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# An architecture “des humeurs”

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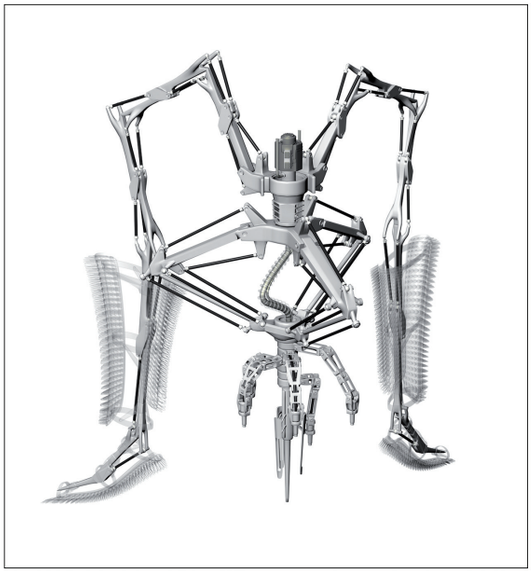

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Publications depuis 2004
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# Editorial

To envisage transdisciplinarity, a favorite theme of the "Mouvement" magazine, solely as a combination of the various artistic "disciplines" would be to adopt a singularly reductive approach to this term. Specifically, it would mean neglecting one of the essential challenges currently presenting itself to art and the world: namely, the relationship (or rather the rhizomatics and complex multitude of relations) uniting art and science, which philosophers such as Bernard Stiegler have identified as the cornerstone of a new economic and social model, in this contemporary world where Web 2.0 is delivering the tools of the new economy functioning along cooperative and contributive lines. It is towards this exciting rapprochement that a structure such as Le Laboratoire naturally strives, conceived as it was right from its initial foundation in 2007 in Paris, by David Edwards, as a "place for experimentation" seeking to "render visible the processes of research in train between scientists and artists". And indeed, the same collective and multidisciplinary dynamic has been the driving force behind the R&Sie(n) architectural office in Paris, set up by architects François Roche and Stéphanie Lavaux. A dynamic which, it should be said, queries the concept of "the work" and copyright since the fruits of "the work" are available as Open Source, thereby celebrating a rare sense of sharing, well away from any type of "positivist mysticism".

The aim of the exhibition "An architecture 'des humeurs'" ("Une architecture des humeurs"), to be seen in Le Laboratoire from 22 January to 26 April 2010 is to review, by concrete expression, the current situation as regards this "cryptic and generous" research work, to borrow the phrase of François Roche. This protocol constitutes the second work (after "I've Heard About", presented at the City of Paris Museum of Modern Art in 2005) of an artistic voyage federating the skills of scientists from a host of disciplines (mathematics, physics, neurobiology, nanotechnologies, etc.) in an attempt to "articulate the real and/or fictional link between geographical situations and the narrative structures capable of transforming them". Specifically, the focus here is on using nanotechnology to collect physiological data of all participants to prepare and model, by means of these "moods" – a (post)modern translation of Hippocrates' humors – the foundations of an architecture in permanent mutation, modeled (and modulated) by our unconscious. An architecture of uncertainty and non-determination, the first prototypes of which should be very soon available thanks to technical progress.

Looking beyond a strictly scientific and architectural parapet, and reading beyond the philosophical benchmarks (from Gilles Deleuze to Peter Sloterdijk, not forgetting Toni Negri), it is tempting, and indeed enlightening, to envisage the R&Sie(n) modus operandi from a metaphorical and poetical angle. And indeed, this special edition, prepared by Mouvement and Le Laboratoire, explores the concept of a "chemistry of bodies", envisaged "as an element liable to disturb and alter linear, authoritarian logics". In a similar vein, we look at the process shedding light on "the relationship of the body to space, and even more so, on bodies in their social relation, in their relation to the other, within a given cell, but also as part of an osmosis with others"; as well as an architecture playing with "conformism" and "conventions"… all bywords of the "undisciplined" conception of art defended by "Mouvement", in its articulation to the collective and political. **David Sanson**

**An architecture "des humeurs", exhibition from 22 January to 26 April 2010 at Le Laboratoire, Paris.**

**To be continued on**
www.new-territories.com/blog/architecturedeshumeurs/

**Conference**
« Synapses Speeches »: neurobiology, computation, robotic, philosophy, 16 February from 1 to 7 pm at the Ecole nationale supérieure d'architecture Paris-Malaquais. With Antonio Negri, Mark Burry, François Jouve, Rupert Soar, Behrokh Khoshnevis, Jean-Didier Vincent, Jeanette Zwingenberger, Chris Younes, Stephan Heinrich, Winston Hampel, Natanel Elfassy, François Roche. Moderation: Giovanni Corbellini.

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**An architecture "des humeurs"**
visit by
**Jeanette Zwingenberger**

# Molecular interfaces

**Jeanette Zwingenberger** is an art historian. Her first collaboration with Francois Roche started was with her exhibition: "L'Homme-Paysage, Visions artistiques du paysage anthropomorphe entre le XVI$^{e}$ et le XXI$^{e}$ siècle", ("Humanlandscape, Artistic Visions From Anthropomorphic Landscape From XVI$^{th}$ Till the XXI$^{st}$ Century") at the Palais des Beaux Arts de Lille, 15.10.2006-14.1.2007 and her seminar at the Collège international de philosophie where François Roche was among the distinguished scholars who were invited.
Her present research about biotope, man as a living interface proposes a new alliance between nature and culture.

**Since its foundation in 1989 in Paris by the architects François Roche and Stéphanie Lavaux, the projects and experiments carried out by the R&Sie(n) architectural agency bespeak of critical architecture conceived as a complex and evolving organism. Through their exploration of the links between a construction, its context and human relationships, R&Sie(n) have redefined the rapport between the human body in its sensual dimension and its environment. The exhibition Une Architecture des Humeurs on show at the Laboratoire is the culmination of this research between architecture and science proffers an immersion in real time based on the neurobiological emissions of each of the spectators. The body is thus no longer considered for its exterior aspect, for its narcissistic appeal, but in its intersubjectivity with other living things.**

> All the décor of the exhibition is in white. Long sheets of milky plastic separate the different spaces and only the spectators stand out against this background. At the entrance a video showing a person stuck in an elevator facing a mirror and repeating "I am late…" invites us into this parallel world. This reference to the rabbit from Lewis Carroll's "Alice in Wonderland" (Carroll, as François Roche loves to remind us, was above all a great mathematician, who enjoyed turning our so called logic on its head.) situates this exhibition on the other side of the mirror within a physiological and biochemical process.
On entering a cabin, the spectator is invited to take a seat facing a screen and a person dressed in white says in a soft voice: "Please place your hand in this receptacle… Over the next 30 seconds it will assess the balance of your body. Your body will thus become the vector of your emotions. During the test a harmless vapour will be released to help us record any evolution in your emotional state. Please allow this vapour to flow through your body. Breathe in deeply. This vapour is in no way harmful… I will absorb the same substance simultaneously. Facing you is a constructive machine, a robot. It will act as both your guide and at the same time an indicator of the state of your emotions. It is a dynamic portrait of you… Its movements are directly affected and influenced by the nanoparticles that you will be inhaling and exhaling. Please breathe deeply and slowly… lose yourself in the labyrinth, the twists and turns, the ramifications, the arborescence…"

This protocol is an extract from a scenario concerning the collection of physiological data through the use of nanotechnology. It was put together with the help of the artists Berdaguer and Péjus for the first act of this research – "I've Heard About" – presented at the Musée d'art moderne de la Ville de Paris in 2005 and on this occasion has been reworked by Gaëtan Robillard, Frédéric Mauclère and Jonathan Derrough. The screen of this robotic machine maps out the four "moods" revealed by your molecular emotions: Dopamine – the pleasure molecule –, Adrenalin – the molecule of the ability to react to a need for energy –, Serotonin – the molecule of melancholy or "depression" –, Cortisol – the molecule of anxiety or stress. For The Pre-Socratics, man was made up of four elements – water, fire, air and earth. Today, biochemistry is looking at things on a molecular level: that of hormones, whose continual yet undefined communicative functions are still not fully understood.

## Acephalous Bodies

So you have now discovered the invisible face of your animal body with its secretions and fluids, reflecting your emotional disposition towards your environment: the chemical interface that your body is not aware of and that our sanitized society is trying to erase. Unlike the standardization of prefabricated living spaces, the habitable morphologies created by R&Sié(n) are the materialization of ones relation to another or groups of others. From this point, conflict becomes a way of life in a permanent confrontation between the multitude of often arbitrary or contradictory impulses and the singularity of a desire. It is thus an architecture of psychological and psychic relationships, which takes into account the empathy between inhabitants by reacting to their bodies.
The protocol: "At last a habitat that reacts to your impulses… More precisely… it is itself the vector… synchronized with your body, your arteries, your blood, your sexual organs, your pulsating organism… and you become an thing, an element among the rest, an element in fusion, porous… which breathes and yearns to be its own environment… Here everything combines and intertwines. Everything is here, its happening now, a movement happening now… Let yourself go. Don't think about it. Let yourself glide into the strangely silky embrace, a little scary but whose soft caress…"

With this experiment, R&Sie(n) are attempting to explore the phase before the *Mirror Stage* where the new-born child is

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3D print model / SLS process /
h: 80 cm

^ Physiological chamber of humor collection: nano-receptor emission, tactile sensor, screen for chemical check up.

> Secretion machine (bio-ciment), scale 1, h: 1.5 m.

still in a symbiotic relationship with its mother and its environment, its disjointed body concerned by its need to survive and its impulses, and which has not yet been unified by its own "body image" [1]. This disunity engenders a separation and even an alienation from oneself. According to Jacques Lacan, the subject is not a being, but rather an operation, which illustrates this dynamic of disunity and the mirage of unity, since this form observed in the mirror or in any "other" that emerges, situates the instance of self inextricably in a line of fiction for the particular individual. [2]
In the same manner, R&Sie(n)'s architectural and social organisation reassesses our spatial and hierarchical reference points, breaking with the vertical notion traditionally separating man from animals. The frontier between the species opens up onto a multitude in a state continual metamorphosis. The human body is caught between the outside and within, between the organic and the inorganic, filled with primordial energy close to a state of nature of non-separability. [3]

## Coral Architecture

In other rooms of the exhibition, you will discover architectural models, which resemble coral structures that do not simply evolve upwards but which proliferate in every direction like a relief map: In this way branches and subdivisions are able to reunite even after their division. According to Horst Bredekamp, the growth of coral gives an anarchic dimension to evolution with its growth pattern contradicting the tree model [4]. R&Sie(n)'s "Architecture non standard" [5] works in the same way by rejecting any form of planning that later developments might impose, thus doing away with the Euclidean grid. This was the ideal during the Renaissance period, with its use of perspective based on realistic representation imitating so-called reality with everything organised around a unique vanishing point. So what constitutes reality for R&Sie(n)? According to Deleuze, their architecture resembles rhizomic growth: a continuum, which has no beginning or end, no centre and no periphery. The mathematical form of open algorithms leads to growth creating hybrid spaces. The Platonic logic of an architectural plan dictates that a number of different parts be subject to a consideration of a Whole, whereas according to R&Sie(n) each part conserves its autonomy with the result that the Whole remains a part itself. The organic nature of desire for growth results in an uncontrollable force. Biology revamping present-day policy. The culture of human construction imitating natural organisms: culture and nature becoming interchangeable rather than systematically in opposition.

## Emerging Geometry

In another room of the exhibition, a white robot, whose long spindly legs evoke a prehistoric insect, transports us to the animal side of nature. A film shows it at work. For R&Sie(n), architecture as computational development resembles a mutant organism interacting with its context. In order to develop dynamic structural strategies, François Jouve has not contented himself with simply following R&Sies(n)'s advances concerning the use of set theory to define relational modes within the topology of the family or the neighbourhood. Together with Marc Fornes, Winston Hampel and Natanel Elfassy, he has developed an algorithm which aims to create structures through optimal calculation without drawing up the structural trajectories in advance. This "algorithm" is based (mainly) on two mathematical strategies: the first follows on from function derivatives and the research carried out by Cauchy-Hadamard, the second originating from a procedure for showing complex shapes by means of meshing thus creating a resulting topology. This is an empirical mathematic process, which makes it possible for the architectural design to react and adapt to previously established constraints instead of the opposite (oriented geometry). R&Sie(n), along with Stephan Henrich, an architect and robotics designer, have created a secretion and weaving machine capable of producing a vertical structure through a successive processes of sintering and extrusion using a hybrid material consisting of bio-plastic cement, which agglutinates and coagulates chemically. They no longer work with prefabricated concrete pieces, which correspond to a preconceived shape. Bio-cement, an agricultural polymer, is secreted in real time, and presenting characteristics of viscosity and adhesion, is ideal for generating structures with complex morphologies [6].
Another film presented in the exhibition shows the medical application of recent research carried out by Mark Kendall, the Australian scientist, who invented Micro-Needles or Nano-Patches (NP). Micro-nanometric projection is a non-invasive technique for detecting biomarkers in the outer layers of the skin, which indicate the presence of different pathologies – cancer or viral contamination for example. In the context of the exhibition the visitor becomes aware of the possibility of using such new clinical tools to collect information necessary to "mood-driven architecture".

The R&Sie(n) experiment raises questions concerning the process we know as feedback, the retrospective procedure concerning a situation an action or a statement, which can equally exist in our bodies or a technical process, by obliging us to reflect on this internal or external negotiation zone.
In this day and age, where we are constantly solicited by hormones of every nature, this exhibition puts us in touch with this aspect of chemistry known better to animals than humans. The visitor discovers an extraordinarily sensitive world of molecules created through the perception of our nervous system. At once animist, vitalist and machinist, this exhibition expresses a fascination for eternal biological life, rhizomatic growth, space for expansion propagating within designs for immortality. The polymorphic character of the living space as a result of potential mutations and its different aspects/shapes contained in an *œuvre* reveal a creative process: evoking an ever-changing space with multiple configurations in permanent mutation. Could it possibly signal a return to vitalist philosophy, moving towards a new natural state?

**Jeanette Zwingenberger**

1. Jacques Lacan in "Minotaure n°1", Paris, May 1933, At the Marienbad International Congress.

2. J. Lacan, "Ecrits I". Le Seuil, Paris, 1966, p. 94.

3. See exhibition catalogue "L'Homme-Paysage, Visions artistiques du paysage anthropomorphe entre le XVI^e^ et le XXI^e^ siècle", curated by Jeanette Zwingenberger, at the Palais des Beaux Arts in Lille, 15/10/2006-14/01/2007, with the participation of R&Sie(n).

4. Horst Bredekamp, "Les Coraux de Darwin – Premiers modèles évolutionnistes et tradition de l'histoire naturelle", Presses du Réel, Paris, 2008.

5. See exhibition catalogue "Architecture non standard", Centre Pompidou, Paris, 2003.

6. A material similar to contour-crafting developed by the Behrokh Khoshnevis Laboratory at USC for the project "I've Heard About", exhibition by R&Sie(n) at the Couvent des Cordeliers, Paris, 2005.

**An architecture "des humeurs"**
interview with
**François Roche**
by **Caroline Naphegyi**, artistic director at Le Laboratoire.

# Protocols /process

The Architect **François Roche** was born in Paris in 1961 and works in collaboration with **Stéphanie Lavaux** and **Toshikatsi Kiuchi**. This team was formed around two structures: **R&Sie(n)**, an architectural production agency and new-territories, a research group. They also run research laboratories such as the Advanced Studio at the Colombia-GSAPP in New York. Over the past ten years R&Sie(n) and François Roche have been invited to teach in London, Vienna, Paris, Barcelona, Philadelphia, Los Angeles and currently at the University of Columbia. Their architectural projects have been exhibited in many teaching institutes (UCLA, Colombia) Museums, (The ICA and Tate Modern in London, The Mori Art Museum in Tokyo, The Centre Pompidou and the Museum of Modern Art in Paris) and festivals (Archilab in Orleans, France in 1999, 2001 and 2003). R&Sie(n) were selected for exhibition in the French Pavilion at the Venice Architectural Biennale in 1990, 1996, 2000 and 2002 (the year they declined to participate) as well as in the International Section in 2000, 2004 and 2008.

www.new-territories.com

**How do you do research and an exhibition at the same time?**

"There are two parts. Research unfolds in what we call the Process room, a pretty basic space. You have to take your time so that the interactions between physiology, robotics and computation fully emerge in their logic and interdependence. The other part, the exhibition, is a suite of visual indices. Since these clues are neither didactic nor chronological nor pedagogical, visitors construct their own logic and subjectivities. Furthermore, this part has an immersion area, a physiological testing station, where visitors, called prospective purchasers by analogy to a sales office, are themselves experimental subject and object. This cognitive and immersive mechanism thus articulates a thirst for knowledge and a willingness to lose oneself in that quest.

**What's this about?**

"It's an unprecedented experiment in which architecture harnesses several different fields of exploration – neurobiology, mechanization and math protocols – working together as an ensemble of structural, transactional and relational operating modes. This is not a sequel to the I've heard about show held by the MAM (Paris municipal modern art museum) in 2005, although that show did explore the relationship between physiology, computation and indeterminism in the sense of its preconditions, its genesis. That earlier piece sought to understand and write (in the sense of writing code) biological geometries that mimic natural ones. The predominant figure was that of coral and its growth. This second piece, at Le Laboratoire, goes beyond that representation, since we've already worked on what conditions the emergence of such a geometry, namely principles of exchange, dynamic principles based on a system's immanent forces.
But that's not all. We wanted to get a better handle on something already sketched out at the MAM show: the capture of body chemistry as an element able to disturb and alter linear logics, the logics of authorities, replacing a top-down approach with a bottom-up one.

**In fact, for you, the axiom on which your "architecture of humors" research is based is the contingency of the humors of the inhabitant on the habitat itself.**

"Humors in the sense that Hippocrates used the word, a concept brought up to date by today's possibilities for detecting body chemistry. Until now the acquisition of information used in residence protocols has been based exclusively on visible, reductive data. In our research we want to add the corporalities and their own substances. They can provide information about the relationship between bodies and space, and especially about the social relationships of bodies, the relationships between them, of the self to the other, both inside a single housing unit and in terms of the osmosis of vicinity.

**In the physiology station located at the entrance to the exhibition, a machine captures visitors' chemical data. So visitors are put into a very particular psychological state. As she asks you to slide your hand onto a screen, Melisa whispers into you ear, "Your body becomes the vector of your emotions. These vapors help you capture the changing course of these emotions…"**

"The signal collection station makes it possible to perceive individual variations and how these changes in emotional state affect the resulting geometries and influence the morphological protocol at the 'living together' level.
This physiological test works like an emotion detector. It unleashes your corporal chemical reactions, principally molecules like dopamine, adrenalin, serotonin and hydrocortisone that feed us information about your animal reactions/degree of pleasure or repulsion, curiosity or disinterest. This physiological test helps us map the visitor's future dwelling area. It only takes seven minutes. The protocol is simple. During the test, a sort of vapor (of nanoparticles) is emitted, so that we can detect the evolution of these emotions without noxious intrusion.
A voice whispers into the visitor's ear, 'Let it enter into you, breath it in. You are in absolutely no danger from this vapor… Your family has become a conflict zone and you can no longer calm things down. It's an illusion to believe that architecture can help you with that. But you can negotiate the distances by negotiating the details… The area where you live can react to your desires. It has the power… to allow you to experience this conflict without denying its existence or making up fantasies about it. Your living area can be transformed into a morphology of the moment. You're free to go along with others or retreat into yourself.'
For us this is an occasion to interrogate the confused region that lies between the notion of enjoyment and that of need, by detecting physiological signals based on neurobiological secretions and thus realize a 'chemistry of humors', treating visitors – I mean the 'future buyer', if we were placed in a pro-

Addition of local (bondage) and global structures for the whole equilibrium (dimension and trajectory path in resultant calculation).

ductive reality (I would have loved to be able to set up a sales office where people could make a purchase and concretize their bio-architecture in a collective aggregation) – as inputs generating the diversity of inhabitable morphologies and the relationships between them. Consequently the formulation of desires in language is inflected by another realty, another complexity, that of the acephalous body, the animal body, so that it can tell us about its adaptation, its sympathy and empathy, in the face of specific situations and environments.

**Why do you introduce contradictory signals – what you call "misunderstandings" – into the heart of your architectural protocol (the inhabitable morphologies)? How does this physiology of desires, this living and unpredictable material, radically shift the architect's whole approach?**

"We decided to take the preliminary step of revisiting the contradictions within the very expression of these desires, both those that traverse public space because of their ability to express a choice, a desire conveyed by language, on the surface of things, and those preexisting and perhaps more disturbing but equally valid desires that reflect the body as a desiring machine (as Deleuze put it), with its own chemistry, imperceptibly anterior to the consciousness those substances generate. The 'architecture of humors' is a way of breaking and entering into language's mechanism of dissimulation in order to physically construct its contradictions. It means staging a break-in to the logic of things when language has to negotiate with the depths of the body, down to the bottom folds, like with Antonin Artaud and his compulsive catatonia.

The concept of free will may be simultaneously the most beautiful and the most corruptible of all. The cultural media pierce us to the core; their influence penetrates us everywhere, generating a conformism that can be considered obscene. We are both its vector and instrument. What we like to do is just the opposite, to seek out the dark side, our animal side, in order to subvert the other side using reactive and emotional data. We're glad that our choices are not guided exclusively by architectural conventions, both the conventions of the client and those of the architects themselves.

There's more to architecture than serving the prince and his totems, as people around here like to do. To speak to some of today's issues, the debate about high-rises is pathetic. Of course density has to be rethought, but I don't think it's relevant for southern Paris to be filled with reproductions of models of verticality conceived for 1950s business districts, or, worse, the Pyramid of Cheops, as a tribute to the grandiloquence of our current mayor. The proposals submitted by the architects selected by the city are puerile in that regard, and the plans for Greater Paris no less so. Architecture has become like a schoolyard full of kids who constantly flatter politicians about what is really that world's weakest point, its modes and fantasies of representation… and then they end up crying about it when the politicians don't commission them to design their Xanadu, like Jean Novel in his 'Le Monde' article. The politicians have largely sucked the lifeblood out of the past. Let's hope that the future can be different. But that's not what we're supposed to be talking about…

**You introduce the possibility of contradictory relational modes into the residential units themselves. How has set theory made you able to handle these "misunderstandings" and the contradictory ways in which individuals relate to their family and those around them?**

"The interviews at the physiological station make it possible to collect some seldom-seen materials. They make visible how the body reacts to a situation of exchange, and indicate the degree of pathology that would afflict the visitor. The data obtained from the physiological interview tell us about familial socialization (distance and relationship between residential areas within a single unit), neighborhood socialization (distance and relationship between residential units), modes of relations to externalities (biotope, light, air, environment, and also seeing, being seen and hiding, modes of relating to access (receiving and/or escaping, even self-exclusion) and the nature of the interstices (from closely spaced to panoptic). We use formulations taken from set theory to define these relationships. This branch of math was founded by the German mathematician Georg Cantor in the late 19th century. Its aim is to define the concepts of sets and belonging. This theory can be used to describe the structure of each situation as a kind of set defining the relationships between the parts and the whole, while taking into consideration that the latter can't be reduced to the sum of its parts or even to the ensemble of relationships between the parts. It allows you to define all the properties of a situation as relational modes, both the relationships between the elements (residential areas) and those between these elements and the ensemble or ensembles they fit into.

The operators of belonging, union, inclusion, intersection and disjunction describe morphologies characterized by their dimensions and position and above all by the negotiations of distance they carry out with the other parts. This produces relational protocols, protocols of attraction, repulsion, contiguity, dependence, sharing, indifference, exclusion, etc. Before the morphology of a habitat is reduced to a functional typology, first it's structured as an area of exchange.

Mathematical formulas aid the development of these combinations and thus become the matrix for the relational structure on which an inhabitable space is based. In contrast to the standardized-model formatting of habitats, this tool offers the potential of negotiation with the ambiguities of one's own humors and desires. It makes it possible to mix contradictory compulsions (appearances) and even some 'malentendus', which could be translated by both misunderstandings and mishearing: 'I'd like that but at the same time / maybe / not / and the opposite.' These 'malentendus' are directly influenced by the pathologies generated by collective living: claustrophobia/philia, agoraphobia/philia), xenophobia/philia, acrophobia/philia, noctophobia/philia, sociophobia/philia, neo-phobia/philia, etc.

**In other words, you approach architecture as a dynamic principle, incorporating incompletion, incertitude and indetermination. These parameters are the basis of your parametric construction system, aren't they?**

"Nature is basically made up of indetermination protocols. Algorithms can simulate the growth of a tree in terms of reproducing its geometry, but the fit between geometry/photosynthesis/equilibrium/growth is and always will be a hidden protocol that can't be reduced to its simple mathematical and geometrical dimensions.
Using the 'architecture of humors' we have staged a constructive and narrative machine that is receptive to two contradictory inputs, the order of desire codified by language and the order of its anterior and even hidden chemical secretion. We wanted this schizoid rereading of an architect's brief 'in constant becoming' to be able to generate protocols of incertitude and incompletion. An urban structure based on these computational and robotic procedures, these vectors of variability and indetermination, makes visible the potential of these heterogeneous aggregations.

**One of the subjects of this research was to consider the bearing structure of these residential units, and thus the final the final shape of the building, as a product and not the starting point. The fact that the bearing structure is not designed beforehand makes it necessary to constantly recalculate the segments and force trajectories that carry these inhabitable cells. How did math solve one of architecture's problematics: how to respond to indeterminate situations, a construction based on affective variability, with a constantly changing form (you use the metaphor of trees, which grow incrementally)?How did your partnership with the mathematician François Jouve [1] start?**
"One of the objectives of our research was to imagine structure as a postproduction element, emerging a posteriori to the inhabitable morphologies, which are themselves thought as unique entities, 'singularities', emancipated from the conceptual logic where the structure is the starting point, the matrix for human organization, so that the spatial contract takes the place of the social contract. Since it's conceived a posteriori, the structure is reactive, adaptive to multiplicity, 'the multitude' to use Antonio Negri's term.
François Jouve developed a mathematical process for 'empirically' seeking optimization by creating forms out of constraints and not vice-versa. That's different than 'direct calculus' methods which, for instance, calculate a building's beams after establishing its design. Instead, it calculates form based on trajectories, the vectorization and intensity of forces, without that form being predetermined. Produced by a simultaneously recursive and incremental optimization protocol, this form, which appears only through the calculations themselves, has to satisfy precise inputs (material constraints, the client's brief, initial and environmental conditions, etc.). In this particular case, the unknown is the form, the hidden part revealed only by the experiment itself.
Through the use of these computational, mathematical and mechanization procedures, the urban structure engenders successive, improbable and uncertain aggregations that constantly rearticulate the relationship between the individual and the collective.

**You emphasize the passage from an industrial era? (seeking uniformity and standardization) to the reintroduction of the concept of singularity in architecture by means of robotics and computations. More recently, what has science – especially math – and technological development – robotics and a biochemical understanding of raw materials – brought to the table in architecture? What new speculative issues has it raised, particularly in France?**
"Nothing is happening in France. The field of architecture is totally sclerotic and held on a leash by a dozen people. It's shameful. Along with our 'professional' practice as R&Sie(n), we have a research organization called 'new-territories, and for the last five years I've been teaching labs at Columbia University. Not only are these core questions in today's debates; they're also a core source of speculations and learning. The point is to get back to the idea that architecture should be a site for knowledge, a site for experimentation, and not just for grandiose celebrations of necrosis organized by the Palais de Chaillot and its 'Cité du patrimoine'.
Regarding your question, it only takes a few years for technology to drain and absorb speculations that once seemed unreal. For instance, in Switzerland and Japan we've designed two buildings entirely conceived by numerical control, one made of solid wood using optimization algorithms, and the other of polyurethane foam using mere digital processing. In five years what once was plausible has become possible. In this case, it's important to conceive protocols and designs not to stand out in some glamour interior decoration magazine but to magnetize a point in the near future, so that it draws our present towards itself.
Regarding the 'architecture of humors', Bherokh Khoshnevis and Stephen Henrich have done research in robotics and mechanization that make it possible to foresee the first prototypes in two or three years.

**Since its opening in 200? Le Laboratoire has sought to give visibility to research projects jointly undertaken by scientists and artists. In the "Processes" space that is at the heart of this show you unfold the various phases of your research, going so far as to make the computational script available as open source software. First of all, the software is available for anyone who wants to further mutate it. Second, the building's final form is the result of a structural calculation and not vice-versa; it's out of the architect's control. What do you expect from this stance, this renunciation of authorship and even copyleft?**
"A script is above all a form of writing, a language. There's no point to it unless it's shared so that other people can take it up and improve it. But it's a tricky position. We all remember the madness of the computer programmer in 'Tron' whose all-powerfulness makes him think he's the master of the universe and that he knows everything about everything. Luckily, the mathematicians we've worked with are protected against this kind of positivist mysticism." Interview by **Caroline Naephegyi**

1. The François Jouve's research relates to applied mathematics, more specifically to numerical analysis and scientific calculation. He's interested in the mathematical modelling of physical and biological phenomena. He's also a teacher in universities as well as at the "Ecole Polytechnique" and the "Ecole Normale Supérieure" in France.

**An architecture "des humeurs"**
analysis by
**David Edwards,**
founder of Le Laboratoire

# Human natures

**David Edwards** is a professor of biomedical engineering at Harvard University. He founded Le Laboratoire in Paris and also has written numerous, essays, scientific texts , articles and novels such as "Artscience: Creativity in the Post-Google Generation" (Harvard University Press 2008). Edwards invented Le Whif, a new approach to eating by breathing and created with the French designer Mathieu Lehanneur an air filter by plants, Andrea. He is a member of the US and French National Academies of Engineering and a Chevalier des Arts et des Lettres of the French Ministry of Culture since 2008.

"An architecture des humeurs" hypothesizes the ability of science to provide technologies that interpret the human condition beyond the ability of humans to directly express this condition through information transmitted by one or more of the five principal senses – touch, sight, smell, hearing, taste.

Of course, many technologies already exist that access physiological information we otherwise might not be aware of. Indeed, for centuries, physicians have employed simple non-invasive methods to try and understand human need. These have included ways to assess body function in health and disease (physical examination and inspection), such as pulse-taking, the auscultation of heart sounds (using the stethoscope), temperature examination (using thermometers), respiratory examination, peripheral vascular examination, oral examination, abdominal examination, external percussion and palpation, blood pressure measurement (using the sphygmomanometer), change in body volumes (using plethysmograph), audiometry, eye examination and many others.

The discovery of the first modern non-invasive techniques – electrocardiography and X-rays – dates back to the end of the 19th century. Since then, non-invasive methods of exploring the human condition – which penetrate the body by electromagnetic or particle radiation rather than by a scalpel – have continuously enlarged the scope of medical technology.

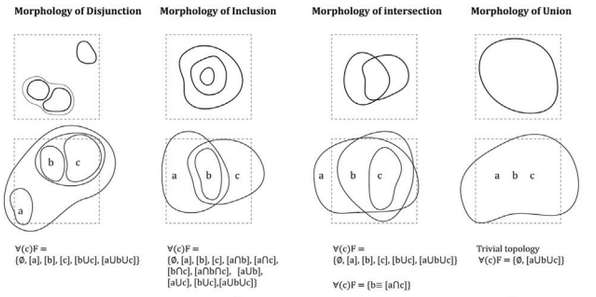
New non-invasive techniques that are being used for diagnosis and therapy include the following diagnosis approaches:
- bioluminescence imaging;
- dermatoscopy;
- diffuse optical tomography;
- gamma camera and other scintillographical methods;
- computed tomography;
- gene expression imaging;
- infrared imaging of the body;
- magnetic resonance elastography;
- magnetic resonance imaging, using external magnetic fields;
- magnetic resonance spectroscopy;
- optical coherence tomography;
- posturography;
- radiography, fluoroscopy and computed tomography, using X- rays
- ultrasonography and echocardiography using ultrasound waves.

The above complements other work related to diagnostic approaches:
- electrocardiography (EKG);
- electroencephalography (EEG);
- electromyography (EMG);

- photoplethysmograph (PPG);
- electrical impedance tomography (EIT);
- electroneuronography (ENoG);
- electroretinography (ERG);
- electronystagmography (ENG);
- magnetoencephalography (MEG);
- evoked potentials, such as the visual evoked potentials (VEP) and the brain evoked response audiometry (BERA) tests;
- body impedanciometry;
- impedance phlebography;
- nuclear magnetic resonance spectroscopy;
- percutaneous light spectroscopy;
- actigraphy;
- breath tests, such as the urea breath test;
- intelligent biomedical clothing;
- non- invasive biomedical sensors;
- endoluminal capsule monitoring.

Finally there are various therapy approaches:
- radiation therapy and radiosurgery, procedures that uses external atomic particles (protons, neutrons, photons, alpha particles, etc.) or gamma rays to destroy pathological tissue within the body;
- lithotripsy, a procedure that uses ultrasound shock waves;
- defibrillation, a procedure to block heart fibrillation;
- mechanical ventilation, such as the iron lung;
- transdermal patches, used to deliver drugs applied to the skin;
- biofeedback;
- continuous positive airway pressure (CPAP) to treat sleep apnea;
- variable positive airway pressure(VPAP);
- bilevel positive airway pressure (BIPAP);
- biphasic cuirass ventilation;
- photodynamic therapy;

| | |
|---|---|
| ∼ Not | [∼P = Not P] |
| ≡ Identity | [A≡B] |
| ∀ for all | $\forall x \in P =$ for all $x$ element of $P$ |
| ∃ exists | $\exists x \in P =$ there exists at least $x$ element of $P$ |
| ∄ Not Exist | |
| ⊂ Belong to | [A ⊂ B =A part [belong to] of B set] |
| ∅ Empty set | |
| ∪ Union | [A∪B = {x: x⊂A, Or, x⊂B}] |
| ∩ Intersection | [A∩B = {x: x⊂A, And, x⊂B}] |




∂ = Frontier
Ext = Exterior
Int = Interior

**Frontier of a Group inside Family:**

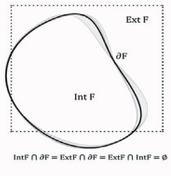
Interior of Group { IntG: {c ⊂ F, G ⊂ F}
Exterior of Group { ExtG: {c ⊂ F, G' ⊂ F}
Frontier of Group { ∂G: {c ⊂ F, c ∉ IntG, c ∉ ExtG})

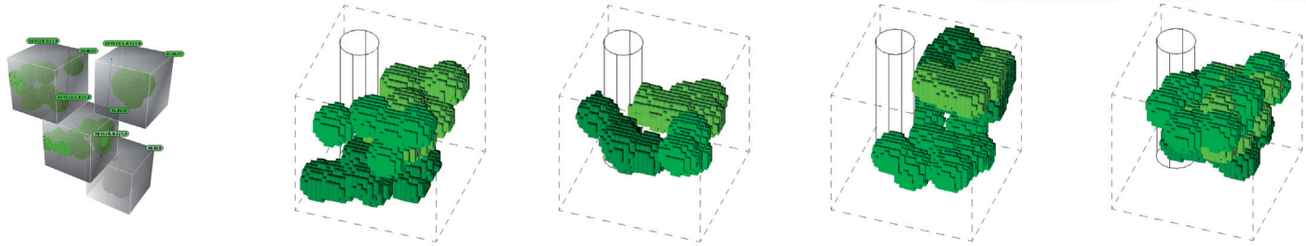
**Therefore a Family is:** { F: { IntG ∪ ∂G ∪ ExtG})

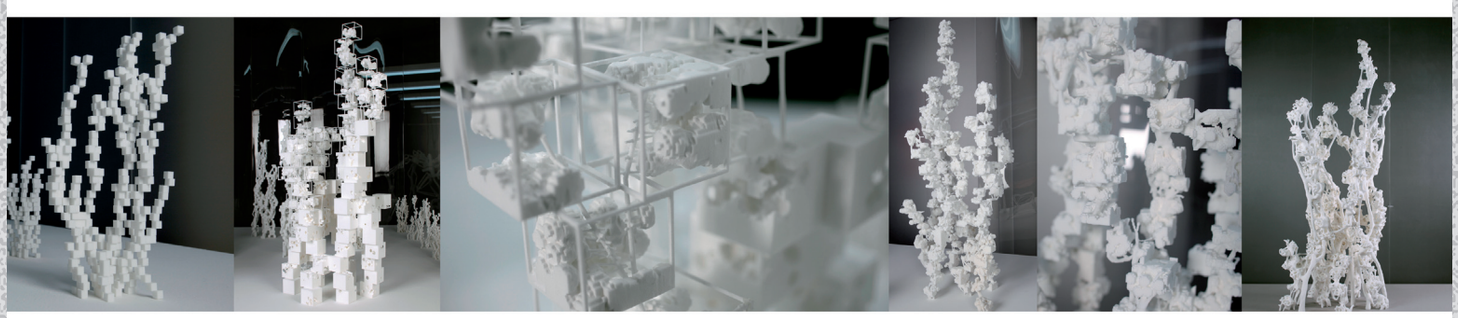
**Frontier of Family:**

Interior of Family { IntF: {G ⊂ N, F ⊂ N}
Exterior of Family { ExtF: {G ⊂ N, F' ⊂ N}
Frontier of Family { ∂F: {F ⊂ N, G ∉ IntF, G ∉ ExtF})

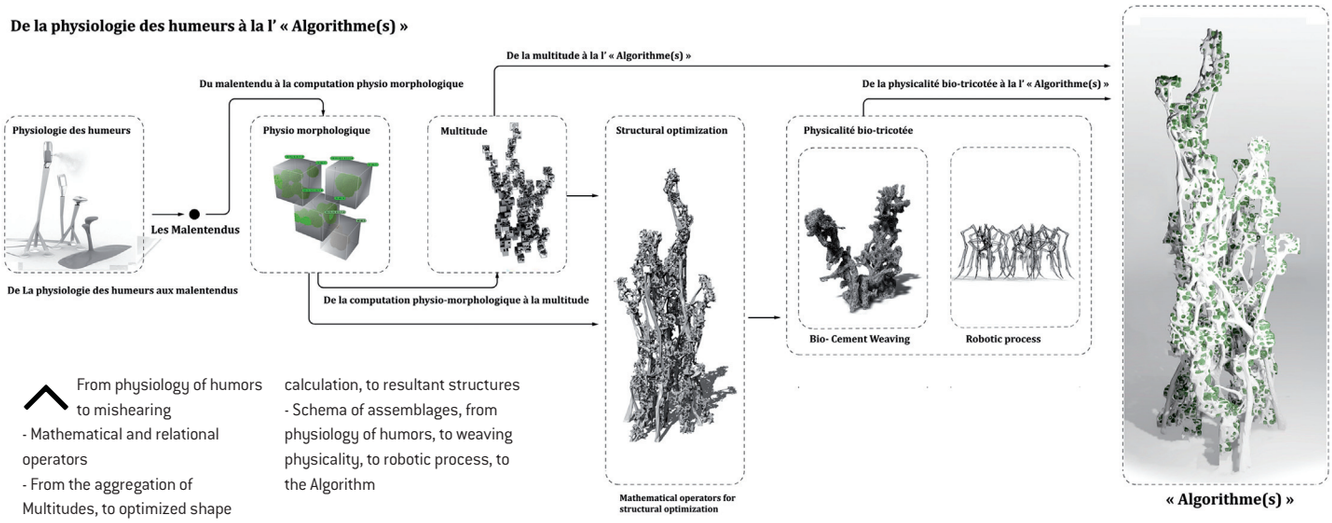
**Therefore a Neighbourhood is:** { N: { IntF ∪ ∂F ∪ ExtF})





**De la physiologie des humeurs à la l' « Algorithme(s) »**




^ From physiology of humors to mishearing
- Mathematical and relational operators
- From the aggregation of Multitudes, to optimized shape calculation, to resultant structures
- Schema of assemblages, from physiology of humors, to weaving physicality, to robotic process, to the Algorithm

- therapeutic ultrasound;
- extracorporeal thermal ablation;
- extracorporeal magnetic innervation;
- photo- infrared pulsed bio- modulation;
- transcranial magnetic stimulation;

Many of these approaches require very sophisticated medical equipment and are not practical as simple ways of broadly increasing human senses of the world.

Two works are presented in the exhibition: the work of Mark Kendall reflecting an effort to achieve simple real- time biochemical data related to the body's physical state, and the work and collaboration between R&Sie(n), Berdaguer&Pejus and the scientific laboratory of "physic spectrometry" of the CNRS in Grenoble exploring, through responsive nanoparticles in the lungs,the ability of expired air to directly indicate health and body function. Even with these methods biochemical and neuroinformatic analysis of information must advance to a point where information recovered can be interpreted in terms of human wish and need. It is im-possible to say precisely when these approaches will lead to the kind of useful insight imagined by "An architecture 'des humeurs'". Perhaps it will not be so very long. **David Edwards**

**An architecture "des humeurs"**, exhibition from 22 January to 26 April 2010

**Credits:**

R&Sie(n)/Le Laboratoire, 2010

Scenario, design, production:
**R&Sie(n)**

Associated to:
**François Jouve:** mathematical process
**Marc Fornes & Winston Hampel**, **Natanel Elfassy**: computations
**Stephan Henrich**: process and robotic design
**Gaëtan Robillard**, **Frédéric Mauclère**, **Jonathan Derrough**: design & process of physiological collect
**Berdaguer&Péjus**: nano-receptors scénario
**Mark Kendall**: microneedles
**Delphine Chevrot**,
**Takako Sato**: "The Lift"
**Candice Poitrey**: physiological interview
**Chris Younes**: text natural machine
**& Jiang Bin**, architect
**Laura Bellamy**
**Rosalie Laurin**

All 3D pictures:
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Exhibition photos:
**Matthieu Kavyrchine.**
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LE LABORATOIRE

## Pratical information

**Opening days:**
Friday, Saturday, Sunday, Monday
from noon to 7 pm

**Admission:**
regular: 6 €
reduced: 4,50 €
group rate available upon request

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www.lelaboratoire.org

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www.new-territories.com/blog/architecturedeshumeurs/

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# Rêves de robots/ Roboter-träume

Avec Thomas Baumann, John Bock, Sibylle Hauert & Daniel Reichmuth, Jon Kessler, Nam June Paik, Niki Passath _R&Sie(n)_ (architect), ...

Museum Tinguely
09.06.–12.09.2010

Vernissage: 08.06.2010, 18:30

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Kunsthaus Graz
Universalmuseum Joanneum
16.10.2010–09.01.2011

Vernissage: 16.10.2010, 11:00

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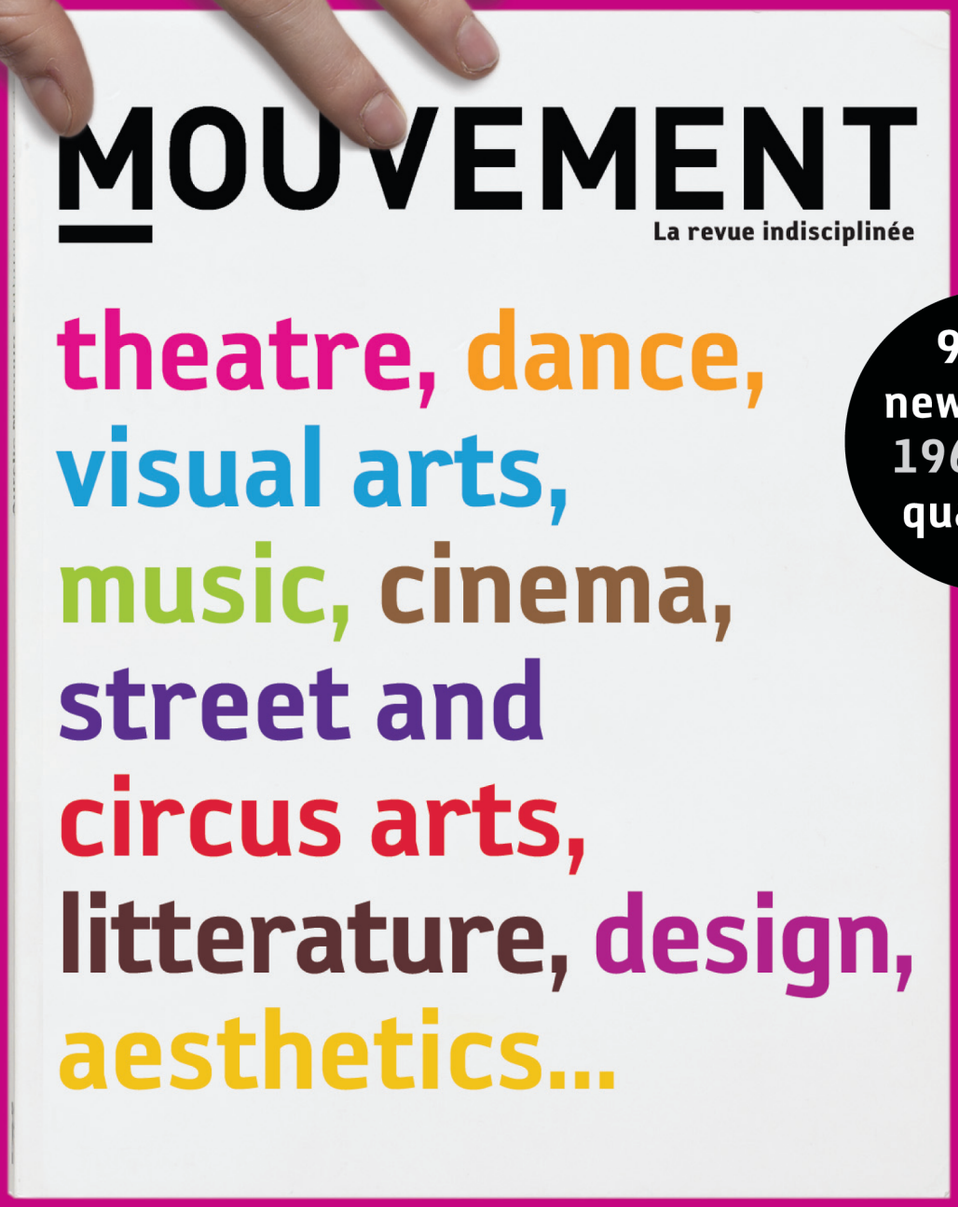


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