

## Philippe Rahm: “Form and Function follow Climate”

PHILIPPE RAHM INTERVIEWED BY  
LAURENT STALDER

**Buildings/building – Swiss Architecture Laboratory (Bauten/bauen – Architekturlabor Schweiz) is a two-year lecture and interview series to be held by the Department of Architecture at ETH Zurich. Swiss architects will be invited to explore new trajectories in architecture and urban design in a sequence of lectures. In parallel, interviews will be conducted, with excerpts appearing regularly in *archithese*. The interviews will be published in their entirety in a compilation in book form at the conclusion of the series.**

**A central premise of your work is that the paradigm shift that took place in Human Sciences in the 1990s has had repercussions also for architecture.**

When I graduated in the 1990s, I was initially interested in the chemical and physical qualities of materials. I wanted to adopt a position on architecture as defined by Hegel, namely that architecture, owing to its materiality, occupies the bottom rung of the artistic ladder, so to speak, subject as it is to weight, the climate and erosion. However, the implication here was not simply to think about individual materials in isolation but rather to understand the connections that exist between them. My work with my former firm, Décosterd & Rahm, associés, was thus rooted from the start in the notion of interconnectedness, of an eco-system. It rested on the hypothesis that materials are not isolated from one another but interconnected by a series of chemical, physical and biological transformations. For example, the potassium and phosphate found in certain stones nourish the soil when they decompose as a result of exposure to air or water. Photosynthesis subsequently allows carbon dioxide and water to metamorphose as oxygen and glucose. It was on the basis of this thesis, that we built in 1995 the annexe of a private

residence from concrete, the stony aggregates of which contained the two aforementioned elements. In eroding over time, the house would replenish the soil with the minerals that plants need in order to grow. At the end of the 1990s, following the arrival of new technologies such as mobile phones and the internet, there emerged the notion of an electromagnetic field and hence, the idea that matter is not only visible but invisible, electromagnetic. From then on, electromagnetic geography superposed itself on physical geography. In 1998, also, the first federal provisions on electromagnetic pollution were published, to regulate thresholds of non-ionising radiation. Paradoxically, that which came to be called “information highways” generated smog, just as real highways do. The field of architecture and urbanism had thus slid towards the invisible dimension. Sure, one didn’t know so far (and still doesn’t) whether or not such dangers are real yet the very notion of an electromagnetic field opened up a new way of thinking about space. Space was from this point on no longer imagined simply as a void, as an absence defined by walls, floor and ceiling but as a less dense mass, disconnected, transparent and yet nevertheless filled with material; a void invisible to the eye, certainly, but in which the body was immersed.

**The architect’s agenda would thus henceforth encompass not only the domain of the object but in a more general sense, that of the environment?**

Yes, absolutely. Actually, I have never been interested much in new technologies per se or as a means to generate new forms. I’ve always remained quite critical of this ongoing virtual, agravic, “paperless” dematerialisation of architecture. Thus in 1999, when I was invited to take part in an exhibition on new technologies in architecture, I proposed a critical project, the *hormonal-web*, in which I demonstrated the physical and biological aspects of the virtual. It was a question of demonstrating that, in

spite of digital dematerialisation, a physiological link continued to exist between the computer and the user’s body, by virtue of the screen’s radiation on the human eye.

This project subsequently developed under the name *i-weather.org*, a sort of climatic cycle for the internet that develops in time with a 25-hour circadian rhythm linked to the hormone melatonin.

**Does scientific progress transform architects’ field of knowledge?**

Yes. For example, reinforced concrete and steel have totally transformed our conception of space. These new materials allowed a spatial arrangement determined by closed, juxtaposed rooms, linked by a corridor, to be replaced by Le Corbusier’s or Mies van der Rohe’s free plan, by fluid space. I believe that knowledge of the physical, electromagnetic and chemical dimensions of space will modify the nature of contemporary architecture in the same way.

**You define this paradigm shift in architecture as the transition from “physical” architecture to “physiological” or “atmospheric” architecture. What do you understand by this?**

This terminology is part of the language of the manifesto. The discovery of the atmospheric dimension of architecture has allowed us to distance ourselves from a Swiss debate that – in the 1990s, in the wake of Herzog & de Meurons’ first projects – focussed only on materials’ narrative or symbolic properties. Concentrating on the physiological and consciously excluding from our research all that might have clouded this dimension, allowed us to apprehend space in a novel, unexpected way, since it was determined by unexplored givens. Thermal imaging and x-rays do actually allow space to be visualized differently. Light, for example, a classic element of the language of architecture, has been enriched since the 1980s by a biological dimension, for its intensity and the length of its waves have



been shown to influence the hormone melatonin. In consequence, architecture is no longer simply the expression of the play of light and shade on bodies and materials but attains a physiological dimension. Such discoveries opened up a new field of research with new implications, with unheard-of design rationales. I called this field “physiological architecture”.

**But how can one reconcile this desire for rupture with notions that remain on the whole very traditional: such as that of “the atmosphere” so entrenched in Swiss architectural debates of the 1990s?**

I see myself as heir to a certain Swiss tradition and to its interest in questions of ambiance linked to the materiality of objects. However, my work moved very rapidly beyond the idea of memory, reference or analogy in favour of a sensual and immediate perception of the odour, the length of a wave, the level of humidity. It's therefore not so much the visual or semantic dimensions of atmosphere that are central to my work as the physiological or meteorological dimensions, in the primary, literal sense of these terms.

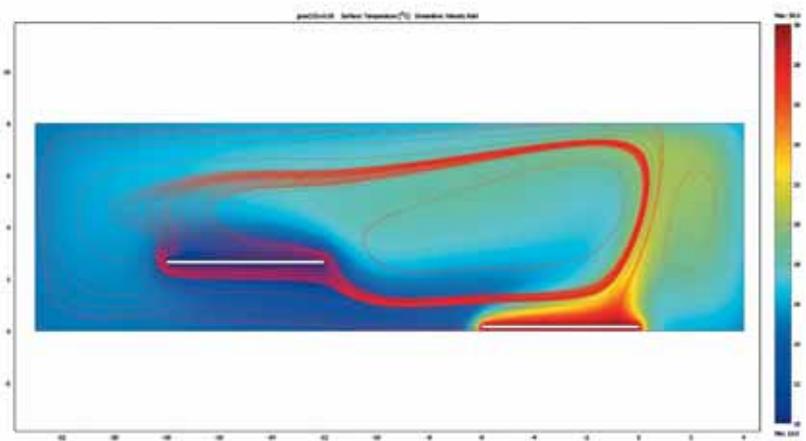
**This mistrust of form transpires in another of your postulates. You don't trace the paradigm shift of the 1990s back solely to the transition from “the physical” to “the physiological” but also to the transition from a concept of architecture as a problem of form to that of architecture as a performance issue. What do you understand by this?**

In the classical tradition, in the work of Vitruvius or Alberti, the emergence of form seems to be linked with harmony and symmetry and their relation to the human body. Then, in Modern architecture, form becomes the expression of function. It is the body that deforms space, the length of an arm that determines the size of a kitchen. In the 1990s, with the emergence of the minimalist “Swiss box”, the question of form became linked with materials, with their

sculptural qualities and surface. For my part, I was no longer interested in the building envelope but in what it contains, no longer in the envelope's matter but in that of space: in the void. My first projects were consequently very “informal”. Then, little by little, by investigating not only the chemical but also the physical characteristics of the air – the fact that warm air rises for example, and the displacement of humidity – I was able to generate a catalogue of forms determined by these conditions.

**So what you mean by performance in architectural terms is control of the interior climate?**

Yes. The primary role of the architect is to modify or adapt a climate to human needs: to raise the temperature when it is cold, the measure of light when it is dark. The very essence of architecture is therefore to create an environment that differs from the exterior environment, be this in terms of



1 Philippe Rahm architectes, Digestible Gulf Stream, 12<sup>th</sup> International Architecture Exhibition, La Biennale di Venezia, 2008 (photo: Noboru Kawagishi)

temperature, humidity, air or sound. The notion of climate or atmosphere is thus fundamental to architecture. I think that ultimately the mass is secondary to the void. Paradoxically, the history of architecture did not assign this status to it.

**Control of the climate is consequently architecture's principal task?**

Yes. There's no other choice. But I wouldn't use the term “control”, with its modern, normative connotations. I would rather say, that design of the atmosphere is now the domain of architecture. And the new ecological norms accentuate that. Today, interior space is insulated to the point where one can practically heat a house with the flick of a lighter. But this gives rise to new problems such as oxygen renewal, evacuation of the humidity that ensues from respiration, or adjustment of temperatures to 22°, 19° or 16°Celsius, depending on what a space



2

3



is to be used for. One can see that the exigencies of sustainable development are causing an increasingly dramatic and fundamental shift in architecture, from the tectonic to the climatic, the visible to the invisible dimensions.

**The well-tempered environment, a concept defined in terms of its mechanical dimension by Reyner Banham in 1969, was the theme of your installation for the Venice Biennale in 2008.**

Yes, that's right. But I discovered the work of the 1950s and 1960s relatively late: the projects of Yves Klein or Andrea Branzi, for example, or the theoretical writings of Reyner Banham and Michel Ragon. Actually, between the 1960s and my project for the Biennale in 2008, *Digestible gulf stream*, Postmodernism served to eclipse this evolution.

By setting up a situation of thermal asymmetry – convection transfer from a warm pole at 24°Celsius to a cold pole at 16°Celsius – my project sought to create a varied thermal landscape. Obviously, inhabitants' behaviour changes according to the tem-

perature of the space they find themselves in. On the lower plateau, heated to 24°Celsius, it's possible to be naked. The climate is paradisaical, summery, voluptuous. The quest for this type of environment is inscribed in a long tradition that oscillates between Monte Verita, Shangri-la, the Golden Age, hippy open-air events and Arcadia. By contrast, the cooler temperature of 16°Celsius emitted by the higher plateau creates a more hostile environment.

It would be interesting to write a "thermal" history of design and its relationship to the interior climate. In films of the 1960s, the domestic landscapes in which skimpily-clad girls dance barefoot on pile carpets suggest an interior climate of around 23 to 24°Celsius. Following the oil crisis in the 1970s, the interior temperature drops to 18°Celsius. These changing conditions lead people to turn down their heating. They're obliged to wear heavy woollen sweaters, even indoors. In the same way, the domestic landscape of the 1970s becomes stiffer; it forces people to stand up, to abandon the floor. Insofar my *Digestible gulf stream* is only fifty per cent a 1960s revival;

the other fifty per cent is a 1970s revival. Architecture thus allows for the production of diverse environments, rich in contrasts. It's possible to totally recreate a Spanish summer, a Tahitian springtime, a Swiss winter, simply by regulating the levels of humidity and luminosity, and the position and intensity of heat sources. Architecture does not simply create spaces that protect one from wind and rain; it also allows for different temporal zones because, in moving from one space into another, it is now possible to make a spatial-temporal leap from the south to the north, from daytime to nighttime, similar to that which one experiences in Switzerland in winter, when crossing the threshold to enter one's home.

**Which leads to your equation, "form and function follow climate"?**

The formula derives from two or three projects from 2005, in which I investigated the interrelation of humidity levels, temperature, air circulation and architectural space. It's based on simple propositions: a human being emits thirty grams of humidity per hour when

2 Philippe Rahm architectes, Domestic Astronomy, Louisiana Museum, Denmark, 2009  
[Photo: Brøndum & Co]

3 Philippe Rahm architectes, Diurnisme, Centre Pompidou, Paris, 2007  
[Photo: Adam Rzepka]

4 Décosterd & Rahm, associés, Hormonorium, 8<sup>th</sup> International Architecture Exhibition, la Biennale di Venezia, 2002  
[Photo: Niklaus Stauss]



4

sleeping, simply by breathing, 150 grams per hour when active, and up to 1500 grams per hour when taking a shower. Our activities thus contribute to progressively raising the level of humidity in the air around us. Consequently, spatial organisation must be designed in the light of our different activities, in accordance with various data on the interior climate. Such data are important when air renewal is controlled by the double-flux heat exchanger stipulated by the new environmental norms.

Normally, the architect organises his plan to suit the proposed functions of a space and introduces a ventilation system only later. I asked myself if it might be possible to reverse this proposition, in such a way that form and function would follow the climate. In consequence, spaces would no longer be organised in accordance with functional principles but in terms of ventilation. The house would literally be designed on a current of air, going from dry to humid. That's the plan for the *Mollier house project*.

The stratified design of the *Archimedes House* at Vassivière corresponds to the air current that runs through the building. The project proposes that one imagines the house in its entirety in the light of the fact that warm air rises, and distributes various usages of the house according to the temperatures they require: thus at the very top of the house, one finds the bathroom, the living room below that, the kitchen below that, and the bedrooms on the ground floor. The circulation of air thus generates a new spatial organisation, a new typology that closely complies with Swiss SIA norms. In fact, the latter recommend themselves that temperatures be variable and reflect inhabitants' activities.

This climatic as opposed to functional approach to the project updates the environmental principles that one finds already in vernacular architecture:

warm spaces have always been south-facing, cold spaces where milk and other foodstuff were stored north-facing, dry spaces for hay in the roof space, and humid ones in the cellar. The defining factor here was therefore not the purpose of a space but its temperature. Spaces might equally be multipurpose. In the inhabited parts of some houses, the room with a hearth served both as a kitchen and living room and perhaps also as a place of repose for the elderly.

This independence of form and function is even more striking in other cases, for example in traditional houses in Baghdad. Rooms there do not have a fixed function. Rather, their function changes in the course of the day and the course of the year. Usage is determined by temperature: the roof may become the bedroom in summertime, for example. It is no accident that the names of rooms are linked not to their function but to different climates.

**What is this need you have, to inscribe yourself in an environmentalist discourse? It permeated your writings in recent years and you refer to it here – yet to me, it seems reductive.**

It's a question of contingency. The environmental concerns that arose shortly before 2005 finally provided a context for my work on physiological architecture. Physiological architecture acquires pertinence in the present framework of sustainable development and it facilitates a critique of a too narrow reading of technical or functionalist environmentalism. But sustainable development per se is of interest to me only insofar as it allows me to find new forms and new ways of designing architecture.

**Every quest for comfort, be it in terms of organising space or, as in your work, the "biological" or even "physiological" dimensions of space, is**

**linked to the issue of control. As you admit in an interview in the magazine *ICON*, work on the "physiological" data of a dwelling enables you not only to control but also to manipulate factors such as sleepiness, mood, wellbeing and so forth. In that interview you even use the term "perversion" to describe this potential.**

I work on the climate, on climatic parameters, and I render them visible, so one might well imagine I'm responsible for them. In reality, all I do is exploit new scientific findings. I didn't invent this link between the hormonal cycle and light. But it happens to exist. However, we're not obliged to biologically manipulate people just because architecture has gained a biological dimension. No more than we are obliged to build solid walls simply because we invented concrete.

In the *ICON* interview, I was led by the idea that my work ensued from a sort of second perversion. The first perversion was modernity's domain since, as Heidegger so aptly described, it perverted natural cycles, transformed day into night, winter into summer. This Modernist project is now over.

In *Diurnisme*, my installation for the Centre Pompidou from 2007, I therefore proposed to pervert perversion of modernity. It was a double perversion. Indeed, while modernity created non-stop daytime by using city lights to suppress the alternation of day and night, thereby transforming the shape of cities and the nature of urban lifestyles (as in night-owls, nightlife, evenings at the theatre or at balls, etc.), in *Diurnisme* I tested continuous night or, to be more precise, a false night in false daylight during a real night.

It's a fact that nocturnal pollution disturbs natural biorhythms. In the daytime, light blocks the human body's secretion of melatonin, which influences the sleep cycle. By contrast, the body secretes large



quantities of melatonin at night. In my project I tried to reintroduce nighttime without re-extinguishing the light. It was a matter not of retracing steps but of going a step further. I therefore worked on the length of those light waves that don't affect melatonin: the length of light waves over 600 nanometres, which show extreme luminous intensity in the oranges/yellows, like high noon, at 7000 lux. The body's biological rhythm is thereby exposed to something like the nocturnal situation yet in full daylight. *Diurnisme* is the creation of a false night in the false daytime of modernity.

**This approach to architecture – which concerns on the one hand the macroscopic scale, that of the environment, and on the other the microscopic scale, that of human metabolism – challenges a whole range of binary relations, for example, the distinction between interior and exterior space, private and public, natural and artificial, human being and machine. What are the consequences for architecture?**

One of the most obvious consequences, for example, is the transition from an understanding of the wall as a tectonic element separating interior and exterior realms to a concept of the wall as strata. Spaces are defined nowadays by regulations derived from thermal coefficients: a material with good insulation properties will have a weak thermal coefficient of 0.45 for example, another a coefficient of 0.9, a window one of 1.1. These days, insulation is assured by adding insulating layers. Instead of adding one layer to another in a compact fashion, as in glazing – simple, double, triple glazing – one can also dilate the spaces between the glazing layers and make them habitable. One would thus inhabit a certain thermal coefficient; the space with the lowest coefficient would be at the centre, that

with the highest coefficient on the periphery. In this way, the borders between inside and outside would dissolve into different spatial thresholds. One would no longer know where the interior begins: after the first layer of glazing, after the second or, perhaps, only after the third? The interior would be modulated.

It would then be possible to organise programmes in terms of their thermal coefficients, as I did in 2006, in my project for the Kantor Museum in Poland and, in 2007, in a competition for a school at La Neuveville in Switzerland, where the architecture was created by adding thermal layers: one level of insulation for the toilets (which in winter could correspond to a temperature of 15°C), two layers for the corridors (160), three layers for the hall (180) and, finally, four layers for the classrooms at the heart of the building (200). This allows one to reinvest space with a sense of the passing seasons, to leave behind the climatic norms and uniformity that current recommendations on sustainable development unwittingly promote.

**The architect's role would hence no longer be simply to question tectonic limits; he would also address the border between the inside and outside of the human body?**

That is what I tried to do in my *Harmonorium* for the Swiss pavilion in Venice, in 2002. The exhibition space put nothing on view. There was nothing to see. Interaction took place beneath the skin, at the hormonal level: the light had an effect on melatonin, the air on erythropoietin.

After that I began to study the relation between climate and human physiology. For example, I asked myself, whether the body is able to compensate for a cold environment by absorbing sugar or proteins: a process familiar to us in Saint Bernard dogs.

Similarly, in Japan one can buy a hot or cold drink from a vending machine on every street corner: take a can of hot coffee to warm oneself up in winter, and the reverse in summer. I often said to myself that cool drinks in summer from these vending machines are a physiological replacement for cool arcades or the shade of a tree, and have become as such a sort of alimentary portal, or an alimentary arcade – it's as if an alimentary solution has replaced an architectural solution.

**So it would be a matter of redefining architecture, no longer solely as a tectonic problem but also as a technical challenge – by introducing air-conditioning or light to a situation, for example – or even as a biological challenge – by acting upon the metabolism?**

Exactly. The canned drink is potable micro-architecture.

**You've contented yourself to date with making installations. You haven't yet built anything.**

I have some interesting projects in the pipeline: residential and commercial commissions.

**Is that realistic? Your approach is above all else a critical one; it seems little suited to practice.**

I don't think that's the case. What you call a critical approach is for me a matter of renewing the language of architecture. And it is with this new language that I want to build.

French-English translation by Jill Delton

6



5 **Philippe Rahm architects, Convective Building, Housing for IBA Hamburg, 2010**  
 (image: Philippe Rahm architects)

6+7 **Philippe Rahm architects, Vaporized Building, Office building for EPAD-EPASA La Défense, Paris, 2010**  
 (images: Philippe Rahm architects)

7



Philippe Rahm, born in 1967, studied architecture at the Swiss Federal Institute of Technology in Lausanne (EPFL) and Zurich where he obtained his degree in 1993. He taught at L'École nationale supérieure de Beaux-Arts Paris, EPFL, Architectural Association London, Accademia di architettura Mendrisio and L'École nationale supérieure d'architecture Paris-Malaquais. Currently he is a guest professor at the Royal Danish Academy of Fine Arts in Copenhagen. In 2002, he was chosen to represent Switzerland at the 8<sup>th</sup> International Architecture Exhibition, la Biennale di Venezia. Exhibitions at CCA Montreal, MoMA, Bienal de Valencia 2003, CCA Kitakyushu, Mori Art Museum Tokyo, FRAC centre Orléans, Centre Pompidou Paris, Manifesta 7 and Louisiana Humlebæk. He works in Paris and Lausanne.

Laurent Stalder has served as Assistant Professor to the Chair of the Theory of Architecture at ETH Zurich since February 2006. Focal points of his research and published work have been the history, criticism and theory of architecture from the 19<sup>th</sup> to 21<sup>st</sup> centuries in Europe and North America.