can experiment with the reach, truthfulness, effectiveness and limitations of the epistemological/cognitive aspects of architecture technology.

Another matter of concern tackled in this research is the necessity to problematise and scrutinise the nearly unilateral emphasis on thing/object (identified by the term 'form'), and to affirm the urgent need to pay more attention to linked occurrences and actions in event spaces (identified by the term 'process').

This problem area can be developed from a philosophical perspective, in terms of ontology and epistemology, but can also be attended to in terms of organisational patterns and methodology, and finally as a means to develop actual relational environments containing a weave of (inter-)relations, interactions and dependencies between diverse entities and actors.

In section 2.II 'Patterns of Interaction between Process and Form', I describe three organisational patterns that display how the reciprocal relationship between forms/objects/things and processes can be interpreted and mapped. The first (the bipolar pattern) and the second (the hermeneutic or symmetric pattern) have already been accounted for in the philosophy of technology and the theory of interpretation (hermeneutics). The first is implicitly present in architectural technology, and the second has already been implemented in discourses on architectural tectonics. This to say that they are not alien to the domain under scrutiny. However, joining them in one discursive space and their diagrammatic translation is of my making and project-specific. The third and last pattern is based upon an interpretation situated in the philosophy of (Goethean) science. I integrated and re-interpreted it, because it provides a context to combine the first and second relational patterns in an alternating sequence, and to explicitly connect the dynamic process-form relationship with time. For this reason it is more meaningful for conceptualising the process-form interactions in the context of architectural construction. I also contextualise this problem space in Section 3.II 'Encounters', chapter 'Things We Do Not See'.

To make sense of the static patterns, and to demonstrate that they can actually be implemented in a learning practice, I devised a made-to-measure construction exercise that enables the activation of the alternating process-form interactions, and makes it possible to experience them in action. Part 5 entitled 'Process and Form' provides an extensive description that includes a detailed account of the actions,

the possible connections with existing theories and discourses, reflections on what happens during the course of the entire process and what can be extracted from it. The nature of the process-form interactions that are depicted, and the observations and interpretations that emerged during the process, point in multiple directions. These indicate that there is more to inquire upon and that alternative scenarios can be developed to provide access to other complementary issues. Some aspects are worth (re-)emphasising at this stage.

First, it is important to acknowledge that the process of architectural construction/making/realisation cannot be reduced to a process of replication. It is more accurate and truthful to conceptualise it as a process of gradual transformations that is (very) susceptible to external influences of all sorts, regardless of whether it is executed in correspondence with a pre-conceived model.

A second aspect is that framing the construction/building process as a linear sequence of technical operations, is a troublesome simplification that veils a more complex reality that consists of complex bundles of converging and diverging trajectories of interacting forces, agents, materials, information, interpretations, choices, constraints, etc. These continually change in nature and participants, sometimes run in parallel and during other periods individually, can be continuous or discontinuous, intuitive or planned, and so forth.

Third is the finding that the alternating form-process interaction can be used to structure a learning-trajectory in which an exchange or dialogue of sorts can be staged between theory and practice, or between actions in context and reflection remote from them. Within these alternating event-spaces a variety of sometimes unexpected information and valuable (learning) situations emerge. These are either non-existing or non-accessible when the realms of theory and practice are engaged separately.

As fourth and final I want to call attention to the fact that the movement from a space of initiating actions (making) to a space of recursive actions (use) can be a powerful heuristic method. The reason is that things defined as aims and ensuing results within one stage of the process, can become instruments in another and subsequent part of that process. It is in the latter that their capacities can be experienced by putting them in practice, where feed-back is provided and re-calibration becomes possible.

Although I mention it here as the last item, it may nonetheless be the one with the

biggest implications for learning. Moreover, it can definitely be seen as an extension of construction's scope, because construction is most often constrained to the space associated with actions of making and not with that of recursive actions in which use is situated, alongside maintenance and repair. Using, cleaning, maintaining and repairing the material artefacts they design and make, is usually not considered part of what architects do, so why bother anyway. But this is a mistake with substantial consequences, as the process-form table-exercise from part 5 convincingly shows. Expanding the territory of construction towards incorporating the space of recursive actions must be taken into consideration seriously, and it is one more area for future investigation. I also touch upon this topic in section 3.II_Encounters, chapter 'Washing Windows - Construction Enhanced' and section 2.I_'What We Talk About When We Talk About Construction', in the chapter 'Construction IS Multi-Layered'.

It is relevant to note that the distinctions between the first (analytical/syncretic) and second (process/form) problem/potentiality spaces are not clear-cut. To amend the analytical take on things, an active consideration of process can be helpful, because it provides a context in which time is not frozen; where things are not independent but share a space, where they are not isolated but come into contact, affect each other and are transformed as a result. In my opinion it may not be feasible, or at least very difficult, to challenge the individualisation of things and the dissection of the world of construction, if a consideration of process is not made part of the equation in one way or another. Processes make it possible to experience concepts at work, that is, extend their meaning beyond their theoretical or abstract descriptive meanings and towards performative (and more flexible) meanings (based on the consideration that meaning follows context); to connect how they appear and can be understood intellectually with what they do (or don't) when they are at work within a certain environment-world.

PROBLEM & POTENTIALITY SPACE 3 ...

the need to deepen the understanding of the concept construction

This matter of concern is based on the consideration that the meaning of the word 'construction' cannot just be presupposed, nor regarded as fixed and unchanging. It is not because something appears self-evident that it actually is. It is not because

the term construction seems unproblematic that it is not in need of questioning; if not to modify it, at least to develop and deepen ones understanding of it. It is the subject area that I applied myself to in section 2.I_ 'What We Talk About When We Talk About Construction'. The systematic unwrapping of the extensive range of meaningful interpretations of construction is necessary to create a platform to build upon and that can be used for subsequent calibration. Exploring the semantic landscape permits a move beyond appearances and preconceptions. What emerges may not appear to be new or unexpected at first, and in a number of cases I acknowledge that it may simply amount to the removal of a veil of dust. But even then, it provides additional sharpness and transparency resulting from an uncovering and relating of meanings, interpretations and conventions.

But there is more to it, because from this position, additional layers of relevant meanings can be added that clarify specific points of view and deepen or contextualise certain interpretations. On top of that, connections can be put in place with other significant domains of knowledge that can contribute to a more comprehensive understanding of the concept. At this stage I see three of them, but obviously there may be more. The first is historical, the second philosophical, and the third concerns the relationship between construction and language. In this work all three remain un(der) developed, because other subjects took precedence. This is not an indication of a lack of pertinence though, and they point in the direction of future inquiry.

The language-construction pair for instance is not far-fetched. Construction is regularly typified as an analogue of language, and this is more than a figure of speech. The correspondence is established on at least three levels: first that of the (language)-system with its organisational order (form or structure) and patterns, identified as general principles and fundamental rules; second, on that of the entity made, i.e. the written, drawn or built work; and finally, that of the meaning of the work, and the discourse it supposedly embodies (this aspect directly connects with the discourses on architectural tectonics). Another aspect in the relationship language-construction is the predominance of nouns. The knowledge of construction-technology is structured on the basis of individually designated entities and the categories to which they belong. The nouns used to name them (like for instance: clay, brick, module, bond, joint, wall, element, house, etc.) unknowingly emphasise and prioritise discrete entities and fixed properties. Inter-relations, activities and events need the presence of verbs (like lift,

move, spread, lay, arrange, etc.), and these are often situated outside the field of view. The final language-topic that deserves attention is related to the way in which a discourse is constructed and the tone it strikes. In the context of construction-technology, prediction and control are uppermost priorities, due to the requirement of performance of architecture's built works. Language amplifies the visibility of the conceptions held within a field of knowledge, and how they effectively incite, steer, support and sustain interpretations, attitudes and actions, and in this case the magnification is often defensive and wary. The perspectives held in a knowledge domain; articulated in its stories, descriptions, representations, diagrams, codes, etc. affirm a certain direction, involve assumptions, priorities, and implicit norms about what deserves attention, what has to be left out, and what to emphasise or inhibit. A connection with these issues has been started in section 3.II_Encounters. More specifically, in the chapters 'Tectonic Re-Visions, Meaning and Interpretation' and 'Queer Bricks, A Unilateral Claim on Freedom', but it remains an area in need of more attention.

PROBLEM & POTENTIALITY SPACE 4 ...

the significance of relations and collectives

A perspective on architectural construction that focusses on individual objects and object categories is currently a given, while conversely, one that gives prominence to relations and collectives is all but established. The epistemological and cognitive infrastructure to support the latter still has to be constructed in my opinion, at least to a large extent. To facilitate this, a complementary conception of technology is needed and would be helpful; especially one that more explicitly defines technology on the basis of its mediating qualities and capacities. The primary reason is that mediation is a relational concept that refers to encounters that occur in the interstice between things. This framing is not new, but must become more prominent. According to the dictionary mediation is an 'intervention in a process or relationship', i.e. both a relational action and an inter-facial occurrence. By analogy, the processes of construction/making/building consist of assortments of relational actions (echoing Ursula K. Le Guinn: ... technology ... is the active human interface with the material world). Extending the rationale leads us to defining tools (technical/construction instruments) and technology (technical/construction theories) as devices conceived,

made and used for mediating. According to such a point of view, a theory is a mediator or mediating tool. It is therefore inevitably positioned in-between entities, subjects and/or systems, and functions as an interface where interactions take place. In order to do its work, it needs to be positioned in-between and not isolated and individualised. In turn, techniques (construction methods) refer to the ways in which relational actions can be performed and/or the repeatable manners in which (or procedures by which) a relational assemblage can be achieved.

I touch upon this line of inquiry in section 2.I, chapter ‘Construction IS Objects, Relations and Mediation’, but also in section 3.I_Growing Islands. In the latter it seems that this issue can be framed on the basis of the question: ‘what aspects of the territory get onto the map?’ But, in relation to what is described above, this phrasing is utterly incomplete, because the mediators (the author, the camera, the notebook, the preconceptions, the conversations, etc.) that mediate between territory and map are not mentioned, as if their role and influence can be discarded. Architectural practice also implies the making of maps (plans, sections, etc.), made with the aim of depicting a territory (an architectural state of organisation). Here too the issue must be expanded towards identifying who/what the mediators are, where they are situated, how they act and what they instigate. In part 4.II ‘Constructing Things for Constructing other Things’, the topic of mediation is integrated in a learning practice that is itself embedded in an actual building process. Here the mediators are more clearly identifiable as technical instruments (tools) and techniques (method), that all have to be conceived/designed, made and used. The mediators that may seem absent in the hands-on actions are technology or the technical theories, but in fact they are not, since they are often put in practice somehow during the process, even when one is not consciously aware of it. Finally this problem space is also present in the actions and procedures described in part 5 ‘Process and Form’. Here again the problem space is far from being exhausted and contains an important potential for the future.

With the preceding journey I started a process to expose concealed subjects that I consider having high pertinence for construction for the discipline of architecture and architectural education. A number of compelling things already emerged, but a range of others is merely pointed at or suggested, and I believe a lot more material remains concealed and lies waiting to be uncovered and attended to.

All of this is a token of the quality and abundance of architecture in general and architectural construction in particular. More inquiries along the lines of this research, and others that can either be extracted from it or connected to it, are required in order to achieve a more comprehensive and intricate understanding of construction in architecture and architecture education. Indubitably, the territory of construction can be engaged with enthusiasm, confidence and curiosity, because the boundaries of the subject are not in sight yet.



ill.6.1:
the Last Whole Earth Catalog back cover from August 1972
showing the ATS-3 satellite image of Earth
used on the cover of the first issue

source: https://en.wikipedia.org/wiki/Whole_Earth_Catalog.
accessed on 3 May 2026

1_ Gilles Deleuze and Félix Guattari interpreted by Manuel De Landa

2_ Paul Ricoeur

3_ Roland Barthes, <https://en.wikipedia.org/wiki/Author>; accessed on 3 May 2026

4_ Stewart Brand

5_ Hélène Frichot

6_ Matthew Crawford

7_ Pat Puckett, The Disciplined Ride, <https://www.thedisciplinedride.com>

This second take is made on valid request. The aim is to provide more clarification about what the work proposes and how it works as an assemblage. This is a new and extra take; not a make-over of the first; the first take must remain. The overview is concise due to time constraints. It highlights talking points and matters of attention ordered as a catalogue of assertions for which the necessary explanations and context are due to be provided during the presentation on June 4, 2026. The chronological sequence is not an indication of hierarchy or importance. Thus, Making is More ...

... is an assemblage with the capacities required by the philosophical concept.¹

... is a structured work to which the hermeneutic paradigm of the text applies.²

... has no one single overarching voice but is a tissue drawn from the innumerable centers of culture where language speaks, and where the text is the author.³

... is an open-ended open-platform for making things possible inspired by but not emulating *'The Whole Earth Catalogue'*.

... is multi-modal.

... is discursive, disputable, not sequential but multi-directional, not an asphalt road but a lively territory.

... is made with and within the field and follows the material it thinks and works with.

... is a congregation of local environment-worlds.

... follows the motto that a building is something that you start and not something that you finish, an ongoing process and a perpetual dialogue with places, users and uses.⁴

... claims that starting and making take precedence over knowing

... must be both tool and tool-box

... must be used as tool and map instead of being contemplated

... is a tool for cleaning, maintenance, repair and maybe renewal

... followed (some of) the principles of and for a feminist design power tool.⁵

... is a dialectic construct of both theory and practice together.

... proposes to look at theory in terms of a (design) practice.

... follows the motto that getting things right demands attentiveness in the way of a conversation rather than assertiveness in the way of a demonstration, and that things need fixing and tending no less than creating.⁶

... slows down and takes the time that must be taken, following the principle that the fastest way to do things is to take the time they need.⁷

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