[Essay Zwick Petruschat]

[Ü]What are the boundaries of problems?

A Dialogue by Jörg Petruschat and Carola Zwick

Jörg Petruschat [JP]:
In the last few years, researchers from many fields have taken an interest in design procedures. They want to learn how they can dispense with calcified or intensely regulated forms of knowledge production and get off the tracks they have been moving on. In actual collaborations, however, strange situations often emerge: because designers enter these configurations from outside, they are almost reflexively assumed to be clueless whenever things get serious, and at those points conflicts emerge. What is the matter here?

Carola Zwick [CZ]:
Knowledge in design is based on experience and cannot be formalized. That makes it difficult to categorize among scientific pursuits and inhibits its integration into research; indeed, design and production processes appear amateurish or even magical from the perspective of other disciplines. When we designers try to establish design as a fully vested culture of knowledge within the academic canon, we often end up slipping through the cracks.

So-called “tacit knowledge,” the implicit knowledge of designers, comes from doing and is constituted therein. Doing, in these terms, is not a method of production as in the case of crafts; rather, it serves as a catalyst for dealing with disparate problems, for testing hypotheses, and for spurring further thought. Design requires many viewpoints and paradigms that remain implicit during the design process. They are difficult to verbalize if they can be verbalized at all, and are only visible retrospectively after many iterations. Designer Charles Eames was once asked whether a design concept for an object could be derived merely from an analysis of its functions. His response was that such a procedure runs the risk of leaving the analysis incomplete

JP:

I have the impression that the concept of experience, so important in design, arouses suspicion among researchers for two reasons: first, something subjective enters a context where almost everything is aimed at overcoming mere opinion and transforming it into generally recognizable knowledge. That is why data, measurements, and statistics are thought to be indispensible for "objectivizing" discrete experiences. The second reason is: experiences are fuzzy. Concretely lived moments may constitute their foundation, but experiences fall into generality for that very reason. Experiences always occur against a background or are projected onto one. John Dewey called that the aesthetic dimension of experience: the projection of sense experience onto the experiential background of the whole of a personality.

Both the subjective motivation and the oscillation between the individual and the general make experiences difficult to grasp theoretically and suspect from the perspective of academic procedures. Those things both work well in the arts, are wonderful for poetic effects, but hardly work in research fields where what matters is a clear frame of reference, a methodically controlled procedure, and testable constructs. In science, the means of constructing a claim should be transparent, and its elements should build on one another. Even where scientific statements stand out for their daring, these statements depart from a body of previous knowledge in a logically determinate manner. The steps of daring constructions are clearly marked on the scaffolding of accepted knowledge.

In the case of design, by contrast, experiences are not linked linearly, as they are in logical chains, or layered one on top of another, like bricks in the construction of a house. Design always deals with the whole: rather than discrete elements, patterns of experience are brought to bear so as to produce order from confusing situations and complex constellations, especially when factors in these constellations do not show a logical relationship to one another. I believe that this is one of the reasons why design is so fascinating for the sciences: in the end, as in the sciences, a very well-founded form emerges, a conclusive process, but in both cases, that form is nowhere to be seen in the beginning.

CZ:

I see your point in describing tacit knowledge as subjective and therefore saying that it cannot be separated from the person. And that there is an individual disposition that can be called designer talent. The ability to recognize faces, to speak foreign languages, and to ride a bicycle belong in this category of dispositions. I was surprised to learn that programming is considered tacit knowledge, as it is learned in most part by watching and imitating. I find that these examples do a lot to explain why the process of acquiring skills is difficult to explain or perhaps inexplicable, whereas the result can be assessed unequivocally.

A designer's implicit knowledge encompasses not only approaches to solving formal problems, such as organizing materials or composing geometries. This competence also extends to methodical procedures, which are selected situation-specifically or modified for the problem at hand. Here too a speechlessness presides, which we can ascribe to the nature of tacit knowledge and should by no means confuse with dilettantism. Designers should be excused for often attributing their decisions to intuition because their decision process evades descriptive objectivization. However, an intuitively made decision is by no means arbitrary; rather, it results from a complex deliberation process, which can only be verbalized in retrospect when forms are found and integrated into their contexts.

JP:

Neurophysiologist Antonio Damasio already indicated before the end of the last century that intuitions are achievements of emotional intelligence, which operate beneath the threshold of consciousness. Intuitions emerge by integrating multiple evaluations of earlier interactions; they come from experiences in which successes are marked for individuals by the *feeling* of their own effectiveness. Damasio distinguishes conscious markers from unconscious somatic ones, and shows that they are what make decisions possible in viable time spans, particularly in complex situations. In later publications of his research, Damasio demonstrated in greater detail that human consciousness and the images presented in it derives from earlier experiences: the sensual experience of the present is formed for individuals through pat-

terns of the recollected past; the relevant image is literally *recognized* and generated in the form of something previously experienced. These are important conclusions for explaining the creative processes if we factor in the way that thoughts are constituted intuitively also in this case. Then again, a paradoxical situation arises if we try to explain creative processes in this manner: where do new thoughts come from if past experiences underlie the images that our minds produce?

I think that we should not picture the evaluation of past experiences as discrete values on imaginary scales, but rather as patterns, as formal constructs, as a quality of experience afforded by mental maps. To put it succinctly, there are many situations that feel similar to other situations because we endow the elements of the new situations with meaning by applying a trusted pattern. Is that only conservative? Or is the creation of meaning in a new situation a creative accomplishment with informative value? From my point of view, designers are very good at abstracting forms and patterns from the contents of previous experience. They can often free themselves from previously rehearsed semantics with astonishing ease. They separate syntax from semantics, "form" from "content." They are quite sovereign in testing configurations that go beyond predetermined standards. They construct models in which a subject matter can be figured in completely different ways.

CZ:

Yes, observation is an essential technique for extending the repertoire of implicit knowledge and for calling preset viewpoints into question. Here as well, a discipline-specific kind of observation can be described, which collides methodologically with other observation-based disciplines, such as sociology. The designer's associative thinking ability creates completely different connections between what they observe and previously acquired knowledge. Observing seemingly disparate events enables designers to recognize new patterns and to transfer them into different contexts. Changes in perspective are essential and allow us to recognize existing solutions as relative and thus alterable. These kinds of insights themselves are recalled associatively when the guiding question indicates corresponding similarities or points of

comparison. Because this process defies describable methodology, designer observation is pegged as subjective and scientifically invalid or untestable.

JP:

Those few, but decisive, phases of the design process that are not transparent tend to mislead experts in scientific work to assume that designers work cluelessly [*ahnungslos*]. Quite the opposite is the case: designers "work with clues" [*ahnen*], that is, they intuit that an arrangement of factors "on the table" can be configured and brought into form completely differently from whatever habitual rules demand. Whoever works aesthetically is thus not clueless, but full of clues [*ahnungsvoll*]. Design operates with an excess of patterns, whose special quality consists of being able to organize quite varied situations precisely because these patterns resemble the constellations on the table, because they are general, loose, and "fuzzy." Part of the generosity of designers comes from their willingness to probe these patterns, and not to immediately insist on "being right;" they know that there can be various formally correct answers to problems. They are not bound to a linear process, which occurs step by step in the harsh light of a controlled causality. What gives patterns their efficacy is that they imply possible orders for disparate factors: patterns produce logic through form.

CZ:

We describe this process as finding a form (as opposed to giving form). Finding means remaining flexible and open to the result, and trusting that a conceptual or formal solution will emerge from the engagement with the complex of all constraints.

Routine is actually hazardous to the design process. While it is the condition for many disciplines, such as medicine, that they establish routines and standards in order to ensure the quality of the process, in design there is a risk that routine could lead to unreflective, schematic protocols. Therefore, techniques, such as modeling alternatives, are employed as destabilizers in order to avoid hasty conclusions.

JP:

Routine is an interesting concept for you to bring up. I find that problems do occur when routines fail. The frustrations that arise when routines fail spur changes to routines, and these frustrations thus stir an excitement of creative energies that pulls from preconscious or no longer conscious material. Karl Popper saw the failure of behavioral norms in concrete situations as the decisive moment in the phylogeny of intelligent behavior, but also, he emphasized, as the basis for the progress of science. If we locate the core of design competence [*gestalterische Kompetenz*] in the overcoming of routine, where I tend to see it, then design does not appear opposed to the sciences; rather, rationalistic calculation is an especially elaborated form of *Gestaltung*. In fact, design, art, and the sciences (even in their applied form as engineering), were still fused at a common root at the beginning of modernity, as cases like Galileo Galilei or Leonardo da Vinci show. The sciences, along with design as a conceptual ability, the arts, and making generally are all differentiated forms of design competence in various conditional and regulated forms and media. Therein, I believe, lies the reason why designers alone cannot claim design and its procedure; instead, design and designing hold explanatory power for how theories are constructed and even for how evidence is organized.

CZ:

That's right. I would claim that the key to research, namely, the development of the research question, is itself a creative act, which can best be compared with the modus operandi in design: a synthesis of observations and experiences and an intuition [*Ahnung*] about where to find blank spaces on the map.

A hypothesis, like a design, is a future-oriented action, which cannot simply be extrapolated from the past. For that reason, it cannot successfully be generated, justified, or even automated by using traditional scientific methods. Attempts to do so are frequently made in order to ensure a design's success. But the two are different matters indeed—the design process and the validation of its results or what is found in data and integrated into existing structures of knowledge. Applying a method is no guarantee of success in trying to learn something. I would call design

practice “pre-search” since it is not merely based on analyzing what already exists or extrapolating from the past, but rather involves speculation where seemingly disparate elements can be synthesized into something innovative.

JP:

And “re-search” would be the gesture of capturing and representing a reality by using the available conceptual networks, wouldn’t it?

To me, the concept of design contains an ambiguity. Design suggests throwing ideas into the open, on the one hand. But throwing can only occur from a secure position, such as where the athlete stands and throws a spear. The spear is still just the familiar, the probable; only the target it aims for contains moments of the unpredictable and improbable. If the spear hits its target, then the unknown is fixed by the known. But on and in the target, as the known and momentarily grasped, we find the dimension of the incommensurable. In *this* domain, the aesthetic is efficacious, where hypotheses meet their limits.

CZ:

I see yet another connotation in the framing of design and its projects as movement or “projectiles”: we designers say that a design must “aim high enough,” and we mean by that that the quality (altitude) and relevance to the future (distance to final landing zone) must be selected with adequate ambition.

JP:

The doctor, bacteriologist, and anthropologist Paul Alsberg, who is nearly forgotten today, wrote a short book in 1922 called *The Riddle of Humanity* [Das Menschheitsrätsel], where he explains that throwing, the overcoming of distance, is the trait that differentiates humans from other animals. By throwing, humans succeed in holding a dangerous reality at a distance and escaping the demand to adapt to the environment. *Human* development has since taken place through technologies; relieved from the “pressure of nature,” the body follows the tools. Peter Sloterdijk remarks

moreover that the achievement of distance creates a perspectival space that accommodates our projects. His exact words are: “The entire improbability of human control over reality is condensed in the gesture of throwing” (*Schäume*, 366–367). Paul Alsberg and Peter Sloterdijk, who takes his thinking further, emphasize how distance—established through developments in throwing devices and tool use—served as a means of freeing up and dismissing the body [*Körperausschaltung*]. If you say that a design has a target in the future, then I believe that the exact opposite also emerges: a connection from the here and now to a future is established through the development and application of bodily and mental powers; not a gesture of dismissing the body or of denying impositions, but rather of admitting them.

On the other hand, in my personal understanding of German etymology, the concept of design as *Entwerfen* relates to *Werfen* (throwing) as the concept of *Enttäuschung* (disillusionment, but also disappointment) relates to *Täuschung* (deception): as a revealing movement. De-sign [*Ent-Werfen*] means thrusting the high-flown idea or speculation into matter, testing it in and through matter. Notably, the movement from the unconscious to consciousness runs parallel with the materialization of an idea (of a form or of a model). The hand that searches for a line on a surface contributes to the precision of mental images. Contrary to a Platonic reading of this process, I think that ideas (or forms) do not lose their beauty or richness through materialization, but rather gain from it: matter puts concepts and models in a context with incomparably more and qualitatively different information than is found in the realm of mental maps. What we admire in the beauty of a pattern or a formula is that it shows potential for application in more than one case.

CZ:

Converting a concept into a real object or product is a delicate process. Concretization is an enrichment on the one hand: materialization and detail enhance the grain of resolution. On the other hand, when a pure idea is converted into the realm of the profane, the “landing zone” should be chosen carefully.

By that I mean that designs must be radical and ambitious enough to sail as far as necessary into the future, and thus to anticipate technological and social developments, which could fundamentally change the framing conditions of a design.

JP:
I am always a little uncomfortable with the concept of the "pure idea." I see ideas as productions by the body, as integrations of experiences, which produce consciousness for the body. My question is: how do ideas come from experiences already lived and inscribed in the body? These ideas, or models, are evidently very abstract, but in their very abstraction, they formulate and make claims to reality; they are models that do not run after reality, but tend to realization.

CZ:
Please do not misunderstand me: I am very much for the profane if we understand it in Rich Gold's sense as the physical expression of culture. In his words: "Design and engineering are rhetorical devices in the sphere of human exchange. They form the physical language a culture speaks in a dialogue about everything from how we will house the elderly to the way we shake salt" (*The Plenitude*, 27). I often notice students delaying the process of concretization as long as possible. I interpret that as fear of potential disappointment with the materialization. They suspect that many ideas do not withstand this process of profanization.

JP:
Perhaps events much earlier in the process underlie the fears of concretization and of finer-grained resolution. They may arise at ideas' secret point of departure—in the dissatisfaction with a reality whose constitution and continuation are felt to be critical or unsettling. Perhaps fear arises because it is no longer possible to tell from the ideas themselves which experiences, which frustrations, which discontents they are founded on. Ideas appear suddenly within the space of thought, and fears could emerge when all of the matter available appears unsuitable to implement the ideas.

I am not well informed on whether scientific researchers have comparably intense experiences with uncertainty. Following a method generally guarantees an assured protocol. Methodologically, the results become probable. This assurance, however, becomes an adverse circumstance when the goal is to establish something unknown about reality, to discover something new. The point is: we do not discover something unknown "about nature outside." That is a naïve view; we discover, develop, design something about our points of access to "nature." We vary and arrange our constructions of our own reality and efficacy [*Wirklichkeit und Wirksamkeit*]. We exist within interactions and take part in network effects, and that is what makes the concept of design (*Gestaltung*) so interesting to researchers.

In one of his last public talks, Vilém Flusser drew attention to the fact that time is not only something historical, something against which we measure our progress, something that passes and occurs when we leave something behind. Time is rather something that arrives at us, particularly when we design: in order to escape the past, to invent and to discover something new, Flusser claims that we must design from within a state of "self-forgetting" out into a field of possibilities, which then become our reality through the design. Carl Friedrich von Weizsäcker's quantum theory of information provided the mathematical model for this argument. Weizsäcker's theory presents the real as an area whose potential we biological beings transform into realities. Carl Friedrich von Weizsäcker thus not only integrated interpretation, the semantic dimension, into information theory—which Claude Shannon and Warren Weaver had subtracted from it. By doing so, he fundamentally modified the conception of the physical world. Although coming from an unexpected field, for designers, these are strong arguments for what they do.

CZ:

Also in design, the methods and tools available determine the space opened up for a design solution. But cleverly switching methods or tools helps to shift this space or even to expand it. Some designers go as far as developing their own tools or new production processes: form follows practice.

Charles and Ray Eames pioneered the practice of designers developing their own tools since they could only produce molded plywood after developing the *Kazaam! Machine*. Now such practices are undergoing a practical and conceptual expansion through digitalization. Budding designers are thematizing production processes and design tools, and they are calling established procedures of form production into question.

Developing alternative concepts for the generation of form, as Kristin Dolz advocates in her Master's thesis, is a kind of question that can only be formulated from the perspective of the practitioner, but which triggers a theoretical discourse highly relevant to the discipline. Dolz postulates surface modeling through virtual particle streams, and thus casts doubt on the prevailing model of the virtual spline (Bézier curve). It is apparent here that the designers' perspective can also open new areas for formulating research questions.

JP:

Such attention to the production process is due, on the one hand, to interest in how something like form comes about at all, and how this process can be influenced. In recent years, much has been said about Bauhaus as an "idea." The fact that Bauhaus was a *practice* above all receded into the background: in Weimar you had to pass a journeyman's test as an evaluation after your training in developing sovereignty over the materials and tools in a workshop. Only after that could you advance to the higher levels of training in Bauhaus. Shortly afterwards, this led to an illusion about "big industry," namely, that people could handle machine systems the way a master handles his drafting pen.

The decisive point here is this: *aesthetic* effort with technology—perhaps *always*—goes beyond established knowledge. Engagement with the production procedures is motivated by much more than the wish for skill or facility. *Aesthetic* engagement is interested in the limits of technical procedures. The effects of the procedures are supposed to be enhanced or varied, the procedures themselves extended, advanced, overcome. Such efforts make for exciting times in art history. Procedures could be pushed to the edge of their effectiveness in areas where the chisel tends to

break or algorithms stumble. But *this* push coming from design is not driven by concerns with efficiency alone, and I would argue that efficiency is not even the top priority. Increasing efficiency or scaling/escalating procedures is merely a technical question, a matter for engineers. With its aesthetic dimension, design, for its part, helps unlock curiosity, "serious play," and implicit knowledge to facilitate research processes.

CZ:
The relevance of design is not being called into question, not even in the research context. Up to this point, however, the competence of design has simply been applied to questions already at hand. The knowledge-generating potential of design has hardly blossomed because the act of asking a question already restricts the space of possible answers. If the goal is to make designers' competence productive in research contexts, then they should be involved from the beginning in the formulation of research questions—in the "framing" of problems.

Whoever shares the view that design embodies its own culture of knowledge should recognize that design research goes far beyond what can be transcribed and handled verbally. It may be that natural sciences and cultural studies understand design best when they reduce it to what theories can say about it. But that cannot bring them very close to understanding the specificity and uniqueness of design's culture of knowledge. Our knowledge is materialized in things, in the processes and interactions we design; we conduct our discourse within those media. To the question, "What are the boundaries of Design?", Charles Eames answered, "What are the boundaries of problems?"

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Translation from the German by Spencer Hawkins

Lit.:

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