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The Promise of an Object

Design Processes as Processes of Theory Construction

The towering achievement of Leon Battista Alberti (1404–72), the most important theorist to emerge from the Renaissance, was that he single-handedly turned architecture from an autographic art into an allographic art. He insisted on the importance of *lineamenta*, that is to say, on the fixed notation of an architectural design in the form of concrete, scale drawings. However, the decisive innovation was not that an edifice could now be built on the basis of exact drawings without the architect having to be present on the construction site; the real innovation was that, by insisting on allographic notation, Alberti turned the design work into a series of modeling processes, each with its own promise of an object. Ever since then design processes have always moved forward, step by step, from one modeling stage to the next—from the first sketch of an idea through a series of scale models to the realization of the original idea in the finished building. Of course the design process is shaped by constant shifts between different scales, but whatever that may mean, the overall process advances in a chain of individual modeling stages from the largest to the smallest scale, with the scale of 1:1 as the final model space. Even though this has long since become common practice and an everyday routine, the consequences of designing using particular scales are far-reaching and can scarcely be overestimated.

First Thesis: Alberti's introduction of the notation of designs in fixed, scale drawings saw architecture advancing beyond its purely material-constructional processes and situative presence to the point where it became open to a new **intellectualization** of its knowledge praxis. The architectural design process turns, in its own particular way, into a process of theory-construction, in the sense that the design-discovery process (as a creative act) and the theory-construction process (as a reflective act) now become closely interlinked.

Second Thesis: The introduction of design using different scales opens up architecture to the **transformation of architectural substance**. For every scale has its own specific design potential. At the outset of every modeling process on a particular scale there is a design hypothesis with a specific promise of an object; each also ends with the notion of an object in its actual, realized form. As the design progresses to the next scale, the ensuing new

possibilities and insights ensure that the precise form previously arrived at is re-opened and becomes a hypothesis for the new model space.

Third Thesis: As a consequence of this chain of modeling processes architecture is able to **absorb the cultural dynamics** of its own time. The status of the chain of models comes to the fore, in so far as this is the prerequisite for the absorption of dynamically changing, cultural logic—in all its complexity—into the substance of architecture. This in turn is the prerequisite for the modern concept of architecture that has steadily been evolving since Alberti. This modern concept sees architecture as the main, symbolic form by means of which people—in dynamically shifting cultural force fields—are able to create an environment that is appropriate to their own time, that is meaningful, uniquely suitable for human beings, and different from nature.

The above statements lead to the significant, central thesis for architecture in the digital age, namely that the currently evident crisis in design is not primarily a crisis of creativity but rather a crisis for theory. With rapid prototyping, 3-D printing, BIM, and other forms of computational design making it possible to skip different stages in the scale modeling process and to progress directly from the initial parameters to the 1:1 model, the chain of models has been broken and, consequently, the process of theory-construction has been short-circuited. As a consequence, the likelihood of the current cultural logic being absorbed into the substance of architecture is reduced, if not removed altogether.

Model Before we go any further, it would be useful to clarify exactly what a model is. In so doing I will make reference to Bernd Mahr and his essay “Das Wissen im Modell.”¹ In Mahr’s view, it is models that make the connection between contents and form possible in the first place. They structure this connection with the aid of “symbolic generalizations.” And it is through them that knowledge can emerge and become effective. Models are, in his view, “vehicles and benchmarks” for knowledge, without themselves laying claim to knowledge as such. Models constitute an ordered system by which—in any disciplinary matrix, such as architecture—things can advance to the point of recognizability.

It is models that provide a means for connecting contents and form. As such they are the vehicles for the knowledge associated with a disciplinary matrix. Or to put it another way: knowledge is realized—with reference to the disciplinary matrix—in the model. In the model it comes to light, by dint of symbolic generalizations, and is subsequently exemplified in a tangible mass-model or in a tangible drawing. We must therefore distinguish between

1. the **disciplinary matrix**. Architecture as a specific knowledge-praxis is a disciplinary matrix of this kind;
2. **model spaces** with their generative potential for architectural knowledge. These model spaces could take the form of hand-done sketches, outline drawings, or perspectival drawings;
3. **symbolic generalizations**, through which knowledge becomes representable. Examples of symbolic generalizations could be lines, continuous or dotted, thick or thin, colored or just black; and
4. an actual representation in the sense of an **exemplification or an exemplar**. That is the actual drawing or the actual wooden model on a particular scale. In these knowledge is expressed and exemplified; it becomes visible and legible.

It should be noted that in the model spaces pertaining to a particular disciplinary matrix, there is an objectification of personal, intuitive, implicit knowledge and mere opinions alike. With the aid of the model, knowledge develops in the transition from the original subject-reference and becomes “liberated thought-content that is both storable and communicable,” as Mahr puts it. It is no longer purely subjective, because it is now tied to the realm of operation of a particular model space and its symbolic generalizations. Knowledge owes its objectification to the structuring achieved through the model. Accordingly there can be no knowledge without a model. However, if knowledge can only be rendered visible with the aid of symbolic generalizations in connection with a model space, then it should also be noted that within any given model space it is only possible to represent certain forms of knowledge. And the model space both determines the level of freedom and potential for the creative process and sets the limits for the latter. This could be described as the pre-structuring or pre-determination of knowledge by the model.

This is what Friedrich Nietzsche meant when he talked of tools being involved in our thought processes: “You are right—our writing utensils contribute to our thoughts,” as he put it in a letter to his friend Heinrich Köselitz.² This is interesting in epistemological terms, in so far as Nietzsche conveys the idea that tools are themselves model spaces, within which knowledge attains structure and visibility. Tools have a certain generative potential for certain forms of knowledge, in the same way that they exclude others. In other words: the epistemic structure of tools informs the knowledge that is attained through them. And this explains references to the “knowledge within the model.” But architects know only too well that creative intuition cannot be separated from their drawing materials. A 6B pencil can be exactly the right tool for a quick sketch of an idea. It belongs within the model space of quick sketches, but not

in the model space of detailed planning, where an HB pencil or even a 2H pencil would be much more useful.

And this is precisely what happens in the design stages in various model spaces, for instance on the scale of 1:1000, 1:100, 1:10 and even 1:1. In each of these there is a transition from subjective ideas to their objectification. The knowledge that can be represented is tied to the given model space, to the relevant scale and the corresponding symbolic expressions or means of representation. Each scale provides the possibility of transferring cultural contents into architectural substance, which is then linked and articulated in architecture through materials, forms and situations. On a scale of 1:500, for instance, spaces with approximate sizes and proportions can be related to each other. However, in discussions of a tiling layout or the precise construction of a wall or a ceiling, the scale 1:500 provides little useful insight, because there is no form of representation that works on this scale and hence no possibility of symbolic generalization. Be they load-bearing or not load-bearing, be they cast in concrete in situ, brick-built, or constructed as partition walls, all walls look more or less the same on a scale of 1:500. On the next scale up, 1:200 it is possible to discern differences in the thickness of walls, on a scale of 1:100 or 1:50 the construction of the wall can be shown, different layers are visible and it is possible to show how walls, doors, and windows relate to each other. On any given scale only one set of knowledge can be rendered visible.

However, a problematic area has emerged for architecture in the digital age. It concerns the matter of the constitution of architectural knowledge in computational design. What happens when—during the computational design process—the hand-done sketch and its potential for knowledge no longer have a part to play? What does it mean—in an parametric design process—if the initial parameters transfer directly into their materialization in a 3-D model? If certain scales and models can be skipped, the customary chain of the modeling process is broken. In these circumstances, how can the transfer of cultural logic into the substance of architecture now be achieved? Or: in the context of a digital process, which cultural knowledge is expressed and rendered visible in architecture?

Pictoriality Having sketched in the relationship between model, knowledge, and the chain of modeling, let us now take a look at the processes within the individual model spaces, that is to say, let us turn to the actual design process. And this is where the concept of pictoriality comes into play. Our point of reference here is the work of Ferdinand Fellmann. In “Wovon sprechen die

Bilder,” which might be literally translated as “What are the pictures talking about?”, Fellmann discusses the notion of pictoriality in terms that are also relevant to any modeling process, which always involves some form of pictoriality—in all its “provocative indeterminacy.”³

Fellmann regards pictures as more than just a “subordinate class of signs.”⁴ The fact that they are different from linguistic signs does not mean that they are subordinate to the latter. The function of linguistic signs, and others, is communication and description; as a rule they point to that which is absent, while they themselves are almost nothing. That is to say, signs are not the thing itself, they merely point to it. The word “tiger” is not a tiger, it only represents that animal.

Pictures, by contrast, are notable for their presentness. Their prime task, as images, is not to point to objects. Pictures are distinguished from pure signs by the fact that they are what they are, in their presence in a particular place. And the picture ensures that that which is given in the picture is present, no more and no less. Fellmann describes this as the “state-of-being” of pictures.

As Fellmann shows, pictures “articulate the field of the visible according to a different principle to that which applies to concepts.”⁵ In contrast to words, which, as a rule, are used intentionally, pictures do not talk of intentions to the same extent. And Fellmann’s suggestion is that this applies not only in the case of painters who paint badly; on the contrary, it is in the nature of pictures that they are not entirely beholden to the author’s intentions. The reason for this is that by definition and due to the material nature of pictures, their various qualities cannot be separated and combined at will, as the uninitiated often imagine. The painted picture always retains a certain openness with regard to the painter’s intentions. A painting never wholly matches the painter’s intentions. Fellmann thus talks of a unique, open realm of “pictoriality.” And this pictoriality indicates the state-of-being of the paintings in their visibility.

The decisive factor is that a painted view of an object only becomes a picture when it is seen in isolation from the other three views. Bearing in mind Edmund Husserl’s “Analysis of Perception” it could be said that in a painted picture a certain “irrealization of objectivity” ensues. For the object, which can be shown perspectively in up to three views in the painting (but no more than that) is not defined in its other views. As Peirce has said, it is not quite *fully determined*. We can fantasize all sorts of things into it, because we cannot know how the painter imagined the back of the object. Paintings present us with almost endless possibilities in that respect. In other words, the object in the painting promises

more than the real object that it is referring to could ever keep. This is why Fellmann talks of the “provocative indeterminacy” of paintings in their pictoriality and of the promise of the object as a sign of pictoriality.

And this is what distinguishes the design process at every stage of modeling: the fact that the sketch or the drawing is initially determined by this degree of openness and provocative indeterminacy. In every model space the object is initially provocatively open. It formulates the promise of an object that is defined with ever greater precision during the course of the design process. At the outset everything in a model space is provocatively open; at the conclusion—depending on the knowledge potential of that particular model space—everything is fixed. Then the scale is changed. What was fixed and precise on the previous scale now—with the new scale—regains the status of pictoriality and, in this new model space, is once again provocatively open.

Abduction In light of what has been said so far, the basis of the creative design process is within the chain of models, and what has been “established” in one model space becomes a “surprising event” in the subsequent model space. It is a surprising event because it does not yet conform to the rules of the new model space. In the context of the new model space, that which was previously concrete turns into a hypothesis and a surprising event. And as a hypothesis of this kind it becomes the point of departure for the creative design process in the new model space.

However, we only describe this as a creative process if, in the subsequent stage of the design process, the removal of the surprise is not achieved merely by ironing it out, by standardizing it, and adapting it to the existing system of rules. We describe it as a creative process if the removal of the surprise is achieved by introducing a *new* rule within the disciplinary matrix. This form of creative approach is described by Charles S. Peirce as abduction. The process of abduction creates a new system of symbolic connections, a new order. It creates new relationships between the elements of architecture, and also ensures that architecture itself enters into a new relationship with the prevailing cultural dynamics.

In the context of his *theory of logical operations* Peirce defines abduction as a form of argument that arises from a “puzzling fact,”⁶ that is to say, from an experience that is at odds with an active or passive conviction. „Abduction is the process of forming an explanatory hypothesis. It is the only logical operation which introduces any new idea.“⁷ The abductive process consists in the

generalization of the surprising experience, in other words, in the formation of a new theory that does not reinforce the old rules but contributes to the creation of a new system.

Various architects have referred to comparable processes. Oswald Matthias Ungers meant something similar when—using the terminology of classical rhetoric—he talked of designing with metaphors and—very much in the spirit of Peirce’s abduction or Mahr’s model theory—saw pictorial metaphors as a means to transpose subjective associations into plausible arguments. In his book *Morphologie, City, Metaphors*⁸ Ungers states that “a model [is] itself a theoretical complexity, which introduces either a visual form or a conceptual order into the components of complex situations.”⁹

Ungers recommends a metaphorical design process, in the spirit of pictoriality, through which possible solutions can be pre-structured. Or, as Gerhard Kurz puts it in *Metapher, Allegorie, Symbol*: “Metaphors function as action- and knowledge-orienting models. They have the capacity to create new realities and to change our system of concepts.”¹⁰ In that sense, metaphors serve in the design process as hypotheses, which instigate the epistemological process of abduction, where abduction is the “first step of all processes of sign interpretation that seek to couple observation and theory.”

Theory It is important to note that the process of abductive theory-construction is a creative process, not for the sake of the subjectivity of the architect and not for the sake of the new, but as a means to incorporate a changing cultural logic into architecture. The actual creative process thus resides not in the free combination of images and metaphors, but precisely in the extrapolation of rules that, in the spirit of abduction, make it possible to integrate metaphors into the model space—by extending existing theories. The processes of modeling are processes of theory-construction specifically if, on the basis of an initial hypothesis, the changed cultural logic finds its way (through abduction) into the substance of architecture and changes the theoretical conception of the latter.

This new insight allows us to make a direct connection between Peirce’s *theory of logical operations* and Mahr’s *Wissen im Modell*. Both are underpinned by a triadic model of epistemology. Mahr talks of the three states of being-a-model or the three identities of an object as model, which, on closer examination, correspond to the three logical operations described by Peirce. Mahr distinguishes firstly the “*object in itself* (qualified as a model), that has its own form of appearance,”¹¹ for instance, as a text, a body, a house, and so on.

Secondly, Mahr talks of the *model of something* which is the result of “what can broadly speaking be regarded as induction, whereby views, experiences, measurements, features . . . come to be part of the model . . . through selection, generalization and by being tied to a new form and representation.”¹² Thirdly Mahr talks of a *model for something*, whereby, in the sense of Peirce’s deduction, “the contents embodied in form and representation are set free again, by the use of the model, and can be transferred to another object.”¹³ Importantly, in order to be able to justify any judgment of the state of being-a-model, there have to be “factors that confirm this threefold identity.”¹⁴

Interestingly Mahr associates the *model of something* and *model for something* with Peirce’s operations of induction (model of something) and deduction (model for something). If one takes the threefold nature of the state of being-a-model seriously (Mahr does not mention this fact), then it seems eminently reasonable to make the connection between the third form of the *object in itself* and the third operation described by Peirce, namely, abduction. The *object in itself*—in its purest form—stands for the hypothesis, for pictoriality, for a pre-theoretical standpoint in the modeling process, that is to say, for the surprising event that, as we have to conclude, first has to create its own new legality through induction, as defined by Peirce. In order to lead to the construction of a theory, it must first be a *model of something* (induction), so that it can become, in the next stage, a *model for something* (deduction), that is to say, it lays down the law and hence becomes theoretically binding.

A normal modeling process, one could say in conclusion, is dominated by deduction and induction, in other words, by the *model for something* and the *model of something*. Nothing new comes of this: the outcome is already familiar, in keeping with familiar rules. The stage of the hypothesis falls by the wayside, the *object in itself* is repressed. It is only abduction, on the basis of a hypothesis, that can set in motion the creative process with its potential to absorb new parameters into the model space of a particular disciplinary matrix, such as architecture, that is to say, to introduce new cultural contents into architectural substance.

If we therefore come to the conclusion that digital design processes interrupt the modeling chain, then the process of abduction, the creative design process, and hence the continuing construction of theory in architecture will also be interrupted. Contrary to some opinions and despite new forms and figures, the construction of theory is short-circuited in strictly algorithmic design processes. In that sense parametric-algorithmic design processes are distinguished by a lack of theory-construction. With reference to computational design processes

the crisis in creativity basically proves to be a crisis in theory-construction, triggered by the partial interruption of the modeling chain, that is to say, by the interruption of the process of abductions. Without these, the processes of the absorption of cultural logic into the substance of architecture may not be halted altogether, but they will certainly be made more difficult.

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¹ Bernd Mahr (2014), "Das Wissen im Modell," unter: <https://www.flp.tu-berlin.de/fileadmin/fg53/KIT-Reports/r150.pdf> [12.3.2014].

² Friedrich Nietzsche (1986), letter written in late February 1882, trans. from idem, *Sämtliche Briefe, Kritische Studienausgabe in 8 Bd.*, ed. Giorgio Colli and Mazzino Montinari, Berlin 1986, vol. 6, p. 172.

³ Ferdinand Fellmann, "Wovon sprechen die Bilder. Aspekte der Bild-Semiotik", in *Bild und Reflexion*, ed. Birgit Recki and Lambert Wiesing, Munich 1997, p. 151.

⁴ Fellmann (1997), p. 147.

⁵ Fellmann (1997), p. 147.

⁶ Uwe Wirth, "Zwischen Zeichen und Hypothese: für eine abduktive Wende in der Sprachphilosophie," in *Die Welt als Zeichen und Hypothese. Perspektiven des semiotischen Pragmatismus von Charles S. Peirce*, ed. Uwe Wirth, Frankfurt am Main 2000, p. 137

⁷ Charles S. Peirce, *Collective Papers*, 5.171.

⁸ Oswald Matthias Ungers, *Morphologie, City, Metaphors*, Cologne 1982, p. 11.

⁹ Ungers (1982), p. 11.

¹⁰ Gerhard Kurz (2004), *Metapher, Allegorie, Symbol*, Göttingen 2004, p. 23.

¹¹ Mahr (2014), "Das Wissen im Modell," p. 11.

¹² Mahr (2014), "Das Wissen im Modell," p. 12.

¹³ Mahr (2014), "Das Wissen im Modell," p. 12.

¹⁴ Mahr (2014), "Das Wissen im Modell," p. 12.