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# The Formation of the Technological Sensitivity

## Gaining a New Perspective on Existing Objects

Sebastien BOURBONNAIS<sup>1</sup>

***Abstract.** This article aims to clarify how recent transformations in the field of architecture, chiefly the availability of new digital design tools, have introduced new ways of approaching projects. It will delve into the philosopher of science Gaston Bachelard's thought and the notion of phenomenotechnique in order to explore the off-centre position of the architect. Mastering these tools has inculcated in architects a 'technological sensibility'. The formation of this sensibility has expanded architects' vision beyond the potential of the technologies themselves to finding new perspectives on more traditional architectural considerations.*

***Keywords.** 1 Digital Architecture, Technological Sensibility, Phenomenotechnique*

Digital technology has introduced new methods to architectural practice, bringing about many transformations, both big and small, which some architects have integrated to their existing considerations. Consequently, this adoption process involves matching this technological potential with the intentions of the architects. These intentions are somewhat nebulous, as they combine zeitgeist-driven motivations, questions passed down from the architects that came before, unique approaches, and an evolving 'digital' imagination. In spite of the complexity and interwovenness of these various intentions, one could say that the adoption process is complete when it finds a unique, relevant application to a specific project. It is through these diverse considerations that digital technology has been introduced into practice and transformed sensibilities - to the extent that it could be said that the technologies themselves 'constructed' these sensibilities.

In his epistemological work, philosopher Gaston Bachelard laid out a number of areas for exploration that may be helpful in attempting to understand the contributions of digital technology to the field of knowledge of architecture. While it is not our intent to equate architectural practice with a scientific endeavour, some concepts, such as *phenomenotechnique*, may be extended to help understand the changes some architects have adopted in their practice. This short article aims to establish a possible analytical method, rather than provide a true in-depth, exhaustive analysis. It will involve examining the evolution of the works of Achim Menges and his multidisciplinary team in order to understand which aspects of architecture have been expanded to gain new perspectives on more traditional architectural considerations, by these complex, sophisticated technologies.

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## The Transformation of Architectural Practice

It is important to remember then, since the end of the 1990s, new technologies have radically transformed the architectural field. Focusing our study of the digital transition on the new technological tools highlights the power dynamics that were created between the architect and the technology. In this sense, the focus is no longer only on the physical reality of the buildings themselves, nor even on their morphogenetic processes, which are complex and varied, but it also extends to the experimental conditions of these practices, and especially on the technical difficulties architects face. It also involves broadening our vision to include what Bachelard would call the “epistemological obstacles” that architects have had to overcome.

Bachelard develops this idea of epistemological obstacles in *The Formation of the Scientific Mind*, in which he aims to explore the efficacy of scientific thought through the prism of normative judgement. The philosopher argues that it is rarely a matter of merely extending or refining an intuition - this intuition must instead be corrected. For this reason, he proposes a series of methods for investigating the disruptions and reversals that *construct* scientific knowledge, such as this one: “Knowledge [must be] brought back into contact with the conditions that gave it birth; we must keep returning to that ‘nascent state’ which is the state of psychic vigour, at the very moment when the answer has come from the problem” (Bachelard, 1938, 49). This method reveals how practices have evolved over time and makes it possible to set aside any biases in order to revisit ideas that had previously been discarded.

It is important to note here that in referring to Bachelard’s work on scientific knowledge we do not mean to imply that architecture is a scientific endeavour. Indeed, our aim is instead to attempt to redefine sensible knowledge, or at least to rethink it in light of the changes wrought by the adoption of digital technologies, which we assimilate to the notion of *phenomenotechnique*.

We are exploring Bachelard’s thought surrounding the role of technique, and more specifically, that of the instruments that are involved in the ‘construction’ of the objects of our study, as well as of the meanings being used. The philosopher insists on this point: “science *realises* its objects without ever just finding them ready-made. *Phenomenotechnique extends* phenomenology” (Bachelard, 1938, 70). Phenomena which would *prima facie* be inaccessible to perception become perceptible through the technical tools that are put into place to observe them. As the philosopher points out, the phenomena do not simply appear, but they do so within the logic of the tool that revealed them.

## Extending the Concept of *Phenomenotechnique*

Bachelard’s notion of *phenomenotechnique* was intended to emphasise the significant position of technical mediation in understanding and perceiving phenomena. “[The purpose of *phenomenotechnique*] is to amplify what is revealed beyond appearance. It takes its instructions from construction” (Bachelard, 1934, 13). Through this notion, which Bachelard limits to scientific phenomenology, the philosopher warns against what appears self-evident to human perception by drawing out the rupture caused by differences in scale. Consequently, contemporary science “is no longer a science of facts, but instead a science of *effects*. The technical device of observation causes the *actualisation* of the phenomenon under observation” (Bontems, 2010, 55). It is within this logic that “a decentring from the initial agreement between perception and the things under consideration” (Bontems, 2010, 53) occurs. Could we not see this type of observation as useful to understand the rippling effects of digital technology on

some architectural practices? If so, we could ask ourselves the following questions: What phenomena are these architects attempting to produce with their simulation software? What previously hidden facts does computational power reveal?

It is, of course, impossible to answer these questions in a general sense. We can only provide an answer for a specific case, as we will show below, with Achim Menges' pavilions. For now, the goal is to draw attention to the reconfigurations brought about by the updated knowledge that is being constructed by these digital tools. It would likely be a worthy endeavour to conduct a deeper analysis of how this specific knowledge, as applied to architectural practices, is constructed, as this would make it possible to understand the thought processes used to reach it from the vague knowledge, imprecise concepts, and fluctuating ideas that are used to describe such experimentations<sup>2</sup>. This knowledge, which is 'objectified' by the instruments, emerges both from the potential of technology, which provides adjustments and changes, and from the heterogeneous intuitions of the architect. This complex arrangement *forms* a technological sensibility, step by step.

### The Formation of Technological Sensibility

The notion of technological sensibility is, of course, distinct from that of the *scientific mind*, as described by Bachelard. It remains that sense and aesthetic knowledge comes to architects through an apparatus that could be described as phenomenotechnical.

This is why it is worth exploring Bachelard's investigations into the process of formation and of the epistemological obstacle to the formation of the scientific mind. Bachelard describes an opposition between the *formative* instinct and the *conservative* instinct. "There comes a time when the mind's preference is for what confirms its knowledge rather than what contradicts it, for answers rather than questions" (Bachelard, 1938, 17). It is in this sense that Bachelard specifies that even a scientific mind that is experimenting and attempting to gain the most objective perspective on what is being observed, without bias, is still confronted with a series of epistemological obstacles preventing it from 'correctly' seeing what it is observing. What does an architect observe with digital tools?

The architect is not attempting to see reality or observe nature in the same way a scientist might. Indeed, the architect is trying to hatch a complex idea, which may be vague, until he/she reaches a proposed spatial configuration that suits the relevant project. There is no need to insist on the chaotic journey required for the architectural object to take form. Of course, the architect does not have a mental image that he/she simply must put to paper. And yet, current digital tools provide the methods to go about the process in another way - perhaps even to create something else altogether. Before exploring what this *something else* might be, we should specify that the formation of a technological sensibility may involve the architects' reflexive ability to be 'sensitive' to the technological dimension of their experimentations as well as to the shift that these technologies have introduced into their practice. In other words, the architect is made aware of the changes in scale that the instrument brings about in some aspects of the project and of how they are integrated with one another.

This is why technological sensibility cannot be fully assimilated to a rational, scientific

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2. I began this work in my dissertation (2014): *Sensibilités technologiques. Expérimentations en architecture numérique 1987-2010*. [Technological Sensibilities. Digital Architectural Experimentation from 1987 to 2010]

mind, instead, it is a deviation of architectural thought brought about by phenomenotechnical instrumentation, which uses simulations to bring fresh knowledge to the project. This fresh knowledge rearranges different parts of the project. Our idea is to argue that it is not the fresh knowledge itself that radically transforms the project, nor the 'objectivation' of data, but its relationship with the traditional intuitive way of designing certain elements of a project.

### **Gaining a New Perspective on Existing Objects**

This is why it is not surprising that in the 1990s, arguments attempting to destabilise several foundational notions of architecture were formulated. An enthusiasm for incidental findings and the role of chance, or an opposition to gravity, or a fascination with the processes that drive emergence, are just a few examples of themes that were explored in these early experimentations. Over the years, it was revealed that many of these themes that were expected to renew architecture were ineffective and disappointing, much in the same way as digitally generated architecture has been. Thus, for many architects, these attempts to formulate new theories were redirected to questions of materiality and construction.

The example of the 'wall' illustrates the various shifts in terminology that followed the adoption of digital technology. At the end of the 1990s, many architects used the concepts of surface and hypersurface to provide a more detailed description of the idea of the wall, although evidence from more recent works shows that these singular characteristics could best be described as a membrane. These shifts highlight the tension generated by the different software solutions used to describe the distinction between indoor and outdoor space. Indeed, while the envelope 'envelops' the inside of a building, or if a wall separates and divides the space between inside and outside, the notion of a membrane puts more emphasis on its chrono-topology, its polarity or its porosity. The term accentuates its dynamic character, as it is undergoing a continual process of stabilisation and organisation. It would be possible to write an entire volume about terminological shifts in the timespan separating early experimentation from recent ones. While exploring the idiomatic productions that followed experimental productions, it is interesting to take an additional step and attempt to not only understand the novelties, but to also retrospectively observe what already existed in light of these experimentations. This idea echoes the argument Bachelard proposed in *The New Scientific Spirit*, that is to say that new theories do not contradict past theories, instead, they give them a new, extended foundation, much as non-Euclidean geometry did for Euclidean geometry. "First constructed in the margins of Euclidean geometry, non-Euclidean geometry sheds a revealing light on the limitations of its predecessor. The same may be said of all the new varieties of scientific thought, which have time and again pointed up gaps in earlier forms of knowledge" (Bachelard, 1934, 8). Would it be possible to understand the new perspective architects have gained on what already exists?

### **Two Pavilions**

The evolution of the projects completed under the guidance of the architect Menges and the engineer Knippers may shed light on some of the issues related to the transformation of practices we have described. It may be helpful to specify here that this team's work is closely tied to scientific thought. Biologists have contributed to several projects, and the team used instruments of measurement with a great deal of precision to analyse the particular morphology of sea urchins, the processes for fiber-reinforced structures of water-spiders, and to predict the self-shaping of wood during the drying process.

For our purposes, it is not relevant to explore the fact that these data have been gleaned from living organisms and that the architects describe their approach as ‘biomimetic’. The main criterion is the disruption of data generation caused by instruments in the process of perceiving the observed phenomenon. As previously stated, what matters most is not that the information is external to the architect, because in this logic, the generated data remain an extension of the architect’s intuition. Indeed, what we aim to highlight in this instance is that the data leads to a redistribution of power balances within a project. In particular, because of the value placed to this data.

We will illustrate our argument with two projects: the *Landesgartenschau Exhibition Hall* (2014) and the *Buga Wood Pavilion* (2019). These two buildings were designed based on the same morphological principle, taking inspiration from the skeletal structure of the sea urchin. Indeed, since it is constructed using plates, it saves a considerable amount of materials. In the few years separating the erection of these two pavilions, the team acquired the know-how to build a higher structure: the first pavilion was 11 m span, and the second 30 m. These gains were primarily achieved by creating lighter plates. In fact, the additional complexity of each plate’s structure was key to creating a more stripped-down, minimalist design for the second pavilion. The uneven surface of the interior of the *Landesgartenschau*’s two domes, with its visible finger joint connections, was supplanted by a smooth, vented surface in the *Buga Pavilion*. The general shape of the pavilions was also softened, shifting from two fused domes to a single central lowered dome with three raised areas, marking the entrances and mimicking the shape of the surrounding dunes. It is somewhat surprising to notice that the work involved during the years separating the construction of these two pavilions was primarily focused on better mastering the technology, freeing up the architects to address traditional architectural considerations, such as site insertion, the ability to integrate a programme using adapted morphology, or be able to integrate basic technical devices, to name a few. This observation is especially striking in the *Urbach Tower* (2019), which displays astonishing sobriety. The technological potentialities are no longer directly visible to the naked eye, are no longer roughly expressed, but are incorporated into the layers of the building.

These examples show that digital technology, far from entirely revolutionising the field of architecture, as was the hope of some architects in the late 90s, has revealed the immutability of some aspects of architectural design. Contemporary architects’ increased focus on the characteristics of some materials and construction processes demonstrate that technology has successfully opened up and built its own scope for intervention that leaves room for their own expression. Most importantly, there is a reconfiguration between the architect’s intuitive knowledge and the knowledge obtained through digital tools. This data no longer merely validates the initial intuitions, but participates in the construction of a new type of expression, which is neither entirely scientific, nor entirely sensitive, but a combination of the both.

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