Ludger Hovestadt

Cultivating the generic

A mathematically inspired pathway for architects

1 Vitruvius, *The Ten Books on Architecture*, trans. Morris Hickey Morgan (New York: Dover, 1960), bk. 1, chaps. 1–3, pp. 5–17.

The Selection, the Body, the Play

On education, architectural machines, the generic and the deadlock, social media, about theory, about mastership, about learning, the centered void, cultivating the paradox, where we are today, oscillations, the name, the word, the project, projectivity, the product, productivity, the article, the quantum, infrastructures and functionalism, eigen-vector, matrix, Riemann, Turing, morphogenesis, simulation, brain, chaos, Markov, self-organizing map.

Introduction

ON EDUCATION IN ARCHITECTURE AND COMPUTING

This Book

This is a book about research and education in architecture and information technology—an interplay between two species similar in kind, neither of them being in the least disciplinal: both affect everything, both are arts of gathering things. The one, 2,500 years old and dignified, and the other, just fifty years of age and impatient. You will acquaint yourself with that interplay at our chair at the department of architecture at the Swiss Federal Institute of Technology, ETH Zurich. While we teach both the bachelor and master curricula here, the one most interesting, challenging, and of particular promise is our post-graduate program, a Master of Advanced Studies in *Architecture and Information*—a full-time one-year class of about sixteen students. We embarked upon this program in 2000. Thus this book introduces it, and presents the research completed by the class of 2012.

Over the past twelve years, we looked into a broad array of IT applications, and ways of using it in architecture. We were scanning for new ideas of what might be done, being always already curious for the next thing. We were impatient, fast, and did not concentrate much on any particular application, nor take any to maturity. That was left to several spin-off companies. In-house we were constantly given to roaming this wide new field of research—explorations summed up in *Beyond the Grid: Architecture and Information Technology; Applications of a Digital Architectonic* (Hovestadt, 2009).

About five years ago, we ran into a substantial problem: everybody had begun using computers. The wide and open field was increasingly getting populated. Since the advent of social networks in particular, everybody was now feeling an expert, and our comprehensive and fundamental work quickly found itself out of date, and engulfed in a flood of rough and easy sketches. While the past had been about comfortably explaining to an interested few how computers might work for architecture, we abruptly ended up exhaustingly expounding to the uninterested many that were busy with computing in architecture that there were much better ways of doing things than the ones they stuck to. Very unsatisfactory. Many of my colleagues escaped into highly specialized research in far-off lands. As for us, we chose to go into abstraction, into thinking about the principles of architecture and those of information technology.

This book now presents that new complexion of our outfit, and a harvest of the first promising results by our students.

On Tradition and Architectural Education

In a disciplinary world compartmentalized into education and research, we do often forget what architecture is about. Therefore it may be well to recall—disregarding it is a cliché—that, according to Vitruvius, architecture's foremost reference, the well-educated architect should be "skilful with the pencil, instructed in geometry, know much history, have followed the philosophers with attention, understand music, have some knowledge of medicine, know the opinions of the jurists, and be familiar with astronomy and the theory of the heavens." And even as it is not possible for an architect to be an expert in all these various disciplines, it is nevertheless desirable that he or she be acquainted with them all; for all these studies "have a common bond of union and intercourse with one another," and "a liberal education forms, as it were, a single body made up of these members."[1] Today, an architect will find it difficult not to be treated as an expert, and to escape disciplinarity. And yet, architecture is, along with philosophy, one of the very few professions that were never disciplinal … are there any others? It is worth remembering that today's disciplines, along with the experts, made their appearance in the nineteenth century. And that, ever since, experts always know better. Lest they be no experts. They are great knowers of whatever is around. But do they know where to go? Are they capable of engendering universal bodies of thinking (BoTs)? Not bodies in the congealed sense of "corpus," but universal bodies that are alive, quick, and motional?

The Beauty of Information Technology

Computers seem to be as universal as architecture, at least as long as they are thought of as abstract machines. But if, due to an improper notion of abstraction, they are perceived as mere—albeit fast—machines, they are frightening, having by now become superfast: just listen, e.g., to Paul Virilio in his *War and Cinema* (1989), *Speed and Politics* (1986), or *The Information Bomb* (2000), and you cannot help get scared. Or to Jean Baudrillard in *Carnival and Cannibal, or the Play of Global Antagonisms* (2010), or asking *Why Hasn't Everything Already Disappeared?* (2009). Why not, indeed? Trying to slow them down? Not a chance. Is that a satisfying scenario, one we'd want to play in? Or are we, conversely, not so much scared as fascinated by the power of computers as machines (i.e. not as abstract machines) and desirous to use that power for our projects? Then we are in for trouble: from resources, and from machinically driven competition by projects of the same kind. Once more there will be serious struggles about scarcities on a planet grown too small for us. How then to overcome such deadlock as seemingly besets our ways with computers? The simple answer is: by discovering that the beauty of computers lies precisely in their being not just machines. They are *abstract* machines. As architects, as masters of architectonics, i.e. the art of putting things together, we therefore ask: What then are these new things, these computers, like? How are they talking to one another? How are they talking to us?

How to Read This Text

This text is fast, sketchy, and a bit intricate. However, we find it suitable to communicate our ideas in this form, today, rather than to shelve them until some fully fledged book, possibly a few years hence. Yet, sketchiness does not mean simplification, or stripping the topic; rather than being exhaustive, we mean to convey a reasonably complete overview of what—from our vantage point today—the future of architecture and information technology might look like. The text should be both challenging and promising. It does not lend itself to being "understood" in a classical sense, nor is it, in that sense, "consistent." It lacks an explicitly coherent storyline. It is not a detailed analysis. And what might surprise: it is not, in the traditional sense, an authority-claiming doctrine or theory. It does not adduce other texts. All that would prove inadequately slow for its scope. The text does not explain, does not follow a solid historical line. But it does try to be a masterly articulated house of indexes. It is a contemporary piece of architecture-cum-philosophy. If you enter it, be welcome!

Read the text Sudoku-fashion. In the beginning, there will be few anchor points for you to understand. There will be a field of interdependent indexes. But that, we promise, will provide you some stability in the overwhelming amount of data around. Much better than solid in-depth analysis might do. You will comprehend much of the specific power of symbolic algebra, and its bearing. The power and speed that information technology is made of. It is super-abstract. This text is an evocative talk. Therefore it is abstaining from reasoned judgments seeking consensus. It lays no claims to whatever truths. But you may find following its indexes attractive, as pointers into the wide world of architecture, philosophy, and information technologies. It tries to make you sense the beauty of a certain BoT.

If you are out for something similar in scope and gesture but with more detail, try the 2,000 or so pages of Eric Voegelin's *Order and History*, or, if you are looking for maximum contrast, the 1,500 pages of Manuel Castell's *The Information Age*.

ARCHITECTURAL MACHINES

Everybody an Expert. 1948: Cybernetics

Let us start by indexing computing's origin around the end of World War II, e.g., Norbert Wiener's *Cybernetics: or Control and Communication in the Animal and the Machine* (1948) or Claude Shannon's *A Mathematical Theory of Communication* (1948). There was cybernetics, claimed to be the "study of systems, such as mechanical, physical, biological, cognitive, and social systems," as by the MACY conferences, intended to lay the foundations for a general science of the workings of the human mind (1946–53), or as

MIRO ROMAN

FOUR CHAIRS AND ALL THE OTHERS

A THREE-DIMENSIONAL NARRATIVE

The *EigenChair* project ponders strategies and concepts of designing by using information technologies. What are the potentials of data-driven design? How can we think about objects once their materiality is diffused into indexical sets of data that need to be articulated in order to take on a manifest reality? How can we engage with objects once their models take an abstractly modular form that is open for infinite manipulation and endowment with capacities? For such an understanding of design, the emphasis is no longer on the creation of physical objects, but on conceiving meta-objects in the possibility space of abstract symbolic forms, and in placing them within narratives. Furthermore, data-driven design enables us to manipulate an abstract object's "resolution" rendered as an entire population of its instances. We no longer have to deal with one ideal object that is thought to represent, as pure typicality, its own original specificity. Yet how do we get such systems of abstraction to relate to the real world? Information technologies have opened up a number of new ways of thinking about the world and the object, and these novel ways of thinking have by far surpassed the formally simplified or parodied manner of expression in modern and postmodern design and architecture. Based on the intellectual heritage of history and culture in its symbolic richness, design by information technologies can explore a twenty-first-century notion of the object by instigating new circulations within this intellectual heritage, and by accumulating new ways of animating the "building blocks" of that with which we have grown familiar as a stale and common basis in the past.

per Norbert Wiener, *God & Golem, Inc.: A Comment on Certain Points Where Cybernetics Impinges on Religion* (1963); or, escalating it a bit, by offerings with slightly uninhibited names such as *World-Systems Analysis* (Immanuel Wallerstein, 1987). There was also the military defense system called Semi-Automatic Ground Environment (SAGE, 1958), as the first network, and its civilian successor or counterpart ARPANET (1969), opening up onto the Internet, which in turn hosts the WWW (1990) today … All this may be read up on elsewhere. We especially suggest a look at Lutz Dammbeck's film *Das Netz* (2004), about the origin of the Internet, and the story of Theodore ("Ted") John Kaczynski, the so-called Unabomber, infamous, and one of the film's lead protagonists.

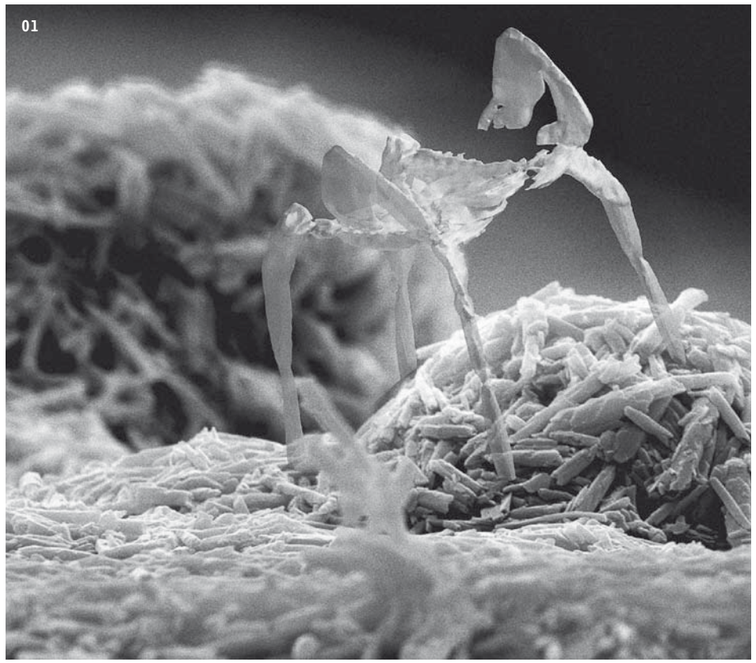
To us architects, it may seem of interest to confront two contrasting attitudes taken vis-à-vis these developments. On the one side there is, e.g., Nicholas Negroponte's *Architecture Machine: Toward a More Human Environment* (1973), especially the experiment SEEK, a cybernetic habitat for gerbils, arranged and controlled by a robot through simple feedback loops. That setup's architectural elements are simple blocks, their configuration controlled by simple rules, executed by the robot. The architecture is controlled as both to form and structure, internally and externally. This we call a tyrannical setup, with no escape. And the gerbils, indeed, died soon of stress, and needed frequent replacement. We shall symbolize this constellation, of an internal necessity embedded in an external necessity, by (N)N.

On the other side, a little left out these days, the pedagogics of Itten, Kandinsky, or Klee, at the Bauhaus in the 1920s, which also uses few elements but opens them up to free negotiation: a constellation of internal necessity embedded in external contingency, to be symbolized by (N)C. We find this combination in the LEGO system (1949)—rather kits than system, because system creation happens subsequently based on the kits—or in the first electronic version of a kit, called Lectron by braun | Egger in 1967. As will be seen later, these kits are inversions of the Fröbel Gifts, designed before 1850, which throw open individual contingence, within a framework of external necessities (C)N, and that today, correctly and interestingly, ought to be called a system rather than a gift. But more of these discussions about the contingencies-and-necessities interplay later on. Suffice it for now to grasp a fundamental difference of approach toward systems, as in *Architecture Machine* on the one hand, and in the Bauhaus, LEGO, or Lectron on the other hand.

The project *Four Chairs* and all the others opens up the possibility of an alternative understanding of design. Rather than offering yet another thesis in support of linear design development, it emphasizes design's polysemantic nature by understanding its processes in terms of an open field of possibilities. Design processes not only explore physical limitations of space, but also react to contemporary social and cultural phenomena. In order to explain the idea, specific techniques are used to replace simple design concepts with a series of parallel narratives, thus provoking new and unexpected situations. The primary interest of this project is to explore the intersection of different domains of human insight, especially regarding architecture, culture, and information sciences.

***EigenChair* is a concept that results from the effort to design a chair that continues the genealogical orders of designed chairs, and yet is carrying as a potentiality also all the chairs that might once be created in the future [FIGURES 01, 02]. *EigenChair* is not an *ideal* chair in the sense of pureness or prototypicality. It is *real* (and not *ideal* in the sense that it has a history, it originates and becomes, it must be regarded in the context of populations of chairs from which it evolves, and in the sense that it can be modeled by empirical experimentation by observing and testing). So it is a *real* chair, and yet it is an *abstract* chair! The project *Four Chairs and all the others - EigenChair* invents an investigative design process that proceeds by what might best be called "a partial summation of the reality-contents of ideas-as-models."**

The prefix *Eigen* is commonly used in linear algebra, in compounds such as *eigenfunction*, *eigenstate*, *eigenvector*. It comes from the German word *eigen* which means "one's own, proper." The basic tool for the design of the population of chairs to be investigated in such a way—i.e. "all the others"—is the *Principal Component Analysis* algorithm (Abdi and Williams, 2010). It is a standard tool for contemporary data analysis that has been adapted in various applications according to diverse needs, from neuroscience to computer graphics, and begins now to be applied in the field of design (Sirovich and Kirby, 1987; Turk and Pentland, 1991). *Principal Component Analysis* reduces a given data set to a set of *principal components*, i.e. *eigenvectors*. The key feature of this algorithm is the intersection and interconnection of all data, whose result adapts and changes according to the required point of view, i.e. according to interpretation attributed to the problem.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02

00 « Rendering to reality 3-D printed chair
01 *EigenChair* seen from an electronic microscope
02 *EigenChair* in the Vitra Design Museum Gallery

The interest of this project is to show strategies and concepts for designing with the use of information technologies. My research questions involve: how can we engage with objects once they take an abstractly modular form, and their manifest materiality is diffused into a set of data? What are the potentials of data-driven design?

ALTERNATIVE UNDERSTANDING OF DESIGN

DESIGN APPROACH

Radical views of the world and of society are today mediated through advanced technological systems. Thanks to—or perhaps due to—such circumstances, design seeks new ways of thinking and conceptualizing, as well as of producing objects and inciting feasibility. The "informationalization" of societal orders and the scope of applicability of computer-aided design tools are opening up a whole range of new manners of how to perceive the temporality and spatiality we inhabit. Algorithmic design is based on new parameters: design of ideas, narratives, procedures, populations, digital production, and new understandings of materiality. Generative design methods drive us to create and modify rules and systems, such that we are generating abstract machines: the products of such industriousness are not items of a set, but instances of a population that are one in kind, that of an abstract object. The designer therefore does not manipulate the "artifact" itself, but rather the rules and systems that allow for generating and producing it. The emphasis is no longer on the creation of physical objects, but on conceiving meta-objects in the possibility space of symbolic forms.

RECYCLING INFORMATION

The postmodern condition equips us with a set of critical, strategic, and discursive practices which, as their main tools, use concepts such as *difference*, *repetition*, *simulacrum*, and *hyperreality* in order to destabilize modernist concepts such as *identity*, *linear progress of history*, or *unambiguity* (Aylesworth, 2013). In contrast to such a reactive point of view, an emerging condition which we call "pre-specific" ceases to focus on the representation or identification of existing "truths," and instead guides its interest to the filtration of attractive and promising approaches out of the plenitude of information. In order to avoid postmodernist tautological nihilism, the "pre-specific" paradigm approaches the abundance of information in an active manner. This paradigm also operates within the field of design. But it puts no longer the object into the focus of its investigation and research, but an object's characteristics, features, relations, ratios, structures, and its indexical context. The information age enables a redefinition of postmodern techniques such as *collage*, *assemblage*, or *bricolage*, all of which define an object by collecting and reassembling various aspects and fractal components. The newly created abstract object is now a fusion of different objects' constitutive data, but it is also completely unique and independent in the forms it can take from any one object in particular. The project *Four Chairs and all the others - EigenChair* is an example of digital recycling: it brings information and data of chairs into new manners of circulating, accumulating, integrating. [FIGURE 03]

ELITISM AND EXCEPTIONALISM OF SINGULAR OBJECT VS. INDIVIDUAL POPULISM OF GENERIC OBJECTS

So far, design understood its practices as dealing with individual objects, their typicality, their specificity. Design was interested in the paradoxical invention of "ideal objects," which are to be original, and yet specific. Such an approach was closely related to the modernist paradigm. Today, however, the emphasis is moving from designing ideal objects to designing the ideality of real objects—the ideality in reference to which an object can be designed as *singular* and *generic* instead of *original* and *specific*. The new paradigm changes the designer's relation to an ideally static reference for his objects that are to be original, by putting an emphasis on conceptualization, interaction of the components, systems, and processes within the referential framework of an object's ideality. What was once the design of a perfect, unique object featuring specific materiality is today the design of a population of objects featuring (potentially) *any* materiality. Instead of a specific object, the designer creates an algorithm. Elitism and exceptionalism associated with the idea of an object's originality is replaced by "individual populisms" associated with the reality of *generic* objects, and the attractiveness they are capable of unfolding. The key role in design is taken over by generative systems (syntaxes and grammars) that offer evaluable methodologies and theoretical worldviews (the "contents" of ideologies—literally the "logics of ideas") as frameworks that instigate dynamisms that distribute processes by multiplication, rather than by unification. The design process becomes an abstract definition of algorithms. Hence in this project, the focus was not on designing a "perfect" chair, but on engendering a whole population of chairs. Instead of creating a parametric master model, indexes of all objects are correlated to a framework of a possibility space—to a Pre-specific mode.

IMPOSED MATERIALITY

In generative object design, the particular materiality of an object is not a precondition for its final manifestation. The choice of materials to work with has so far served as the basis for determining the design process, defining the expected execution of

1989: From Expansion to Connectivity

Cybernetics expansion reached its global limits, and ended with the demise of the Soviet Union and the end of the Cold War (1989). Arguably, information technology found new bearings in the wake of the so-called dotcom bubble in 2000. From then on, computers were no longer understood as "symbolic machines" but increasingly as an infrastructure for applications, called the "global network." Mobile computing, services, and social networks emerged, combining toward a new basic order.

There is a very illustrative metaphor of the change undergone by the notion of technics and our look upon our world. In 1969, Apollo 11 gave us the first picture of our planet seen from another planet, the moon. The total world within one technical picture. A one-shot reflection of the complete world, from an outside perspective. An internal and external necessity (N)N. In contrast to that, only forty years later, in 2009 the lot of us are rendering our world: using Google Earth. The single Apollo picture is replaced by a symbolic surface of trillions of indexes for all things used for explicating our world. The 1969 single outside *reflection* produced by one man, in 2009 gets replaced by an inside *projection* produced by everyone. And today's Google-perspective-induced question would be: is there still an internal as well as external necessity, as was the case with the Apollo view? An (N)N? Or may we abstract from our Apollo view, and cultivate the ground prepared by Google, in a free and open way, by negotiating the contingencies in an (N)C setup?

Indeed. Following the break marked by the advent of social media, we are drastically shown how everybody and everything feel themselves experts. Which is great, because we do need political articulations, identities that take responsibilities, dealing competently with the contingencies of our world. But sympathy toward all co-experts in social media still does not mean everyone is indeed navigating the depth of serious applications. Or playing masterly. Whereas our own subject is in-depth cultivation of the new symbolic ground. Or, put figuratively, and quite down architects' alley: How to settle down? Or: *How to inhabit media?*[2]

With such queries in our mind, there arises the question about the actual state of mainstream computing in architecture. We would say, tentatively, it is at least twenty years behind times—which is something every generation might throw at the younger generation. We ourselves were caught up in that phenomenon: as researchers in 1990,

2 Vera Bühlmann. *Inhabiting Media. Annäherungen an Herkünfte und Topoi medialer Architektonik* (PhD diss., 2009), published online: http://edoc.unibas.ch/1354/.

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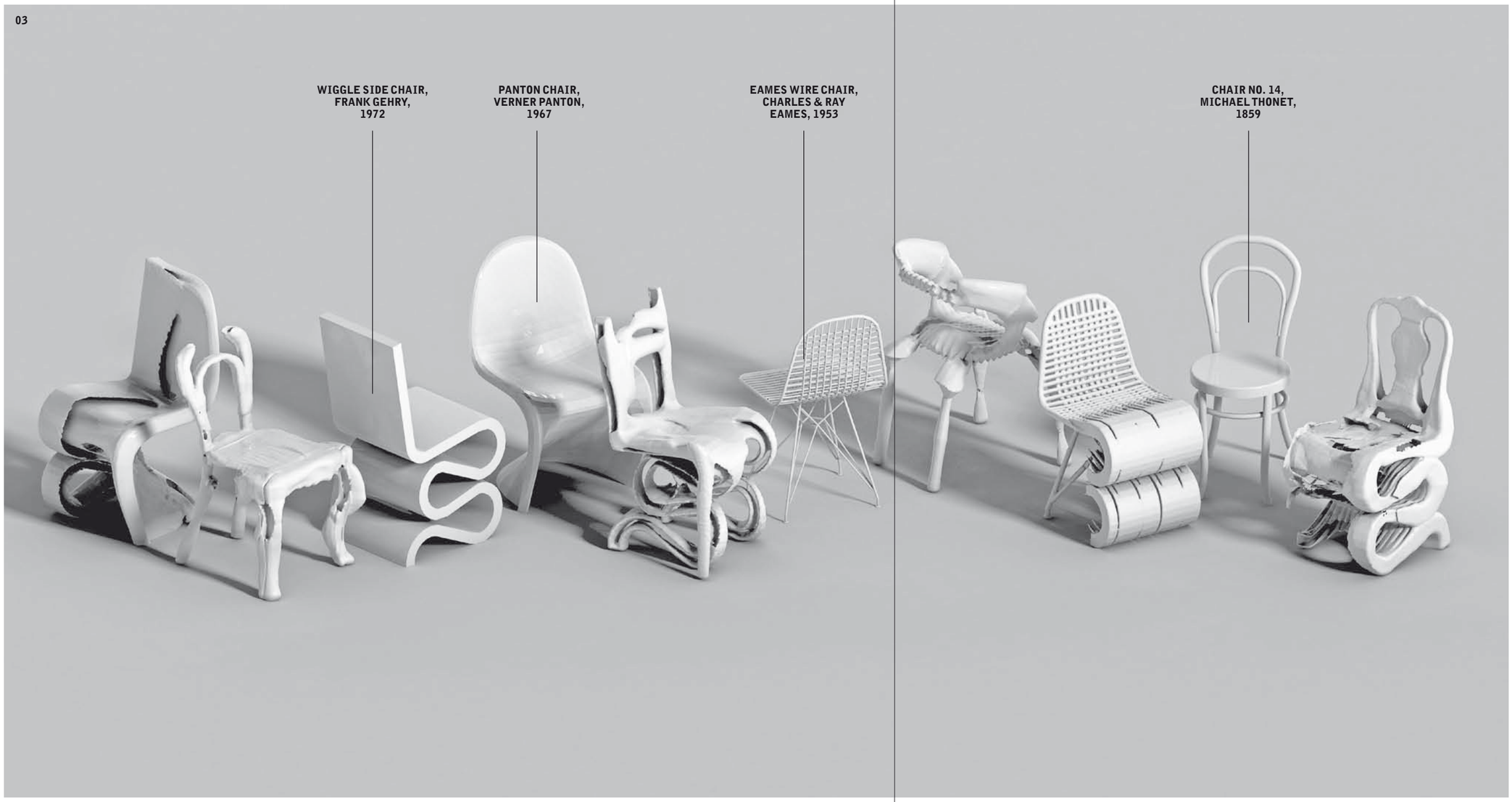

04

03 Four Chairs and their fusions
04 Four Chairs and all the others

we were up against the mainstream-architecture bias alleging that to us computers were machines. They were not; we worked on abstractions, but that's how we were perceived. Today the coin has flipped: in 1990 architecture denied computers were machines, today it vehemently affirms they are. Therefore our diagnosis is: even as the new field of architecture-cum-computing is so built-over today, the same, unchanged absence of abstraction still prevails, the same lack of basic insight into the "nature" of computers, which then makes cultivating the "Google planet" difficult, as it does staying out of the functionalistic game of implementing the necessities-driven global economical infrastructures.

THE GENERIC AND THE DEADLOCK

Back to the architectural discourse. As one of a very few, Rem Koolhaas acknowledges this situation (1995): "The great originality of the Generic City is simply to abandon what doesn't work—what has outlived its use—to break up the blacktop of idealism with the jackhammers of realism, and to accept whatever grows in its place. In that sense, the Generic City accommodates both the primordial and the futuristic—in fact only these two. The Generic City is all that remains of what used to be the city. The Generic City is the post-city being, prepared on the site of the ex-city." Far from throwing up a theory, or claiming to have a way out, Koolhaas is dealing with the paradoxical situation where things are made worse by trying to make them better, or by thinking up well-intended projects, doing deficit analyzing, letting oneself be guided by empathy, and carefully avoiding making mistakes. Yet, that does not mean that acting less, not at all, or even mistakenly might be more helpful, let alone be a way out of the paradox. Some jam. Koolhaas's tone is sarcastic, but he owns up to the problem like no other prominent architect. The planet gets balanced, entropic, generic … with necessities-informed global economical infrastructures, (N)N.

That's it, within the Generic City, we might say. And as you are stepping out, you step into another game. The way out of it is abstraction. *Simply start to cultivate* the Generic City, Junk Space or—less sarcastically—the natural order, and begin to negotiate our cultural sediments, celebrate contingency, and engage in politics. We should refrain from thinking of ourselves as living in some given nature. Rather, instead of gathering beneath some overarching absolute world spirit, some *Weltgeist*, or indeed Nature, i.e.,

details, connections, and textures. Today, generative system design enables the imposition of materiality to each instance of an abstract object. The form, no longer complementary to certain materials, can now be attached to it by mere use of intellectual control. Therefore, the objects, previously described by *fixed* geometries, can now be variously described by relative geometries that can be rendered into reality in any materiality. If one wishes to fully automate the entire production chain, the abstract object can materialize through 3-D printing.

DESIGNING NARRATIVES

By rethinking the notion of "good design," one comes to the conclusion that design is just a tangible fragment of reality, which narrates one of the many stories that surround us. Design never appears in silence. What we call "good design" nowadays is imbued with a series of narratives constructed by different discourses: formal, ideological, psychological, and theoretical. It is only one part of the design process that is constituted by the object's material and formal aspects, while most of it is built upon stories that describe the object, and upon the individuals who transfer the stories or identify with them. Therefore, besides designing an object, it is also necessary to design a narrative that defines the object's ambition in terms of how it will become meaningful.

The research focus of the project *Four Chairs and all the others* is the design of a chair that does not carry on the heritage of originally iconic or functional pieces of furniture, but a generic heritage that cultivates information about "all chairs ever created". For this, the term *EigenChair* is used—to describe partial summations of the embodied realities of ideas-as-models, i.e. the "realities" of particular chair designs that are elected as actors in the design narrative. The algorithm database contains a large amount of "other chairs." Their fusions enable an infinite variety of possible results. In order to achieve a certain control over the results, out of "all other chairs" we have chosen four particular chairs that will provide the basis of

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recognizability in the dramatization of the object in the particular narrations. Fusions of characteristic parts of those four chairs with all the others are defined by user-made maps that define the transformations, upgrade the performance of the *Principal Component Analysis* tool, and enable the control of the result [FIGURE 04]. The project *Four Chairs and all the others* has elected four iconic chairs: Thonet's *Chair No.14*, *Wire Chair* by Charles and Ray Eames, *Panton Chair*, and Ghery's *Wiggle Side Chair* (Vegesack et al., 1996). Their main mutual link is specificity and uniqueness of the materials, and the respective technological innovation in the context of which they had been designed. It is the richness of meaning and historical references of these examples that are responsible for enabling us the further creation of analogies, stories, and narratives, which, in turn, fertilize the viewer's active participation in the process of visual representation [FIGURE 05].

MULTI-DIMENSIONAL VECTOR

TECHNICAL APPROACH

The project *Four Chairs and all the others* deals with options of manipulating data, and thereby engenders new objects. It takes a whole library of chairs as its starting point; that is, their geometric and spatial characteristics along with their historical importance and their narratives. By using open-source 3-D models of chairs from the Google warehouse, their geometry is appropriated through a set of algorithms, on which the *Principal Component Analysis* algorithm is applied to calculate fusions, mergings, and manipulations from the input information, from which new objects can be generated and produced. The result is a population of objects that are over-coding cultural and historical space-time relations

under the primacy of space and time, we find ourselves expelled, and thrown to the primacy of our intellect—in circumstances symmetrical, but in abstraction toward, those of the likewise expelled Greeks, or the Renaissance man. As they did, we also step out onto a new stage, the one of generic infrastructures. Rather than dwelling in generic cities, we can now perform new, abstract, masterly plays on our new stage.

Thus flips our self-perception. We no longer ask, as does Koolhaas: "What is left after identity-stripping? The generic?" Rather, we see ourselves as intellectuals, as beings bored after three days. Which is just the opposite of the emptiness of Natalini & Toraldo di Francia's Superstudio, or Kubrick's *Odyssey*. We suddenly awake in a jungle of primary intellectual abundance, with the whole wealth of all the masterpieces of our ancestors around to engage with.

The Skeleton

This text argues in a mathematically inspired algebraic way. We do know that we are not able fully to comprehend the masterworks of the world around us. On principle, we are convinced we can't. And we know there are lots of such masterworks, of all times, and of all cultures. Thus, instead of analyzing just one, or a few of them, in depth, we try to establish our own skeleton of thinking, by working out axes of symmetry between masterpieces. Thereby we can find invariances, and gain stabilities for our BoT, from nothing but the masterpieces themselves. Stability no longer depends on any external reference. Such external references, and their use as anchor points, would perforce entail a certain blindness. With the help of our skeleton, however, we are free to move within the richness of our world. Algebra lets us create the identity of our own BoT, and thus unshackle ourselves from the constraining logic imposed by some allegedly natural order. So let us slowly work out how a skeleton may be built.

SOCIAL MEDIA

First some introductory remarks, using again Google as an example, because it has a lot to do with the approach we mean to establish. As may be inferred from the introductory argumentation, this implies first media-izing, and then cultivating the social media. So,

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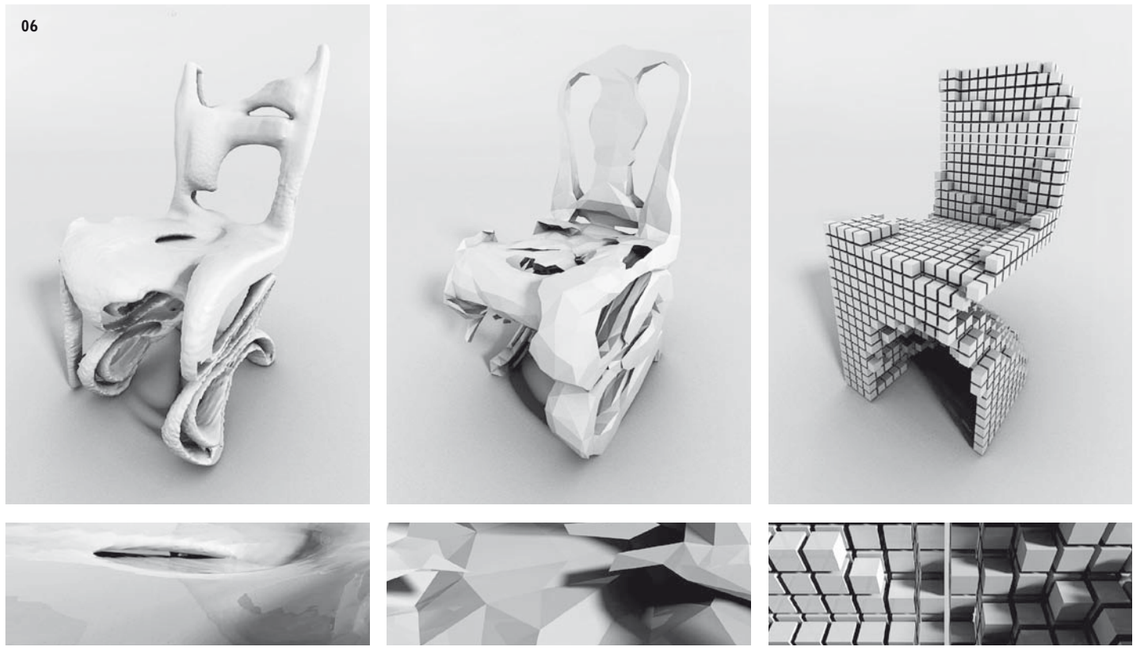

HIGH-RESOLUTION ISO SURFACE MESH

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numberOfVoxelsX	-125
numberOfVoxelsY	-111
numberOfVoxelsZ	-201
numberOfVoxels	-2788875

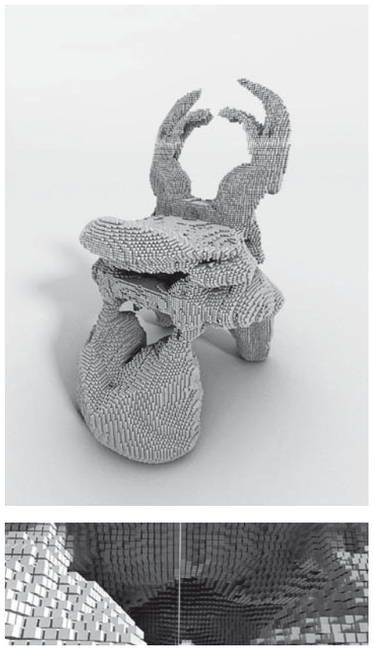
LOW-RESOLUTION ISO SURFACE MESH

sizeOfVoxels	-30
numberOfVoxelsX	-18
numberOfVoxelsY	-16
numberOfVoxelsZ	-30
numberOfVoxels	-8640

LOW-RESOLUTION VOXEL MESH

sizeOfVoxels	-30
numberOfVoxelsX	-18
numberOfVoxelsY	-16
numberOfVoxelsZ	-30
numberOfVoxels	-8640

05 « *EigenChair* in *Alice in Wonderland*—Tim Burton's movie (2010)
06 *EigenChair* potential for geometrical manipulation



HIGH-RESOLUTION VOXEL MESH

sizeOfVoxels	-4.5
numberOfVoxelsX	-125
numberOfVoxelsY	-111
numberOfVoxelsZ	-201
numberOfVoxels	-2788875

through the imposition of logistic networks. The final objects are entirely a product of mathematical and logical thinking, designated according to a particular aesthetic sensibility (mine). The identity of the object is engendered by pure intellect, and contingently rooted in historical and cultural legacies. The main algorithm, which technically organizes the whole project, is the *Principal Component Analysis* algorithm.

LOGICAL STEPS

The initial step was to normalize and prepare the data of all the chairs. In this case study, due to computational limitations, a total of twelve chairs were used as a testing data set. All data had to fit in the same bounding box, and mesh vertices were equally distributed throughout the mesh.

The whole procedure consists of three main parts. The first part is the *Algorithm for Voxelizing Polygon Meshes*. This algorithm transforms each mesh into a voxel-based object defined by a one-dimensional numerical array list, i.e. a multidimensional vector. In case of the highest resolution, each chair is represented by 2,788,875 values. Each value marks the distance between the given voxel and the closest mesh vertex. Values for each chair are exported as separate txt files, in order to reduce computing time of the main application.

The second part is the *Algorithm for Morphing Chairs*. The base of this algorithm consists in the multidimensional vectors generated by the *Principal Component Analysis*. The goals of *Principal Component Analysis* are (1) to extract the most important informational aspects from the data set, (2) to compress the size of the data set by keeping only the important informational aspects, (3) to simplify the description of the data set, and (4) to analyze the structure of the observations and the variables. In order to achieve these goals, *Principal Component Analysis* computes new variables, called *principal components* or *Eigenvectors*, which are obtained as linear combinations of the original variables. The *first principal component* is required to have the largest possible variance. The second component is computed under the constraint of being orthogonal to the first component, and thus needs to have the second largest possible variance. The other components are computed likewise. [FIGURE 06]

According to the size of the initial bounding box, a voxel-based space is created. Each voxel receives values from txt files exported in the first step. With the use of *Principal Component Analysis* we can represent each chair by using only a set of so-called *eigenweights*, e.g. (-5673, -85184, 50, -25533, 31594). By changing the values of the *principal components*, i.e., the *eigenweights*, we are able to achieve linear transformations between all the chairs.

The third part is the *Algorithm for Mapped Morphing*. It is an upgrade from linear *Principal Component Analysis* transformations to mappings of nonlinear transformations. An RGB map, in which each color represents a particular chair, is projected onto the voxel-based space. This enables us to define and control the nonlinear transformations and fusions of three different chairs into a new one. Thus created, chairs can be used again as input chairs for the second step, and achieve a new nonlinear variability.

The rest of the algorithms served to prepare the data for *Principal Component Analysis* and to help with their final visualization. Furthermore, an important role was played by a series of open-source libraries, especially the *Marching Cubes Algorithm* (Lorensen and Cline, 1987), responsible for generating watertight mesh objects ready for 3-D printing. All codes were written in the Java programming language.

Bearing in mind the thoughts presented in an earlier part of this text regarding referentiality and recycling, it is important to note that the algorithms used in the project, e.g., the *Principal Component Analysis* algorithm and *Marching Cubes Algorithm*, are already and widely in practice. They are thoroughly adapted, functionally redirected, recycled, to fit the needs of design in this particular project. [FIGURE 07]

how does Google work? It's about how to get onto one single screen the world's complete knowledge relating to any particular question. The principle for doing it is strikingly radical and simple, and may be explained in a rather elegant but—we must warn you—slightly unusual way.

1. Defer understanding it all. The established dichotomy of signifier and signified doesn't wash. Indexes are pointers without significance. Forget about content. Indexes are what you care about, and through them you deal with whatever content. Content is with the questioner.
2. Renounce answering questions. Just tender indexes surrounding that question. It's up to the questioner to work out the answer to his question. He has the content, whatever it is. He must compete with the masterships, articulating is up to him, whatever it is. And the simplest and most sketchy way of articulating the answer is by selecting a certain index. Or the questioner goes fishing by throwing out some circumscribing indexes. Google recognizes these answers, and shifts its whole world of indexes a little in their direction.

In this step-by-step way, social media build the contentless index of the world's content. It is all about infinity, inversion, and negation, and so the BoT characterized by signifying and *functioning* is shed, and one of indexing and *operating* is being taken on. Idem with Wikipedia. Of course! Let's give it a try: a Wiki presents indexes around questions, instead of answers. And instead of selecting, as in the case of Google, you will write, encircling the answer. The answer, on principle, it not there. That's it. No meaning. No answer. Therefore Wiki contains *anything*, instead of *everything*. You are complaining about insufficient or faulty content? Great! Be welcome! Contribute! That's the game. Today, in 2013, one might—pushing it perhaps a bit—characterize Wikipedia as the "consensus" of the second league in its attempt to understand the first league, the masters, who in principle elude full explication. Which is great! But in clear contrast to the encyclopedists, who "defined" the first league of their time, in the eighteenth century.

ABOUT THEORY

So, let us give it a try with Wikipedia, on a question about the meaning of theory. According to the English Wikipedia (en.wikipedia.org, June 2013), "Theory is a contemplative

ARTICULATING INDEXES

THEORETICAL APPROACH

INFORMATION

The key term that best describes and corresponds to what characterizes, overall, contemporary society and science is information. Information technologies are entering all spheres of society: from the ways in which we organize our everyday life, to the ways in which we think about natural sciences and humanities. This view suggests the inadequacy of understanding human environments in predominantly material terms and physical relations between energy and matter; in order to create a more comprehensive worldview, analysis must take into consideration also information as a quasi-material category. At the same time, being surrounded by excessive amounts of information, any analysis requires a stable environment, which enables its observations and uses.

REFLECTIONS ON THE REAL

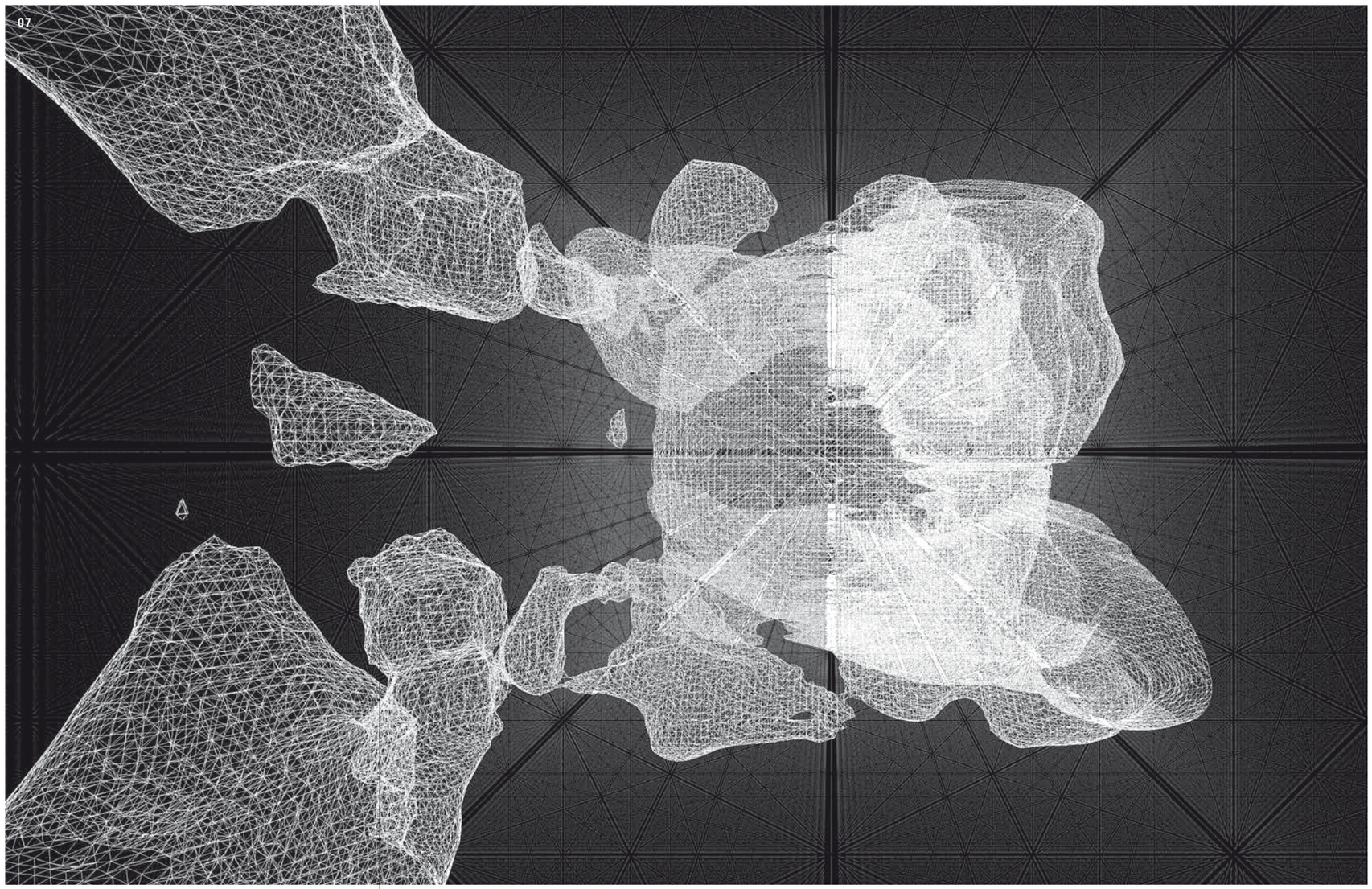
It is impossible to comprehend or examine exhaustively what is to be considered as "real," because such consideration depends upon the quantization and formalization of ideas. Hierarchies and the relations between originals and their copies, which is the key concern of materially oriented societies, have become almost completely irrelevant in an age in which virtual realities dominate human lives. Depending on the ways of our understanding and capacities of accepting the "unfamiliar," we comprehend and legitimize what is to be considered as real. Brian Massumi is perceptive to this in a multifaceted way, by comparing Baudrillard's interpretation of the reality-simulation, in which there is no division between the real and the virtual, with Deleuze and Guattari's negation of the linear approach to the real. Such a non-linear approach to reality is supported by the vanishing of boundaries, and the influence of the virtual on the real.

"Baudrillard sidesteps the question of whether simulation replaces a real that did indeed exist, or if simulation is all there has ever been. Deleuze and Guattari say yes to both. The alternative is a false one because simulation is a process that produces the real, or, more precisely, more real (a more-than-real) on the basis of the real. 'It carries the real beyond its principle to the point where it is effectively produced.' Every simulation takes as its point of departure a regularized world comprising apparently stable identities or territories. But these 'real' entities are in fact undercover simulacra that have consented to feign being copies."

MASSUMI, 1987

ABSTRACTION

The "Internet age" is exactly such a condition, in which immaterial information is part of what we call reality. In other words, there is a peculiar reality proper to models, even if they are, necessarily, idealizations. In such a condition, the only way of dealing with information is abstraction, and it can be adequately used only by those who are, in a mass of information, able to define their contexts as flexible, adjustable fields of possibilities with polyvalent, and ultimately undecidable, meaningfulness. The project *Four Chairs and all the others* considers the creation of abstractions of objects to a degree that multiplies the manners in which objects can be manipulated beyond any definite bounds, and by this, it considers how new meanings can be provoked from the abundance of information. If objects—chairs, or entire populations of objects—are assigned an abstract expression, as multidimensional vectors (i.e. as a series of numbers in a line, as indexes to what can be linearized) they become very potent and can be manipulated in manifold manners. Such abstract objects, which consist of nothing else but indexes, are placed in a meta-space that contains the summation of the potentials of all the objects which are constitutive for this meta-space. [FIGURE 08] Governed by the *Principal Component Analysis* algorithm, meta-space is able to correlate indexes of all objects, creating



and rational type of abstract or generalizing thinking, or the results of such thinking. Depending on the context, the results might for example include generalized explanations of how nature works"—or even how divine or metaphysical matters are thought to work in philosophy and theology. Wow! A "generalized explanation of how nature works." Theory as a manual for putting together a toolbox useful even on metaphysical stuff. Among those toolbox appliances, generalization seems to be of particular interest. It is prominently used three times in the introductory paragraph, and obviously tries to reduce the contrast to one of our most important concepts: abstraction. Our algebraic approach maintains that abstraction refers to that which is common to several entities without being part of any, as opposed to "general," meaning parts that are common to some entities. To sum it up, English Wikipedia tries to keep the notion of "something that has no common parts" out of the game of theory, by jumbling it together with generalization.

Hereafter comes German Wikipedia, presenting a striking contrast: "Eine Theorie ist ein System von Aussagen, das dazu dient, Ausschnitte der Realität zu beschreiben, beziehungsweise zu erklären und Prognosen über die Zukunft zu erstellen." In this case, "a theory is a system of propositions, which serves to describe or explain clips of reality, and to build predictions about the future." Theory is not thought of as a toolbox, but as an environment for negotiations.

The contrast couldn't be greater: generalization of parts of things vs. partless abstraction of things. The "English" theory evolves around an inner necessity, the "German" one within an environmental or external necessity. In physics, the English notion of theory may be found, e.g., with Newton, the German one, e.g., with Lagrange. Mechanics and Dynamics.

Our approach is aimed at applying abstraction to the "English" and inversion to the "German" theory concept. Whatever it may be. To start with, that's what we think cultivation of the global generic infrastructures turns upon. That approach encompasses generalization in a manner the "German" theory notion is blind to, as it does abstraction, which the "English" notion taboo-izes. Rather than mechanical or dynamical lines, we'll follow quanta, or points of probabilities (more about this later).

It is important to remember that our object is not establishing a new definition of theory. It is the working out of contrasts, and learning from what such contrasts

thus an open logistic network, an abstract possibility space. This marks the level of how heterogeneous objects might be articulated as an abstractly engendered kind, and it allows for the generation of entire populations of singularly particular objects which all belong to the same generic "kind." By looking at objects through the levels of their abstractions, we realize the potency of information (in meaning and shapes, with which we can work), but at the same time we realize the sheer emptiness that is proper to abstraction, when we regard it on the symbolical level of indexes alone.

MEANING, CONTEXT, AND NARRATIVE

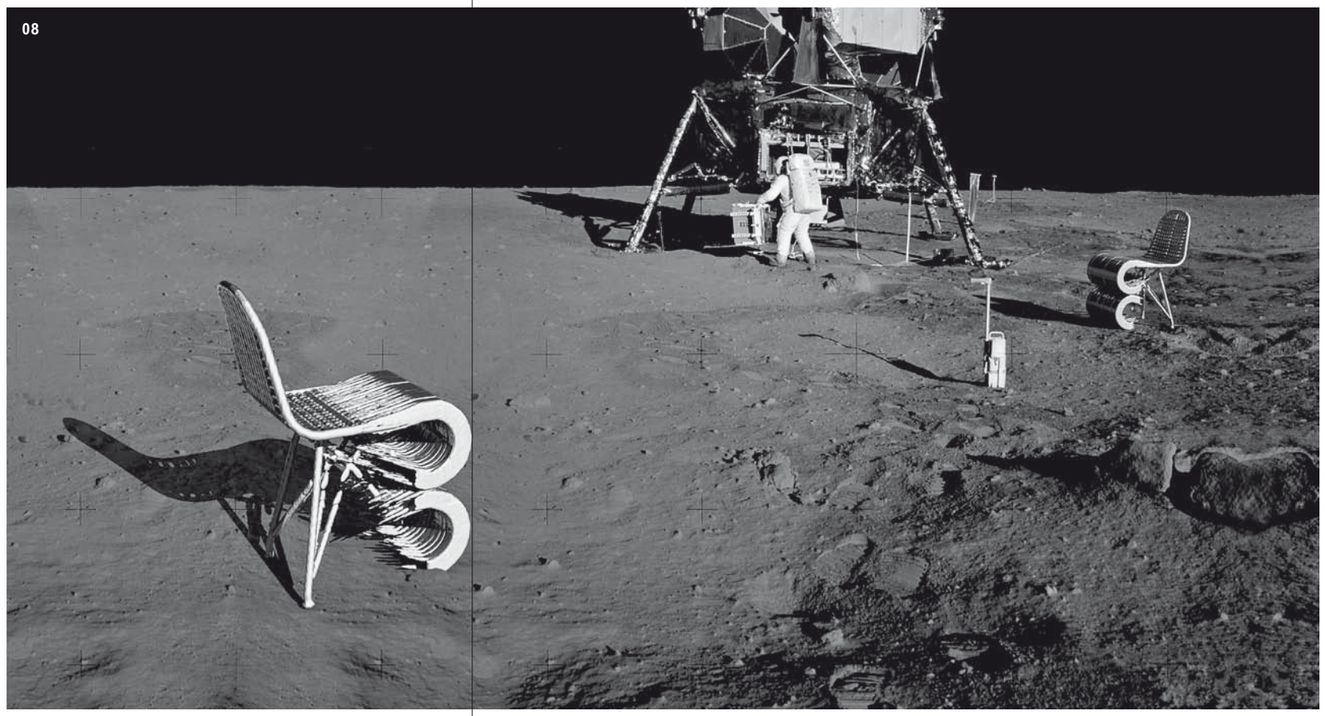
Post-traditional societies (societies that embrace modernization) offer new perspectives on old concepts to which new meanings are attributed, or which are judge critically, by negotiating their discursive contexts. The mass of information shapes our world: text, visual representation, music, money. However, the idea offered by the information-theory pioneer Claude Shannon, namely that "*information does not itself carry meaning but transmits messages*," has become rather liberating in the academic discourse: in carrying no meaning, information offers unlimited freedom of manipulation. It is important to emphasize that contextualization and the successive creation of narratives inevitably "fill in" the void of information (its constitutive meaninglessness). Contextualization and narration gain power by carefully gathering evidence (real data) for what they are meant to comprehend. At the same time, they take care that the larger contextualizations and stories in which they claim to be embedded rely on the collective reality and memory of culture and history. It is also important to note that in the process of contextualizing generic instances, by composing their proper narratives before they are actually generated and produced, there is a whole world of possibilities from which one actualizes only a fraction. Yet the effects of such "reductionism" are not to impoverish, but to maintain open the potential for novelty and for the unexpected. This project shows that design is able to manipulate predetermined potentials, while filling them, at the same time, with narratives. Design is not a part of the endless evolutionary process aimed at creating the next new ideal object, but a part of a defined context with chosen references, and their respective genealogies. [FIGURE 09]

EIGENCHAIR: DATA-DRIVEN DESIGN

By using information manipulation and various spatial conceptions, algorithmic design approaches an object in a completely abstract manner, distancing it thus from its own immediate "reality". In making the object extremely flexible for different interpretations and contextualizations, algorithmic design also contributes to the instability of its design process: lacking the resistance of material constraints, designing an object could easily be reduced to a formalistic geometry exercise. Therefore, a key feature of such an understanding of design is not only the definition of algorithms, but also the construction of parallel narratives around the object. It seems therefore inviting to re/turn to the postulates of the pre-Socratic philosopher Empedocles, who claimed that "nothing comes out of nothing and nothing disappears into nothing." Such philosophical re/turn marks an effort to observe context and processes as more important factors for defining the object than those implicit in the Objectivism (Terzidis, 2012). The advantage of procedural design in our contemporary world is its ability to refer to partial summations of global knowledge, and to use it effectively.

This project tries to show—by conceiving and shaping the idea of a chair for the early twenty-first century—the necessity of perceiving design through three equally important, interdependent aspects: design, theory, and technology. Design is now data driven. [FIGURE 10]

08



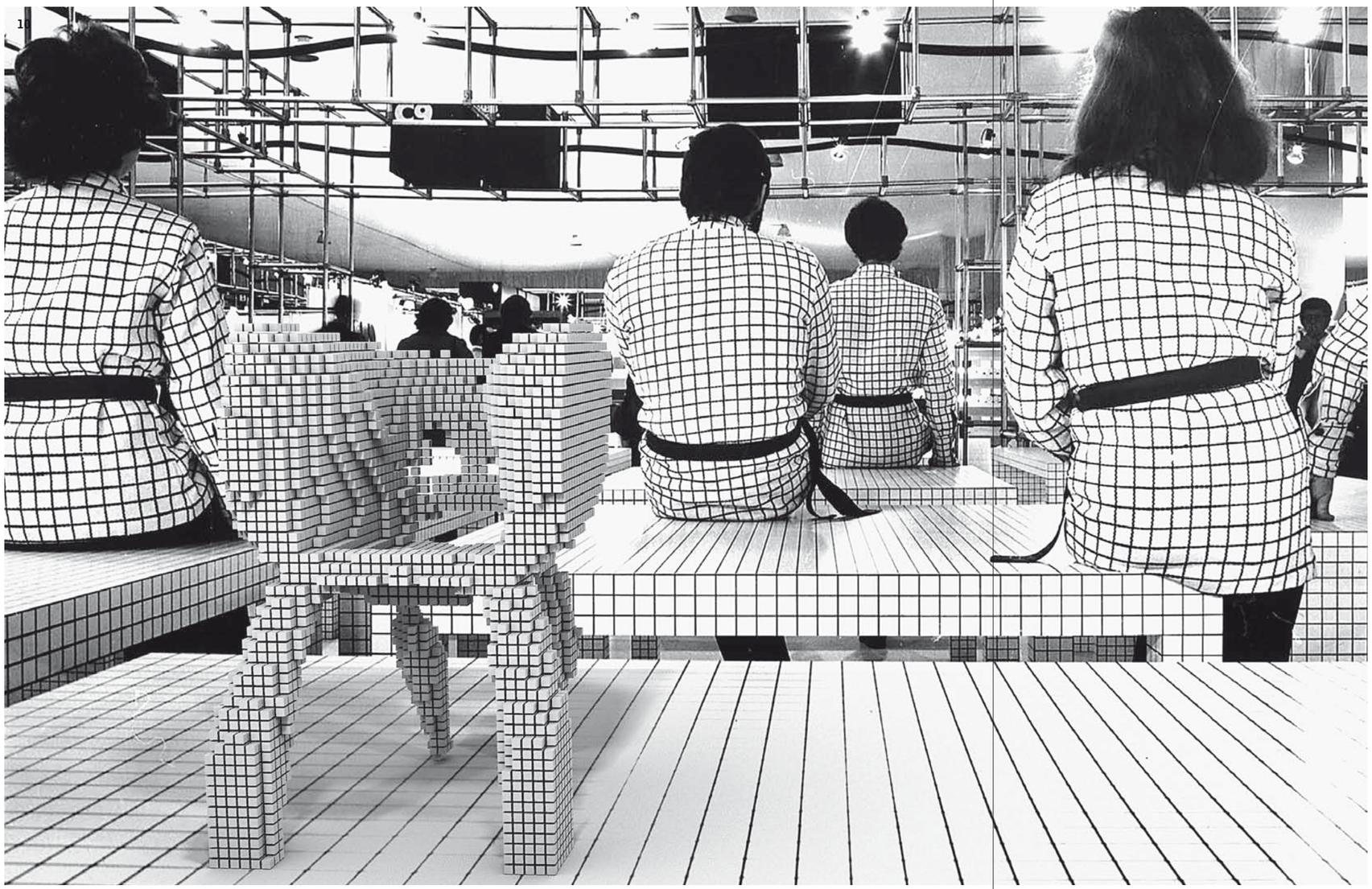
09

07 « *EigenChair* in meta-space—possibility of interconnection and interrelation of all active data
08 *EigenChair* in Apollo 11 Mission (1969)—Aldrin unpacks experiments
09 Rendering to reality—3-D printed chair—simulating decomposition
10 » *EigenChair* with Superstudio (1966)

may tell us. There is no dearth of other interesting language games comparing theory definitions in different sciences, for sure. But these two shall suffice for our present purpose.

ABOUT MASTERSHIP

In a similar vein, we shall now address the concept of technics. We'll then discover it presents an interesting morphological turnabout: with the pre-Socratics of the fifth century BCE, *technítēs* relates to the *mastery of the craftsman*; with the near-contemporaneous sophists *tektaínomai* relates to *mastery of convincing talk*. Plato, in the 4th c., oriented the game toward *téchnē*—which addresses the skills around the purposes of an object—in a predominantly theoretical sense. And Aristotle, in the 3rd c., uncouples the *méthodos*, the controlled procedure, from the téchnē, the ability to create an artifact. What interests us is the inversion from—putting it succinctly—the "mastership in creating objects" (5th c.) to "objects presenting mastership" (3rd c.). In the 5th c., "mastership" is necessary and objects are contingent, whereas in the 3rd c., "good objects" are necessary and mastership is contingent, which we would symbolize as: (C)N vs. (N)C.



Comparing that with the differing definitions of theory between English and German Wikipedia, one tends to assume that the "German" BoT is more comfortable with the 5th-c. notion of technics, and the English BoT more so with the 3rd-c. one. One directly finds this confirmed when, e.g., the English Wikipedia states that téchnē "was not concerned with the necessity and eternal a-priori truths of the cosmos, nor with the a-posteriori contingencies and exigencies of ethics and politics. … Moreover, this was a kind of knowledge associated with people who were bound to necessity. That is, téchnē was chiefly operative in the domestic sphere, in farming and slavery, and not in the free realm of the Greek polis." And here we are, *avant la lettre*, in the middle of the Koolhaasian Junk Space. Perhaps we can go along with the second part of the quote, but we take strict exception to the first: technics, theory, intellect are affine to the cosmos; technics plays its own part in the game of contingencies and politics, but it is not a reductionist, romantic story about freedom and slavery, as is associated with a criticism of téchnē. Téchnē 's playground must be elevated to a more abstract league, if we are to cultivate the Junk Space.

Such are the reductionisms we mean to oppose. The exemplary inversion from the pre-Socratics to Aristotle should not be read, as is usually done, as a progress story, where one content of a concept is replaced by a better one. It should be read as a rotation, inclusion, and inversion, by which both the "mastership of the craftsman" *and* the "talk of good objects" *and* the "convincing method" are indexed by the algebraic symmetries, aforementioned. Just indexing; no need for deciding, no need for judging. All we do need is stability, and with algebra's help we can preserve the richness.

ABOUT LEARNING

Now, do you find all this unnecessarily complicated? It can't be otherwise, really: because people always were clever, because they always included the whole into their masterpieces, and because they always wanted to measure themselves against the masterpieces around. Indeed, the wide-spread fantasy of, and yearning for, a simple, easy-to-understand description of our world strikes us as a bit astonishing. In developing our masterships, we struggle, contend, and measure ourselves against the masterpieces of our species. Simplicity is for beginners.

So, what is a masterpiece? Masterpieces are achievements that are beyond what oneself, or oneself's environment, is capable of—achievements of which one doesn't know what it is that makes them better, or how that was accomplished. Thus no matter what the field, or what level your own mastership, in relation to that of others there is always blindness involved. There is no common reference nor common denominator. But how to go about learning, then? There is an "art of learning"—it's called mathematic(s). Mathematic(s) is not primarily about complicated forms, numbers, and formulas. Mathematic(s) articulates most explicitly what BoTs and what mastership are about.

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For our purpose, it is interesting that there is a distinction in mathematic(s) between geometry and arithmetic on the one hand, and another between logic and algebra on the other hand. Geometry is *investigation of forms*. Which may be seen as the primacy of things in how they can be perceived, over the question of what they are. Arithmetic is "calculation with numbers," which is an investigation "behind the scenes" where the question of "what things are" is primary, and supersedes their actual formal expression. So we may further stabilize our symmetry: geometry is on the (N)C side, arithmetic on the (C)N side. Any masterpiece needs at once geometry and arithmetic, whereby at times stability is on the geometric side, and at other times on the arithmetic one. With Euclid, e.g., stability is centered upon geometry—we are in the 3rd c. BCE—and the concept of technics, e.g., is one we discussed for Aristotle. We find the same setup in the 16th–17th c. CE, just as we did, in a preceding chapter, in today's English Wikipedia. Stability centered upon arithmetic is found in pre-Socratic thinking relative to technítnēs, around the 5th c. BCE, with a corresponding appearance in the 18th–19th c. CE, or in today's German Wikipedia.

All this sounds rather speculative, but let us take it one step further: *logic is investigation of correct conclusions*, while algebra is resolution of balances, or indeed "solution of equations." Whereas logic may be assimilated to geometry of self-reference, algebra may so be to arithmetic of self-reference. Geometry and arithmetic are on the root level, logic and algebra on the transcendental level, of understanding masterpieces.

This manner of putting it is just ours, and most of today's history-of-mathematics experts will contend that it is picking a wrong schema, and then oversimplifying it, to boot. This may be countered by the argument that most of today's pertinent literature is geometrical and *logical*, and has achieved an enormous diversity and complexity. Particularly in the 20th c. Whereas, by contrast, our game as presented here is geometrical and *algebraic*. While admittedly not compiled by a mathematician, it draws great compactness and elegance from bringing in algebra. We'll see what it will let us do.

Our question was, how can we learn from masterpieces around us, while acting from within our specific 21st-c. setup. As our discussion of the generic showed, there is no explicating foreign masterpieces through geometry and logics. Nor is there, our answer goes, through algebra and geometry. But algebraic self-reference can be used for stepping out of today's geometrical generalisms, out of what Koolhaas called Generic City and Junk Space. And there is the hopefully reassuring observation that this situation is anything but new. Similar configurations prevailed around the 16th c. CE, and during the 5th–3rd c. BCE, and contrary ones did in the 18th c. CE, and the 3rd c. BCE

This is your wherewithal to learning from our masters.

THE CENTERED VOID

Abstraction is one of our key concepts. Some idea of its power may be gained from a look at a simple object, the Pythagorean triangle, along with one at how the Greeks around 500 BCE managed to uncouple planes from objects, and turned planes, in lieu of objects, into their primary entity. Or, figuratively speaking, how they managed to retrieve the triangle from the pyramid solid as a new source of stability and truth.

Let us start with the primacy of objects, and the assumption that in Egypt, or in the Mesopotamian world, *numbers reflect series of things* (the meaning of which shall be explained later). On its strength, we think of the three lines of a right-angled triangle as "numbers reflecting the series of lines-of-the-triangle things." This is working fine with the catheti of the triangle. It does not work with the hypotenuse, which can be reflected by whole numbers only in very few constellations (so-called primitive triples): if the legs are, e.g., 3 and 4, the hypotenuse is 5. In most other cases the hypotenuse is between whole numbers. If, e.g., the legs are 1 and 1, the hypotenuse is somewhere between 1 and 2. The hypotenuse, having no whole number, has—according to our hypothesis—no name and no identity. It is not a series of things. It is a not a thing.

The Greeks around 500 BCE, developed a new kind of thinking for this problem. How did they do it? As usual: by giving the established BoT an infinite dimension, and then symbolizing the negation of this infinity. Where the old notion of numbers *reflects a series of things*, the new number does not. The new number notion is a *self-reflection of not all the other series of things*.

On this assumption, two things are *identical* if they share the *same self-reflection*. Whereby they share the same number or the same name (for more details about this BoT, cf. the *Organon* of Aristotle). To stress the contrast: prior to this new way of thinking, things had been identical if they *were reflections of the same series of things*. Now things drop out of this equation. If two of these new numbers or names appear on stage, they are *not reflecting all the other series of things*, which means they project

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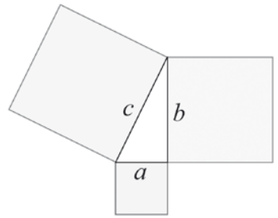

their relation. A square then is a *self-projection uncoupled from any thing*, and no longer a *reflection of this series of things*.

[FIGURE A] And now watch this Pythagorean stage play: take the self-projection of one cathetus of a right-angled triangle, add the self-projection of the opposed leg, and there appears directly the self-projection of the hypotenuse: the hypotenuse has acquired a very interesting new stability, unneedful of any particular series of things for an anchor. The stability in describing the world is no longer provided by a *series of things to be reflected*, but by a *stage play of projective selves* symbolized by a new notion of names and numbers. In this example, these are, on the one hand, anchored through primitive triples (like 3, 4, 5), while on the other hand working with all the other triples as well. This particular stage play, this new notion of names and numbers as projective selves, is called Euclidean geometry; it opened up a whole new cosmos of thinking. The characteristic of this thinking is, as the right-angled-triangle act shows, the play around a centered void, projecting a *series of things to be reflected*. In that stage play, the hypotenuse is still a challenging character, but it is not a no-thing any longer, it is just an irrational self, interplaying with rational selves in a syllogistic stage play. But remember—and this is very important for what follows—the Pythagorean triangle as a plane is not as real a thing as the pyramid is a thing. The actors of the Euclidean geometry are self-reflected voids, constituted by a syllogistic interplay of projected planes organized to reflect a *pyramid which is not there*. And this now is how we would introduce the concept of media: an agent of the stabilities of the world left behind, as a new BoT is being acquired. As exemplified by the Euclidean geometry media-izing the mythical stabilities of the Egyptian pyramids.

CULTIVATING THE PARADOX

Pythagoras is a jumping board here, not a bedrock. There are plenty of similar BoTs around. Each of them packs the intellectuality of people of a specific time and region. And people, of any time and place, have always been our equals in intelligence. Needless to say that today we are living in a BoT different from the Greeks', and we should not even think ourselves successors to their thinking. The thinking in historicity, and in predecessions and successions, is 19th-c. BoT, and might be characterized as arithmetic. In the 21st c. we are fitted with another, geometric constitution, with inverse implications. More about dealing with inversions later on.

But again, how to learn, in our 21st c. constitution, from an extraneous BoT? We argued for shifting from logical geometry to algebraic geometry in order to be able to step out of the generic. Western thought holds a prominent invariance, potentially helpful in establishing an algebraic symmetry across BoTs, and known as Diodorus Cronus's (4th–3rd c. BCE) master argument. It consists of three statements about future contingents:

1. every past truth must be necessary
2. an impossibility does not follow from a possibility
3. something is possible which neither is nor will be true.

These statements' fascination is that, taken singly, each of them looks reasonable, but any pair of them combined logically always contradicts the third. All major Western thinkers struggled with this paradox, trying to give different weight to this or that argument, but none was able to find a satisfactory solution. Jules Vuillemin gives a thorough discussion of the argument's evolution in *Necessity or Contingency: The Master Argument* (1996). The master argument therefore is a useful access point to foreign BoTs, and an axis along which different BoTs can talk to one another.

Let us name and symbolize these arguments, so as to be able to work with them:

- The first argument is about necessities – N
- the second about contingencies – C
- and the third, we would say, about self-reference – S

This master argument shall be our principle on which to seat the algebraic build of our skeleton of thinking. So let's take it from here, establish the symmetries between the BoTs belonging to prominent masterpieces, and check the kinetics of ours.

To that end, we associate geometry with the necessity N of the first argument, arithmetic with the contingency C of the second, and algebra and logic with the self-reference S of the third argument.

Applying that to our Pythagorean-triangle discussion, the rational catheti may be associated with N, the irrational hypotenuse with C, and the interplay itself, the triangle, or centered void, with S.

Now things are growing powerful. But the question arises, how are the paradox components brought into balance in our Pythagoras example? In his argumentation, Pythagoras starts with N and asks for C: in our parlance (N)C. Another question relates to the weight of self-reference within the correlation between C and N. Regarding Pythagoras, it might be said that to him self-reference is prior to the positive constellation of C and N; proof and establishment of self-reference are primary: in his case, the expression would be (N)CL. (For Aristotle, a few hundred years later, this type of thinking was established, and his main focus was therefore on explicating it in all applications. The corresponding expression would be (N)CA.)

That now establishes algebraic vectors as a skeleton, a framework for BoTs. Let us then take it one step further: an (N)C setup implies a BoT that is geometrically expressive while arithmetically impressed. A (C)N setup implies a BoT that is arithmetically expressive and geometrically impressed. An (N)CL one implies a logical geometrical expression, while a (S)CA one does an algebraic geometrical expression, and so forth.

The summarizing of the changes in the concept of technics, introduced above, will illustrate the power of these symbolizations: in the 3rd-c.-BCE view, of technics as a *controlled procedure*, or *methodics*, uncoupled from the object, in abstraction to the object (*enérgeia*) and prior to it (*dýnamis*), there is internal necessity and external contingency: (N)C. In the 6th-c.-BCE "mastership of the craftsman," trust is put into the craftsman, and the artifact left to negotiation: (C)N. And so forth: other times, other concepts. As we see, with these skeletons thinking becomes capable of increasingly higher speed.

And now just imagine the boost to our thinking from ingesting the following statement: *Within one same period and region, masterpieces of whatever discipline are of one and the same BoT.*

With this, we are going to find attractive and challenging symmetries everywhere. Our world will get fast, rich, and interesting.

WHERE WE ARE TODAY

Dialectics

Let's get our hands on such a BoT, and play around a bit with the symmetries and invariances of which it consists, just to get the hang of it—by focusing on two important notions. What we are proposing is neither critiquing nor dialectic. The German Wiki: "In classical antiquity and the Middle Ages, dialectics denoted a method of discourse or argumentation, as well as the area that is called logic today." We directly see the symmetry to the 3rd-c.-BCE play: (N)C. And further: "Since the 18th c., a new signification of this word gained acceptance: the theory of contradictions in things, or ideas, and the identification

STANISLAVA PREDOJEVIC

HARD-BOILED WORLD WIDE WEB AND THE END OF DISTANCE

Hard-Boiled World Wide Web and the End of Distance **is a conceptual and experimental design proposal for reading, mapping, and rearranging conditions and complexities of the city and our urban environment. This research is open for different media and strategies not only from architecture and urban design, but also from technology, literature, and philosophy.**

The proposed design approach is provoked by the transformations of urban environments and interpersonal interactions within these environments we experience collectively today, but it is also driven by many personal choices, perceptions, and variously distinct points of view. All of this together initiates a broad spectrum of artistic, architectural, and socially relevant questions and tasks, and allows for an open-ended process which engages "form" and "content" within higher levels of decoupled independence, and hence within vaster spaces for interpretation and variation. The proposed design approach assumes that by radically multiplying the amount of predefined rules, it is possible to increase and differentiate also the power of critical stances toward questions that are related to the contemporary city transformation processes.

The proposed method works in terms of an abstract documentary, but at the same time also in a generative way by means of extracting many indexes for the invention of new concepts of organization. These indexes are meant to feed back—projectively—in the documentary side of the procedure. The proposed design approach proceeds within a self-referential space. Input information is always related to the given state, and to what we assume could be important in any one such state. In computational mappings, these states are clustered according to measures extracted from activities and physical properties. Such mapping and clustering afford to "manipulate" the information by interpreting it toward virtually any direction.

[of thesis and antithesis] and sublation [*Aufhebung*] of such contradictions." This corresponds to (C)N, is a strikingly straight inversion of the preceding setup, and symmetrical to the pre-Socratic "craftsman's-mastery" play. As upheld by Marx (1845) talking about Feuerbach: "The question whether human thinking be possessed with concrete verity is not theoretical, but practical. It is in practice that man must prove verity, i.e. reality and power, materiality of his thinking. The dispute about reality or non-reality of thinking—as cut from practice—is purely scholastic in nature." This flies clearly in the face of the Aristotelian separation of theory and practice (which we symbolized by (N)C), and represents therefore a (C)N game, as introduced and symbolized earlier when talking of the "difference of things." Interestingly enough, Marx's piece is not about things-related (3rd-c.-BCE), but thinking-related (19th-c.) craftsmanship.

These quotes point up that Kant, Hegel, and Marx are performing a (C)N play on a stage inverse to Socrates's, Plato's, and Aristotle's (N)C stage. Today, in the 21st c., we'd argue that the play again takes place on the (N)C stage, as opposed to the 19th-c. (C)N one. Yet, our play, while on the same stage, unfolds on a different level of abstraction: in the 3rd c. BCE things turn upon "syllogistic," in the 15th c. upon "logic," and in our

00

time, in the 21st c., they revolve around "logistics." And once more: no reason for particular pride today; all these different BoTs are of equal richness, independently of their abstraction, because people, especially the masters of their epoch, were at all times as bright as we think we are.

Structuralism

Having had a glance at the 19th c. with a (C)N setup, we now step onto the 20th-c. (N)C stage and give it a closer look, by entering "structuralism" into English Wikipedia: "Structuralism is a theoretical paradigm emphasizing that elements of culture must be understood in terms of their relationship to a larger, overarching system or structure." Or in German Wikipedia: "Structuralism is a collective term for interdisciplinary methods and research programs that investigate structures and relationships within the mostly unconsciously functioning mechanisms of cultural symbolic systems." Once more there is symmetry with the 3rd-c.-BCE (N)C setup, but instead of playing with the *syllogistic of object-names*, we are doing so with the *logistics of cultural elements*.

Post-Structuralism

Our focus now turns upon the 1960s stage play (German Wikipedia, June 2013): "The term 'post-structuralism' denotes different scientific approaches in humanities and social sciences that originated first in France toward the late 1960s, and dealt in various ways with the relationship between performative language and social reality. Key tenet is the realization that language not only *represents reality*, but indeed *creates* it through categories and distinctions. Typically this perspective is accompanied by the turning away from an objectivistic view of society that considers social facts as necessary; in its place, the varying possibilities (contingencies) of societal developments are being stressed." There is remarkably straight symmetry between the "craftsman's mastership" of the 6th c. BCE and the 1960s' "creation of varying realities," or the "contradiction in things" (19th c.) and the 1960s' "contingency of societal developments." In the second half of the 20th c. there takes place an obvious inversion of the first half's setup. The first we associate with (N)C, the second with (C)N.

But, to our mind, structuralism, post-structuralism, and all the other -isms populating the 20th c. are not fully evolved BoTs. We would describe them as a diversity of

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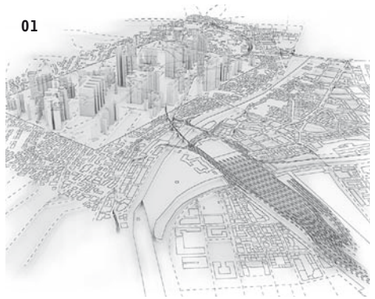

ON READING THE CITY META-FORM

"*The city is not a closed determined system of signs. Nevertheless, the urban has the ability to appropriate signs, to produce them. Reading space, then, is interpretative work that understands experience as a learning process. In this way, the city itself becomes a learning organization.*" [FIGURE 01]

***CHRISTOPHER DELL, REPLAYCITY. IMPROVISATION ALS URBANE PRAXIS* ((BERLIN: JOVIS VERLAG, 2011); MY TRANSLATION.**

Starting from the postulate that "the environment as we perceive it is our invention" (H. v Förster, 1973), the project sets out from personal experience. Experience, as a collection of our memories, is stored in symbols, personal maps of existing places, gathered, fragmented, rearranged, and re-puzzled by different sets of rules. Like this, experience can trigger reflections on the world's unity, and such reflection produces a vivid sketch of momentary spaces, real and unreal at the same time; countless diversification of concepts, contexts, and desires. Mapping different moments of possibilities, playing with specific locations in terms of density, complexity, and topology on the one hand, and on the other with our perception and memories, we are able to create new arrangements of our experience depending on the "directions" we desire and chose to face.

Similar to the Situationists' interest in mapping cities in terms of experience—fragmented, subjective, temporal, and cultural—this project also assumes that the city is dynamic and changing, and that such maps would need to be updated and changed. This research proposes an open-ended design process for mapping, understanding, and cultivating "memory" and "experience" in relation to "the city."

How do we understand and navigate space? How to locate oneself? Regarding scale, what is the smallest and what is the biggest unit we deal with? Furthermore, what would be an appropriate reference allowing for comparison? Can artifacts help us in orientation? Artifacts embody our aesthetic and ethic criteria and our way of thinking about urbanized space—for instance, a building: any one we may have passed by, been in, seen, or engaged with in any way.

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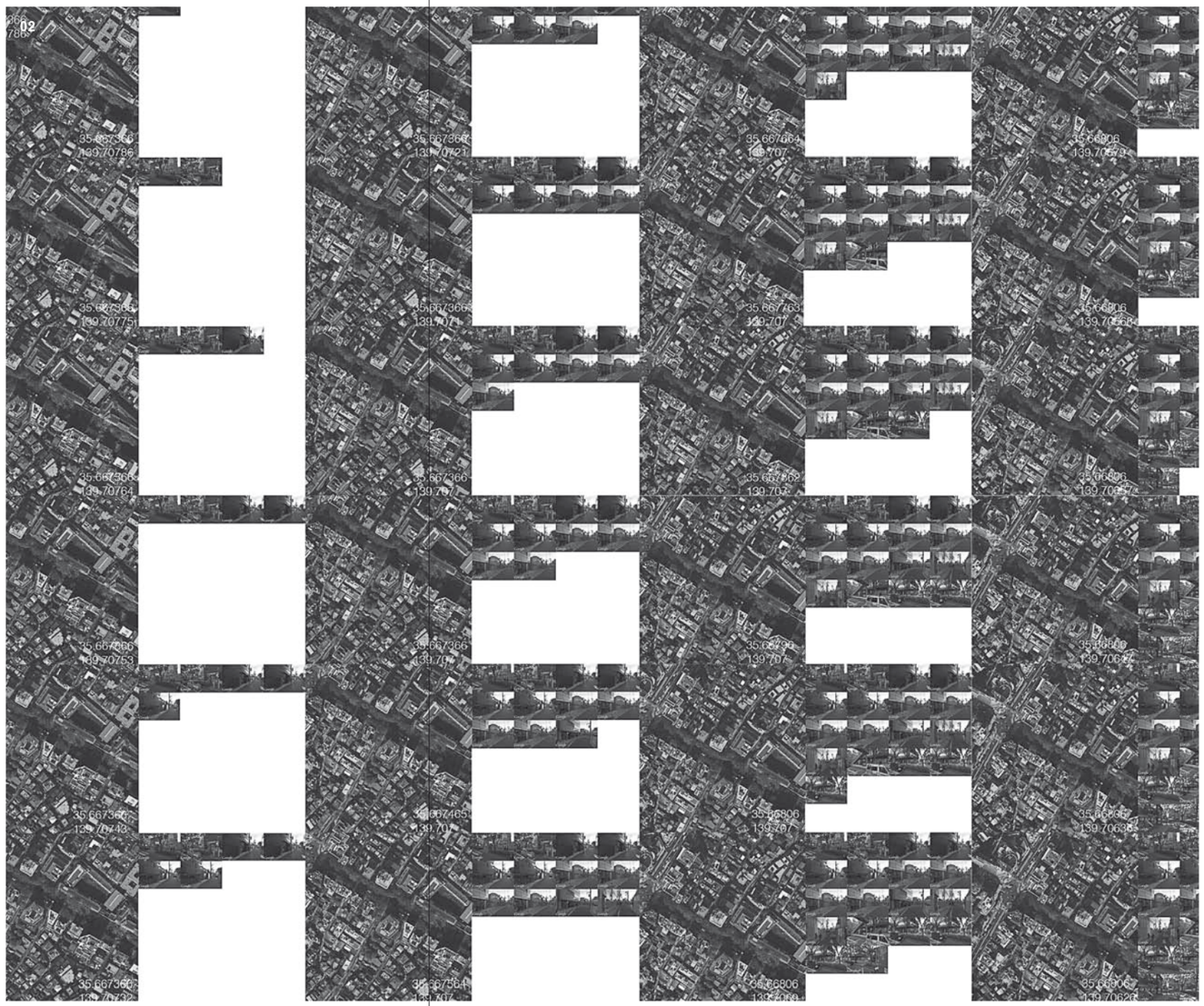


00 « Map of properties: different places, clusters of information, activities, interests, perception
01 Hard-Boiled World Wide Web and the End of Distance
02 Geocoding. Mapping Tokyo: orientation, choice making, relation to the environment, perception (Google Maps, processing)

TAG BUILDING

Let us take such a building as our semiotic "interpretant" (C. S. Peirce) of which we know that it contains within itself names, places, situations, full of immanent contradictoriness and complexity. We might begin by asking, what is the function, shape, or role of this building? What are the actions incited and supported by it? We can encode this real, physical environment which surrounds us and affects our senses, and use it to construct new possible scenarios, new ways to interpret different layers of the city.

TOWARD PRODUCING "NEW MULTIPLICITY"

Self-organizing maps [SOMs] is an algorithmic procedure which offers a new manner for rendering complexity by mappings. It is capable of taking into account large amounts of multidimensional data and transforming it into easily graspable low-dimensional fields, each composed of multiple boundaries, constraints, and thresholds. The more intensely we make all virtually possible connections, boundaries, and distances disappear from the maps, the more we grow aware of the coexistence of all these places in the same time. There are many ways of combining these fragmentary orders and to organize them locally. Maurice Merleau-Ponty has given a vivid description of the primacy of perception:

"The object of perception is immanently tied to its background; to the link of meaningful relations among objects within the world; each object reflects the other [...] much in the style of Leibniz's monads. [...] Through involvement in the world—being in the world—the perceiver tacitly experiences all the perspectives upon that object

characters secondary to the lead one, the dominant BoT, an (N)C setup on the level of abstraction around "logistics," "points of probabilities," "quanta," or "indexes." In this logistical setup, structuralism would seem to index the (N)C stages of prior BoTs, while post-structuralism indexes their (C)N stages. Hence the different levels of the body-of-thinking setups, and one possible explanation of the inflation of -isms in the 20th c.

The whole of the 20th c. seems to be an (N)CL setup expressing logical geometry in an arithmetical environment. We met that setup around the 4th c. BCE, and again in the 1500s (Renaissance). Hypothetically, with the 21st c. we are entering an (N)CA setup: the introduction of geometrical algebra within an arithmetical environment, as seen in the 3rd c. BCE, and in the 17th c. (Baroque). More of this later.

TYRANNICAL NATURES

We are now going to take this argument to the health of BoTs, as it were. Like any body, a BoT has many organs, some good and some bad experiences, many moods, and reflects all of the diverse worlds of cultures and times—i.e. that a BoT, if said to have an (N)C setup, or to be on a certain level of abstraction, does not necessarily and narrowly follow some set scheme. Rather, a BoT describes a certain focal point, and balances out some substance of great intellectual hybridity.

With this in mind, we would say that a healthy BoT manages to keep the N, C, and S paradox in fruitful openness, while an ailing BoT is unable to keep its balance, and sacrifices the openness of the paradox to giving priority to one or the other pair. This happens especially when levels of abstraction are getting mixed, or inversions disregarded.

Abstraction means, as per above, that we gain more freedom at negotiating contingencies, while controlling the necessities at the same time requires more effort. Thus an abstract C' expends more energy in controlling N' than a less-abstract C does in controlling a less-abstract N. However, in the case of controlling an abstract C' through a concrete N, consistency will be lost, and a *terroristic* setup created, where everything is coerced into *meaningless excitement*. Conversely, when controlling a concrete C with an abstract N', differentiation will be lost, and a *tyrannical* setup generated where everything is forced into *meaningless entropy*.

coming from all the surrounding things of its environment, as well as the potential perspectives that object has upon the beings around it. Each object is a mirror of all others. [...] Our bodily involvement with things is always provisional and indeterminate, we encounter meaningful things in a unified though ever open-ended world."

MAURICE MERLEAU-PONTY, "ON CONSCIOUSNESS" IN *THE PRIMACY OF PERCEPTION* (1964).

In the maps produced by the SOM procedure, buildings are reconstituted into a new abstract entity which now consist not only of representations of concrete objects, but also of events, ideas, activities; they are discretized and rendered available to design new systems of networks, boundaries, borders, constraints. Playing with different levels of dependency, exploring relationships between physical objects and the flows around them, we are able to construct a new system of relations, a kind of new infrastructure.

With this approach using artifacts for orientation (in our case a building), one artifact can be considered as the smallest city unit (later we call it Basic Unit of Information, in short: BIT). But at the same time, this unit can contain—in its fragmentary scale with all the loose ends—entire networks of streets, roads, paths, squares, patterns of movements, usages of space, and all the information proper to experiencing cities. Such an artifact is to give orientation, while allowing for new heterogeneity in terms of scale, role, connections, or the character, the expression of the certain intensity of a personal experience.

DESIGN STEPS: EXPOSE YOURSELF TO A RANGE OF POSSIBILITIES

The input data with which SOMs work are based on statistical, written, and visual sources, as well as, through the data selected, on personal impressions and memory. Mapping the experience of cities in the proposed manner implies to work with references, images, Google Maps, and Open Street Maps, and to morph them further in Grasshopper, Rhino, Processing, Eclipse. We start with an image, as a symbol of our perception, which we take as an initial and undetermined variable. Then the process is run by several following steps, conceived and oriented around modes of sign production as Umberto Eco distinguishes them: recognition, ostension, replica, invention (U. Eco, 1978); to orientate our steps of the design process around these modes of sign production allows for emphasizing a state of impermanence, and makes room for "invention." The link between experience, cognition, and computation is based on the reflection and learning from social relations and existing urban situations, and "the urban as sublated, absolute form develops from actions, decisions, surface, volume" (H. v Förster, 1973). This approach is inspired by Heinz von Förster's question "*what are the consequences of all this in ethics and aesthetics*," and it takes his two maxims, one for an ethical imperative: "to act always so as to increase the number of choices," and one for an aesthetic imperative: "if you desire to see, learn how to act" (H. v Förster, 1973) as guidelines for further development of the proposed design process.

Hence the proposed procedure assumes: In order to increase the number of choices, followed by city rhythm, complexity, connections, and relations, there is an action to be taken and an experience to be articulated. To develop a theory of composition as an improvised choreography, we are asked by Förster's two maxims to imagine an absence of gravity as the precondition for producing multiplicities out of formal arrangements, of existing places and common perception.

RECOGNITION: AN IMAGE

The first step of the design process is what Umberto Eco calls "recognition" and it should be related to the imprints, symptoms, and clues to which we respond. It starts with the exposure of oneself to a range of possibilities in order to create an image as a symbol of our perception, which contains a whole set of not strictly related information regarding our interests. For example, as an initial variable in the process of delineating a specific place and its geo-coordinates we can use randomly picked images from Flickr, and present them together with the tags of different activities that we have used as first search criteria.

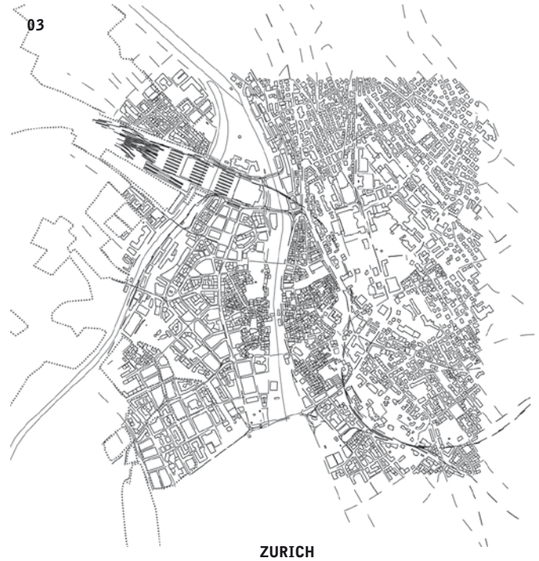
OSTENSION: GEOCODING

The second step is geocoding. It is about choice making, orientation, and our relation to the environment. The algorithm for converting the longitude and latitude values of the specific location into the city map and the corresponding street view is scripted in Java Processing. In this way, playing with Google Maps and purpose-made Processing scripts, we are able to project ourselves to any place in the world, instantaneously. We can also visit several places simultaneously, by choosing and combining different locations. The aim of this design step is to develop deeper understanding of the specific context and to engender a common perception image based on the extracted street views. [FIGURE 02]

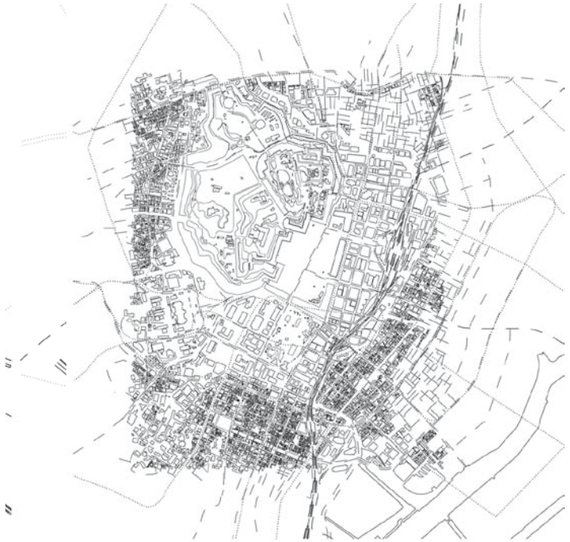
REPLICA: REDRAWING

Readings of a specific city, or of parts of a city, allow us to extract indices and transform the multidimensional data into the low-dimensional data list we can use for training our computational procedure to produce what we call "a Basic Unit of Information." This "Basic Unit of Information"—in short: BIT—is to be treated as the artifact mentioned in the beginning, an artifact which is to help us orientate while navigating the maps of how we experience cities. The data list with which we train our BIT takes the form of a matrix, and it includes different relations, vectors of transformation and combination. This step involves working with Open Street Maps, OSM XML files, Rhinoceros, Grasshopper, and the Elk plug-in. The various city layers are represented through classical two-dimensional drawings, but every element, either building, square, street, bridge, or part of the road, brings with it a set of information that is related to the specific location, area, perimeter, or ratio of physical properties, color, name, function, number of users, visitors, or passersby. [FIGURE 03]

03



ZURICH



TOKYO

LONDON

03 Redrawing. Extracting layers of the city: city area, networks, paths, nodes, and constraints. Locations: Zurich, London, Tokyo
04 » An artifact: any building. Sequence of the catalogue of buildings from Zurich, London, and Tokyo
05 » Self-organized map: a new city plan. Location: ZurichLondonTokyo (SOM, Eclipse)

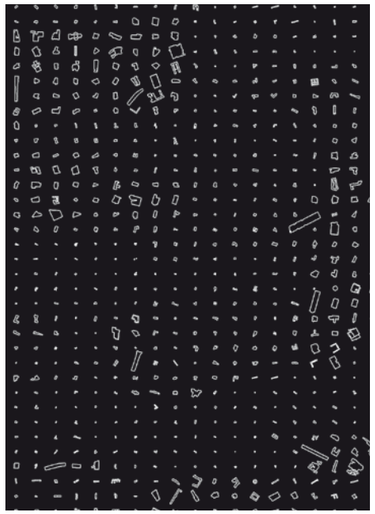
Similarly disturbing results are to be expected from disregarding inversion, and treating it, e.g., as negation: trying to balance an external C, not against an internal (N) but straight against an external N (necessarily of less abstraction) results in *ideological stagnation* (C'N—political politics, a potentially interesting approach to fascism), whereas the reverse ends up in pragmatic hyper-activism ((N')(C)—economical economy, which might be called *radical imperialism*). This argumentation has a sketchy and somewhat brusque feel to it, relative to its scope, and admittedly we are still a bit uneasy in it. In this respect, however, two points ought to be borne in mind concerning our method: we are very sure that it is always the whole we must deal with, which means we never know enough while we are still being held to articulating a position, even when the field is shifty. We are able to do that without recourse to sarcasm or fatalism, because we take the liberty not to judge.

Grasshopper

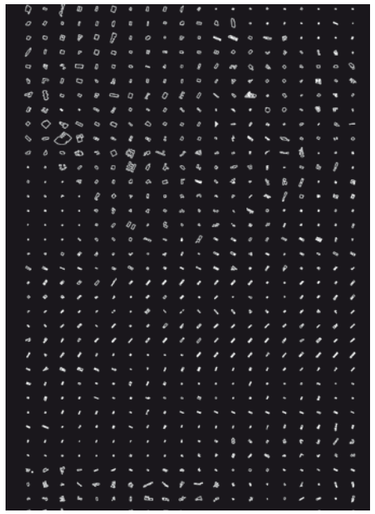
Now, without judging, let us look at artifacts in the field of architecture and computer science today.


04

ZURICH



LONDON



TOKYO

Our BIT, which is to be engendered into an artifact—in this case, a building—is no longer only an object, a physical property, but rather an articulated symbol with both physical and not-physical properties, social relations and conditions. [FIGURE 04]

INVENTION: EIGENPERCEPTION

As a final step, invention deals with the actions, actors, places, and their relations in real time. The SOM procedure, scripted in Java, Eclipse Juno, compares the artifacts with various sets of data and rearranges them in accordance with the prespecified rules and different criteria for choosing the Best Matching Unit (BMU) to compare and train what is to count as our BIT. Such training is an open-end process, and it makes use of the input examples and the competitive process of vector weighting or vector quantization, feeding back on itself and including all the newly produced input vectors.

The SOM procedure has the capability to produce numerous connections, to literally connect any aspect with any aspect. The mappings of such connectivity show multiplicities out of formal arrangements and existing places, and they follow the aim of creating a new scenario, a scene behind the scene, as an enacted result of what we have seen and what we think we have seen: an image as a symbol of one's EigenPerception in existing places.

With the intention to describe the most diverse relations and approaches for mapping perceptions of an urban environment objectively, and yet in terms of personal impressions, our case starts with a few simple and general activities and "takes place" in the three randomly chosen cities: Zurich, London, and Tokyo.

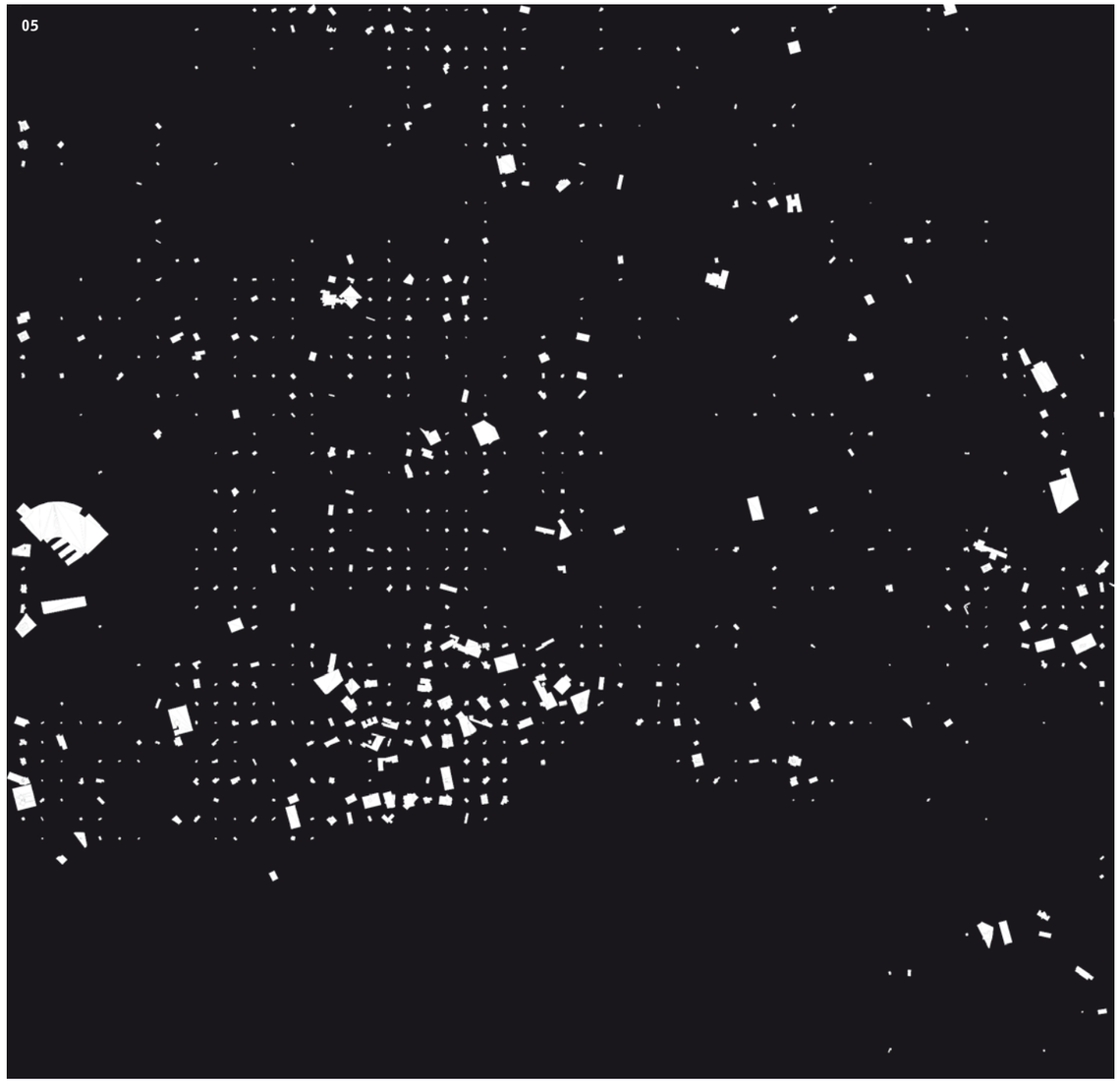
***To move, to see, to search, to find, to discover...* These activities can lead us anywhere, but coupled with the rules and design methods mentioned above, it is possible to create a series of rearrangements of a projective, and virtually existing, urban environment. Depending on whether our movement is linear or circular, or on the scope of our perception of the city, we are able to explore different reconfigurations of existing built structures, for instance in Tokyo.**

The same set of criteria and design steps can be applied to a number of cities simultaneously, taking them into account at one and the same time; this latter option results in more personal maps of existing places, and they are more artistic and free in interpretation. [FIGURE 05]

***To educate, to learn, to live, to work...* these are the activities we followed in the context of Zurich. Considering the rearrangements of the ETH Centre and the ETH Hönggerberg Campus take into account, beside existing educational and residential facilities, also the identity of their specific locations. Such mappings allow us to investigate new urban scenarios in relation to the main ETH building, computed by the SOM as the best matching unit.**

***To pray, to search, to choose, to believe, to rule...* these are the activities we followed when considering contextual aspects from**

"*Grasshopper* (2007) is a visual programming language … which … runs within the *Rhinoceros* 3D CAD application. Programs are created by dragging components onto a canvas. The outputs from these components are then connected to the inputs to subsequent components. *Grasshopper* is used mainly to build generative algorithms. … Programs may also contain other disbalanced types of algorithms including numeric, textual, audio-visual and haptic applications." Making use of our skeleton, we see the symbolic ability of structuring the environment (an abstract C') being reduced to the capacity of negotiation through Euclidean geometry: a less abstract C, which is easy to use due to the lack of abstraction, yet powerful at controlling (an abstract N'). Which adds up to a disbalanced structuralistic (see above) BoT. The endemic result is a "tyrannical" (N')C setup, euphorically presented as: "Popular among students and professionals, McNeel Associate's Rhino modelling tool is endemic in the architectural design world. The new *Grasshopper* environment provides an intuitive way to explore designs without having to learn to script" (English Wikipedia). Which is perfect for beginners, and an essential frustration-free first step toward computing in architecture. But for experts it is problematical, because negotiating results adequately is by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far not as easy and accessible. Consequently we increasingly risk churning out more and more meaningless entropic smooth lines, dross that smothers our heritages and intellectual negotiations under the instant fascinations of surprising geometrical phenomena. If we don't care.

Processing and Logo

With the programming languages *Processing* (2001) and its predecessor *Logo* (1967), we are faced with similar success and results but a contrary setup. "*Processing* is an open-source programming language, and integrated development environment (IDE) built for the electronic-arts and visual-design communities with the purpose of teaching the fundamentals of computer programming in a visual context. … One of the stated aims of Processing is to act as a tool to get non-programmers started with programming, through the instant gratification of visual feedback." In this case the power of symbolic computing (N') is not controlled by Euclidean geometry, but by visual feedback from *intuition*. Intuition plays the role of geometrical impression of outside necessity, on the 19th-c. stage, with a vector of (C)N. Combining 21st-c. computing power, as the internal necessity, with 19th-c. external necessity produces a (N')N setup, which we called "tyrannical." We are mindful that *Processing*, like *Grasshopper*, very successfully opens up information technology to architecture, thanks to its impressive learning curve. And, unlike *Grasshopper*, *Processing* even shows a path toward the full-fledged programming language *JAVA*—which allows coding of whatever is codeable—thus leaving the pathway to digital literacy unobstructed. Still, we observe that major imbalances and attendant difficulties exist in acquiring expertise, not only at creating results with *Processing*, but at negotiating them. Thus we'd tend to diagnose *Processing* as a case of ignorance of inversion, and *Grasshopper* as one of lack in abstraction. One can find the same constellation with the processor *Logo*, which "is a multi-paradigm computer programming language used in education. … It was originally conceived and written as a functional programming language, and drove a mechanical turtle as an output device. … *Logo* was created in 1967 for educational use, indeed for constructivist teaching, by Daniel G. Bobrow." Which lands us smack in the field of cybernetics, and aggressive infantilization, and naturalization of information technology in the second half of the 20th c.

history and culture in broad terms. Seeking manifestations of a common understanding of power, this map considers the areas and the churches of Zurich around Stadthausquai and Limmatquai, St. Paul's in London, and Imperial Palace in Tokyo. The resulting maps of our rearrangements are projectively placed in the context of London. [FIGURE 06]

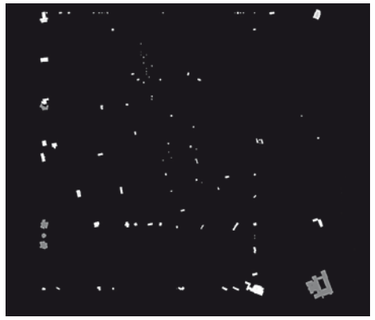
THE END OF DISTANCE

This research proposes to investigate a number of strategies by using real-time data, and to organize this data into appropriate groups based on a predefined set of criteria. Such organization of data offers unlimited choices and combinations of different concepts and contexts. We can regard it as a kind of "speech" or "orality" that can be "voiced" by computational languages. Such "speech" articulates "the present" as the medium of ever-changing city conditions. At the same time, it treats such articulation as an expression of individual appropriation and interpretation. By choosing and formulating activities and locations to project ourselves into, we can keep asking about what kind of atmosphere and identity we are actually participating in. [FIGURE 07]

06

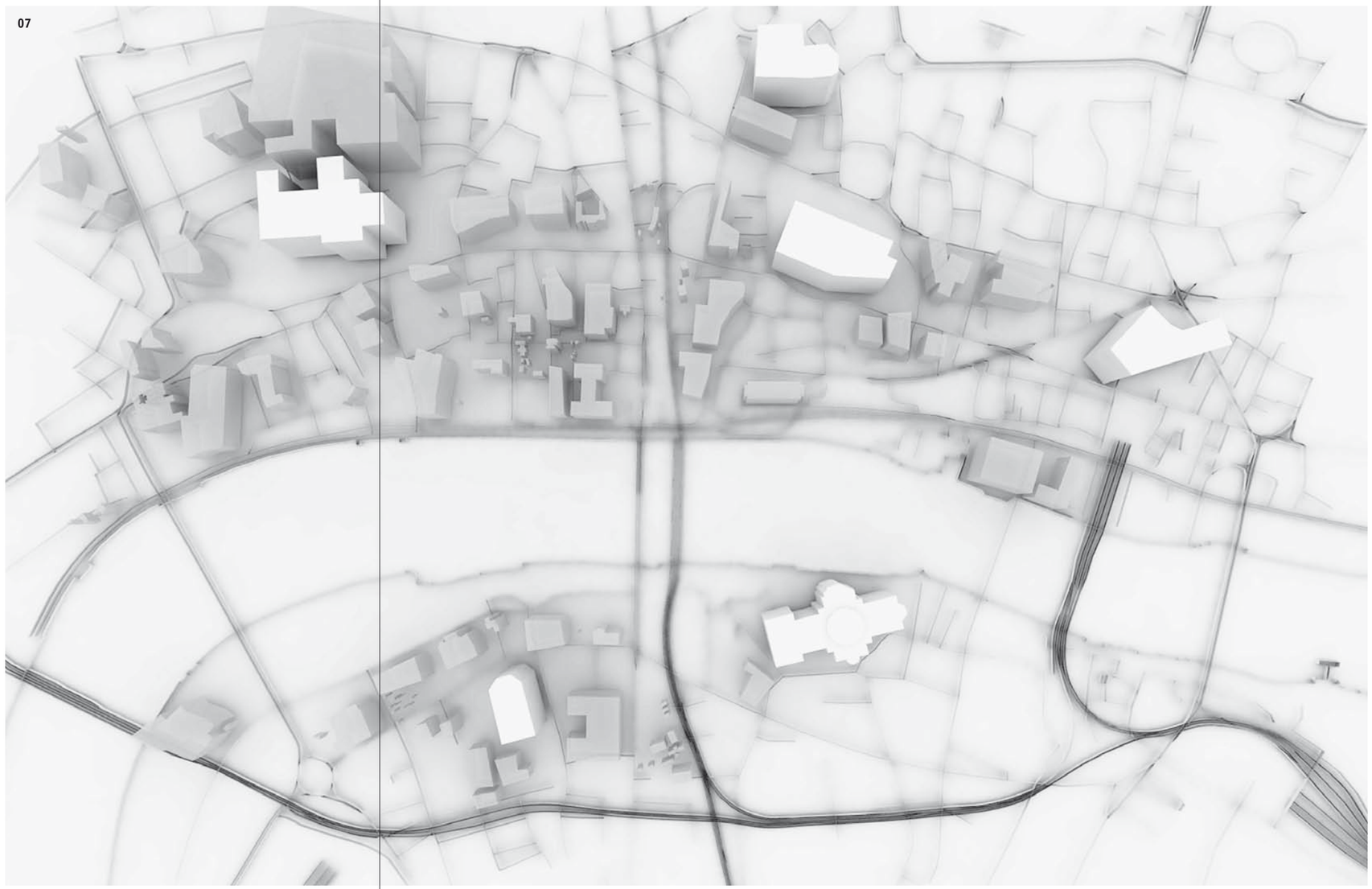
TOKYO: IMPERIAL GARDEN

LONDON: ST. PAUL'S



ZURICH: STADTHAUSQUAI
+ LIMMATQUAI

07



06 Self-organizing maps rearrangement. Locations: Stadthausquai and Limmatquai Zurich, St. Paul's London, Imperial Garden Tokyo. (SOM, Eclipse)
07 Self-organized map: A new city plan. Rearrangement of the parts of three different cities, Zurich, London, and Tokyo in the context of London. (SOM, Eclipse)
08 Self-organized map: Sequence of the new city plan. Location: ZurichLondonTokyo. (SOM, Eclipse)

More ...

Some more indexes pointing to symptoms of such "tyrannical" talks that are crowding our field today: "I am not finished yet." Nobody will ever be finished. Infinity is always part of it, and is no excuse for not adjusting the vectors of a BoT. Insufficiency of technology is the C in the balance. Ignoring the C by saying "I know, but I am not finished yet" is propagating a tyrannical dominance of N. Nor may one say, "I am on the other side, I am on the good side," or "I don't want this or that." Even while negating N, you are still on the control side, not on the contingency side. Nor is there "I am concentrating on this small part, and will do this tiny thing well. The whole is too complex for me." Or as a popular German nursery song goes, "I am little, and pure of heart." Every serious cultural articulation, every masterpiece addresses anything. So does architecture, so does whatever technology. Self-reference is part of it. Especially radical constructivism and its fancy chaotic artifacts are mere renderings of structuralistic self-reference into Euclidean geometry, and therefore no major contribution to the actual cultural status quo.

Using randomization means establishing a mechanical version of a 19th-c. external control mechanism, a sprinkling of nature onto artifacts, with some direct entropic impact upon intellectuality. Random is not opening up, it is always obturating. The same goes for the aesthetic argument of the "creative architect." It amounts to just saying good-bye to one's thinking, and handing control over to machines.

The Body

OSCILLATIONS

1. A body of thinking (BoT) is a cultural constitution indicating how relations between necessity, contingency, and self-reference are being maintained.
2. BoTs are not disciplinal.
3. BoTs are articulated by masterpieces.
4. The masterpieces of a certain time and region engender and articulate, evocatively, one same BoT.
5. Masterpieces cannot be fully explicated or perfectly reproduced.
6. An imperfect reproduction of a masterpiece is an expression of its articulation.
7. Mathematic is the most explicit means of articulating a BoT.
8. BoTs are either expelled or gathered.
9. In an expelled BoT, geometry is the expression of necessities and the impression of contingencies (N)C.
10. In a gathered BoT, geometry is the expression of contingencies and the impression of necessities (C)N.
11. In an expelled BoT, arithmetic is the impression of necessities and the expression of contingencies.
12. In a gathered BoT, arithmetic is the impression of contingencies and the expression of necessities.
13. Architectonic is the interplay between geometry and arithmetic.
14. Logic as the "investigation of conclusions" is the explication of self-reference.
15. Algebra as the "resolution of balance" is the implication of self-reference.
16. As corporeal entities, BoTs oscillate between expulsion and gathering.
17. As intellectual entities, BoTs oscillate between logic and algebra.
18. Corporeal and intellectual oscillations of a BoT are mutually orthogonal.
19. Corporeal oscillations result in an inversion of BoTs.
20. Intellectual oscillations result in an abstraction of BoTs.
21. Architectonic incorporates the interplay between logic and algebra.

A remark about this schema. Mathematics, and especially geometry and logic, are not to be taken as referential constitutions, but as operational ones. We hold the idea that—unfamiliar as it may seem—there are a lot of geometries, arithmetics, logics, and algebras around. They are cultural articulations, they are masterpieces in their own right. They are not natural

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phenomena, predetermined, pre-existent, innate, to be uncovered. It is just us: through our self-reflection within our masterpieces. And in each of these masterpieces we perceive a certain manifestation of the constellation of geometry, arithmetic, logic, algebra, whatever each of them be. So let us point out some symmetries of these constellations on the stage of temporality.

a) That manifestation is invariant to all masterpieces of all disciplines, and manifests itself in a manner that is consistent across all masterpieces within a given time and region (4, above).

Therefore, such invariance is available for mediating between masterpieces. On the strength of a relatively profound understanding of masterpieces in one field, e.g., medicine, one may be sure to encounter the same BoT at work in the masterpieces of architecture, economics, physics, etc., of that time. Such symmetry in the manifestations within a time and region, and across disciplines, is very helpful for achieving fast comprehension, and indeed a better understanding of our own original discipline. But it must be stressed that such symmetry mediates geometries, arithmetics, logics, and algebras, and there is no need for spelling out what each of those actually is. This text follows a self-reflective algebraic paradigm, not a projective or reflective logical one, such as they are popular these days.

Another symmetry mediates between time complexes:

b) Over time the manifestation oscillates along an axis of necessity N and contingency C.

In the symbolization introduced above, over time a series of BoTs shows up as: --- (N)C --- (C)N --- (N)C --- (C)N ---. Again, this schema media-izes the notions of contingency and necessity, and is helpful in establishing the historicity (not history) of masterpieces. Cf. Eric Voegelin's *Order and History*: (N)C might be related to his concept of the ecumenical age, and (C)N to his cosmic age.

There is another symmetry that mediates over time:

c) Over time the manifestation oscillates along an axis of logic L and algebra A.

We can find such time series in how BoTs show up over time, such as: --- (L)A --- (A)L --- (L)A --- (A)L ---. For this now, a strong reference exists: G. R. Hocke's introducing, in 1957, a schema of cultural alternation between classical and manneristic phases. Hocke called the Renaissance (~16th c.) and Classicism (~18th c.) classical phases, and Baroque (~17th c.) and Romanticism (~19th c.) manneristic phases, going deep into details. Joining Hocke, we pursue the line "--- 16th c. --- 17th c. --- 18th c. --- 19th c. ---" as: "--- (L)A --- (A)L --- (L)A --- (A)L ---."

d) The two symmetries mediating over time are mutually orthogonal.

So we may write: --- $(N)C_{(L)A}$ --- $(N)C_{(A)L}$ --- $(C)N_{(A)L}$ --- $(C)N_{(L)A}$--- $(N)C_{(L)A}$--- $(N)C_{(A)L}$ --- $(C)N_{(A)L}$ --- $(C)N_{(L)A}$ --- $(N)C_{(L)A}$--- $(N)C_{(A)L}$ ---, describing two and a half cycles that address roughly the following periods of Western culture: --- 5th c. BCE --- 3rd c. BCE --- 3rd c. CE --- 12th c. --- 16th c. --- 17th c. --- 18th c. --- 19th c. --- 20th c. --- 21st c.

Again: this schema does not describe recurrences, but cultural axes of symmetry. Nor is it—in contrast to Hocke, but in line with Voegelin—meant as a *periodization of history*, which we would describe as an articulation of a certain BoT, especially the 18th–19th-c. (C)N setup. Furthermore, BoTs often falter, as e.g. in medieval Europe. Incidentally, a change between BoTs is by no means an undivided panacea. It is mostly attended by substantial crises and catastrophes. With good reason BoTs are therefore equipped with strong immune defenses against change. Hence, being careful is an ethical imperative. In the 21st-c. context we would actually say that, as one indeed may be "outraged," one should definitely "not be engaged." The machines and their power and potential are extant and provide a generic and common ground. Nothing to worry about in a positive sense. Thus, while being afraid is legitimate, there is one—only one—way of overcoming it: learning to keep up with the mastership of the others.

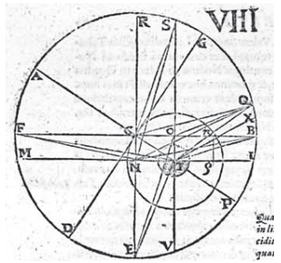
THE NAME, 3RD C. BCE—(N)C

Now more closely to the modern-age Western BoTs. With the retrieval of the triangle from the solid manifestation of the pyramid, we characterized the

B

Thomas Chantimpré, *De natura rerum*, fol. 105, schematic representation of the "mundus." Aldersbach, ca. 1295.

C



The computation of planetary orbits in Kepler's Rudolphine Tables (1627).

Pythagorean-Euclidean space, and its particular constellation between geometry, arithmetics, logics, and algebra, as the *interplay of the self-reflection of a series of things, a talk of things*represented by *numbers*. If you have a wider interest in this BoT, you will find that Michel Serres describes it very interestingly in his *Hermes* books (1968–80).

THE WORD, 3RD C. CE—(C)N

[FIGURE B] An inversion of the Pythagorean-Euclidean BoT appears around the 3rd c. BCE, and lasts throughout the Middle Ages, where it evolves around the geocentric world view, as represented by the authorities articulating it, and where things are *entities animated within the cosmic order*. Whereas the Euclidean BoT was centered upon the *talk of things*, the cosmic order is centered upon the *thing of talks* again. From (talk)thing to (thing)talk to (talk)thing, yet now on a new level of abstraction: by the Euclidean inversion, we unhooked the talk from the *series of things* and established a new BoT centered upon the thing as necessary, and the talk as contingent—(N)C. With the new inversion starting around the 3rd c., we gathered or included all talks into a thing, and established a new BoT centered upon the talk as necessary, and the thing as contingent. Or, if we expand the *talk of things* to *talk of things (= not all the other talks)*, ending up with talk of things *(= not all the other talks = (not all the other things))*, the abstraction becomes directly apparent: things are found on two levels. Abstraction is *not-all-the-others-implicated of not-the-others-explicated. It is the thing expanded to the-whole-world-included-in-one-thing.*

This is the difference between an X and its abstraction, to be symbolized as X'. Normally we use different concepts for the thinking of similar things on different levels of abstraction. Therefore we easily overlook the abstraction itself, and its double-inversion character. We switch for example from *syllogistic*, via *logic*, to *logistic*. In our thinking, they are all stagings of the same invariance, on different levels of abstraction. Logic includes the whole syllogistic world, and logistic in turn does the whole logical one. Logic is syllogistic', logistic is syllogistic''. Or from *mystical order*, through *cosmic order*, to *natural order*. Or from *talking things*, via *animated things*, to *enlightened things*, and from *thing* via *object* to *article* … from *naming*, through *calculating*, to *quantizing* … Such are the kinds of invariances we are looking for, and from which, in the various BoTs (which we cannot know, as not being ours), the meanings that make sense of them are unhinged. However, studying the permutations in the ways invariances manifest themselves in the different BoTs, is then a source of stability for our own BoT.

Another line of abstraction: Prior to the Pythagorean-Euclidean BoT, we observe that thinking proceeds in *reflections of series of things*. In the 5th c. BCE, a new concept of *numbers* is projected, and uncoupled from these *series of things*. In the 3rd c. CE, reflective thinking in *series of numbers* is established. As may be thus summarized:

1. numbers are things
2. series are indicators of a (C)N setup
3. non-series are indicators of an (N)C setup.

And as architects we conclude:

4. in a (C)N setup, the void indexed by series reflects a thing
5. in an (N)C setup the things project a void.

In our BoT, the geocentric world of the 3rd c. CE must be read along the vector of thing of talks, and on the level of abstraction together with animation and cosmic order. The geocentric world therefore is an articulation of entities animated in a cosmic order. Mathematically speaking, this order is articulated as series of numbers to be read as thing of talks, or number animated in cosmic order, as symbolized by (C)N.

THE PROJECT, 16TH C.—(N)C

[FIGURE C] In Renaissance mathematics, this setup undergoes an inversion again: the establishment of "infinite series of numbers" (as, e.g., per Viete), the *interplay of not all the other series of numbers*, or the *interplay of the self-reflection of numbers* represented by a new number notion called *rational number*. Bodies of infinite series, and rational numbers, cease, geometrically, to be reflections of the cosmic order inasmuch as single specific constellations; they now project all possible constellations to form a geometrical entity, elevating its meaning from being the instantiation of one specific animation, to a range of potential variations of modes of animating it. Which means that such entity is no longer pointing to an animated element, but

to a geometrical line of movement. Therefore, in the Renaissance BoT, *geometrical element* means *not the other points of a movement.* Similarly for the rational numbers: "not the other ratios."

Consequently the Keplerian heliocentric worldview is not just a replacement of the Earth by the sun as the center of the order. We are in the presence of a whole new BoT. Renaissance man, metaphorically speaking, managed to leave the stable Earth-centered cosmic order, managed to leave the geosphere by putting the lines of his own movements into his pockets, and, equipped with that knowledge, succeeded in entering the heliosphere, and moving around the sun. Thus becoming able to look at the cosmos with new, mechanical eyes, and to behold the self-projective interplay of moving entities. He even managed to detach himself from the centric circular movement, and to conceive of an elliptical movement based on a moving center. On stage, these interplays of lines of movements, or points-that-are-not-there, are able to project themselves as friends. This is how Kepler explains eclipses, this is how architectural geometrical models and perspective drawings emerged, e.g., Dürer's, or Palladio's. This is the mechanical worldview, on the same vector as, but in abstraction to the Euclidean geometry (N)C, and in clear inversion of the medieval cosmic order (C)N.

D

The church of San Carlo alle Quattro Fontane in Rome, by Francesco Borromini, 1636–40.

PROJECTIVITY OR THE CENTERED VOID, 17TH C.—(N)C

[FIGURE D] After detailed discussion, and pointing up the invariances and operations relating to BoTs, the pace will now quicken, leaving more ample details to hopefully coming publications.

In the 16th-c. BoT we are handling rational numbers as *infinite series of numbers* in a manner that treats them as *finite series of numbers*. This means that the *talk of things* on the 16th-c. stage is a *finite talk of infinite things*, to be called, as it were, an (N)C(L)A setup—i.e. that in a geometrical constitution we negotiate contingencies by following straight logical lines. A setup that fits a phase where a new BoT is expanding and exploring its new plateaus, which are opened up by inverting N and C. Stability is achieved by importing the logic from the previous BoT. But with time, familiarity with the new plateaus within the logical limits increases, and thinking turns toward self-reflection, shifting from logic to algebra. This is what we observe in the 17th-c. setup, symbolized by (N)C(A)L. Within this new BoT, thinking is now directed at self-reflective *infinite talks of infinite things*, establishing the rational numbers as *self-reflective infinite series of numbers*, and demanding projection of the projective self.

How is this articulated architecturally? In the Baroque's overload of *talks of things which are not there* we can observe the production of a centered void, projected by an overwhelming amount of things. Deleuze's *The Fold* (1988), about Leibniz and the Baroque, further develops this.

PRODUCT OR SYSTEM, 18TH C.—(C)N

[FIGURE E] Leibniz is the first to symbolize prominently these centered voids,

EKATERINA AGEEVA

HYBRIDITY

AS AN URBAN SPECULATION

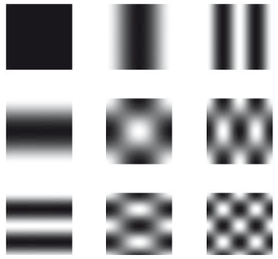
"We are no longer ourselves"—but who are we, whom have we been, and what is our *Welt*? While humans are changing their own habitats and environments, humanity is changing as a species. Let us assume that this process did not start recently, but is ongoing since the beginning of time. This project talks about urban and social speculation through the prism of hybridity.

You will find four possible scenarios, each telling stories based on different theories: one, the story of a creature of various races and cultures; two, stories of mechano-biological species; three, stories of hybrids in terms of gender and socialization; and four, stories of hybridity that unfolds across the internality and externality of ourselves.

By parallel storytelling, similarities and affinities among different theories are projected into one single space. The scenarios are not to be taken as a prediction, but as a cloud of indexes that might expand, merge with others, or also dissolve. It is possible to extract from it unlimited sets of different combinations. Playing with combinations we are able to compose a perpetual puzzle, unstable collages that will constantly change by means of feeding in new information, and by changing the characterizations of the actors.

In the contemporary urban condition, we are confronted with an indefinite multitude of spaces, each one piled upon, or perhaps contained within, the next: geographical, economic, demographic, sociological, ecological, political, commercial, national, continental, global. Does the empowering of technical generalizations, which we are facing today, keep any creative potential next to its sheer productivity? Is there a "cultural" fertility proper to the generic masses that spring from the grounds all around the globe? Those questions are raised in the chapters of this work. In different acts of storytelling it zooms in from theoretical abstract notions to the level of specific cities and everyday urban artifacts, stages them through abstract actors and activities in collage form, and "re-encodes" these collages into other arrangements of abstract interrelations.

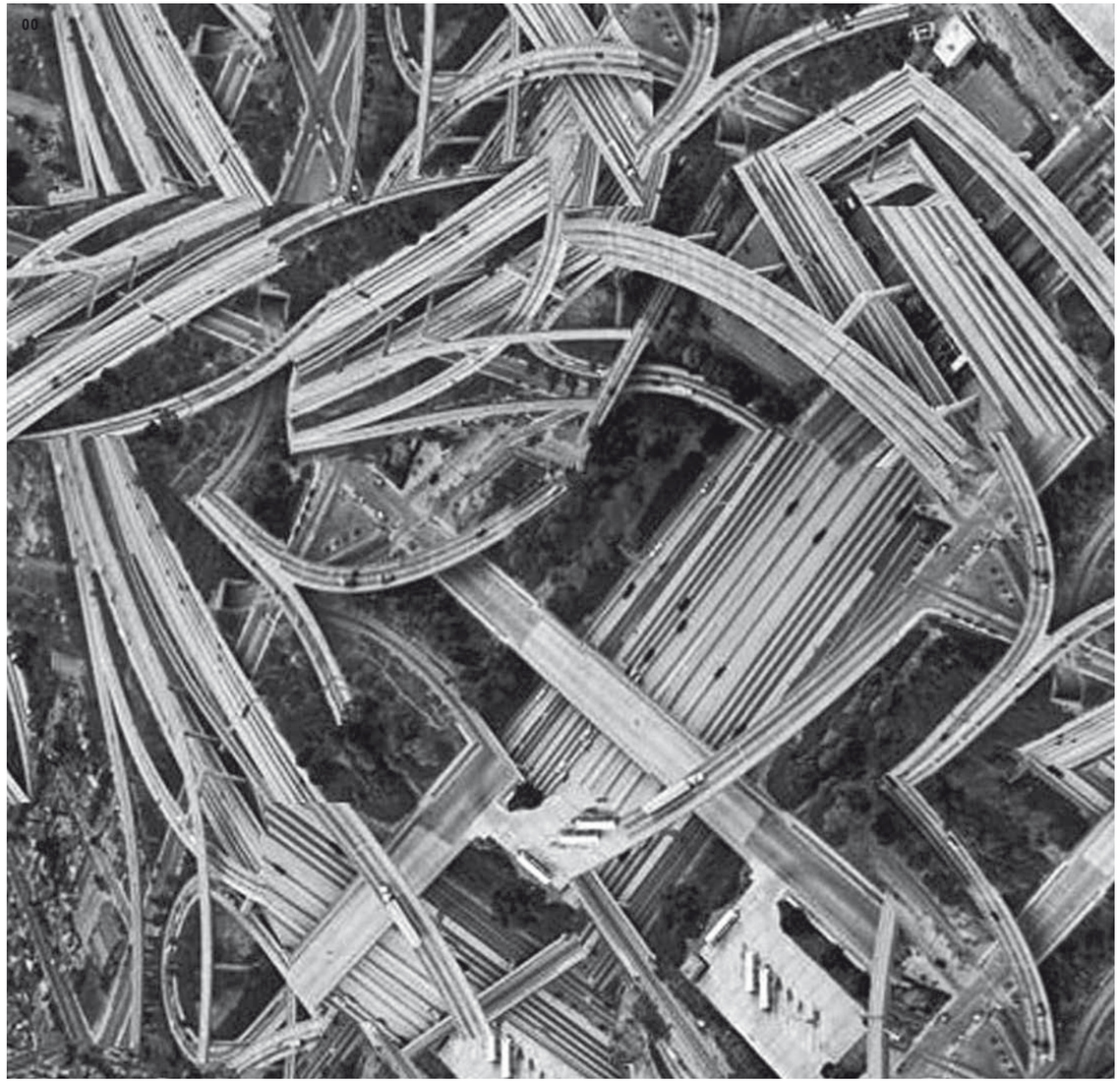
E



A pattern of waves à la Fourier.

establishing a new abstraction of arithmetic, or simply giving these voids new names. His monads are things that cannot be divided. One might say they are *fictitious things of rational talks*, *series of rational numbers*. They establish a new abstraction of the *thing of talks*, an abstraction of the *animated thing of syllogistic talks* pursuant to the 3rd c. Our BoT gets inverted from *projective to reflective*. Entities don't any longer have one name, but series of names made up of polynomial terms. Fictitious names, as yet undetermined, to be negotiated by way of their interplay with other polynomial terms, producing projections of *things that are not there*. Products negotiated within *systems* of other products. Productivity of a system. Geometrical *pragmatism* under arithmetical control. (C)N.

We call it the Cartesian space, and look at it as centered voids, as rational talks of arithmetic articulations for creating fictitious things. Those manifest themselves as stable points of an oscillating curve, or patterns of interfering waves: points of stability, balancing all the infinite movements of the elements around. There is no stability, no finding these points without integrating the total environment as a prerequisite to bringing them into balance—no finding stability without actually *doing* it.



However, there may be rational talk about these points, using arithmetics, without actually doing it. Such is the new notion of *models* in analysis, reflection, and construction. It is a clear inversion of the model of projection, as discussed for the 16th- and 17th-c. context. These dynamical models unfold the Baroque void, or infinite determinism, into specificity. This is analytical geometry. Surprisingly, we find that intuition is the specificity of the predetermined void. The necessary environment for the contingent elements. (C)N. Political entities embedded in an economics environment.

PRODUCTIVITY, 19TH C.—(C)N

What happens if not merely a limited but an infinite number of polynomials is to be constituted? Or, how to reflect the reflected self? Complicated question. So let us follow our symmetries: the 18th c. created its new BoT by inverting C and N, and kept stability by retaining the algebraic kind of self-reflection (A) from the preceding 17th-c. BoT (17th c.: (N)C$_{(A)L}$ --- 18th c.: (C)N$_{(A)L}$). Following the expansion to this new BoT, time had come for explicating the self-reference logically (18th c.: (C)N$_{(A)L}$ --- 19th c.: (C)N$_{(L)A}$).

By putting the question of reflection of the reflected self, the limits of 18th-c. Descartes or Leibniz analytical geometry are being challenged. In the 19th c. we observe, in an inversion of the 17th-c. setup, an emptiness of analysis surrounding a centered every-thing. The new thing as *not all the analysis*. The Eiffel Tower, e.g., as inverted, respectively as *not the other objects and not the other functions*. An abstraction of the 16th-c. object, and an inversion of the 18th-c. void of analytical objectivity. Which opens up onto the 20th-c. Or, taking psychology as an example: the "Ich" started out in the 18th c. as the necessary counterpart of the contingent individual, and ended up, by the late 19th/early 20th c., as *not all the analysis of the individual* (18th c.: (C)N$_{(A)L}$ --- 19th c.: (C)N$_{(L)A}$ --- 20th c.: (N)C$_{(L)A}$).

THE ARTICLE, 20TH C.—(N)C

You may feel this argumentation to be a bit far-fetched or convoluted. Mostly it is unusual. It is an unusual algebraic-geometric approach, and we need it for finding stability against the logical-geometric BoT so pervasive today. By focusing on the specific setup of the 20th-c. masterpieces, we hope to sharpen our understanding of the present-day power of information technology. And following our symmetries, we have to argue our reasoning is two-pronged:

00 « Hybridity Artifacts: perpetual infrastructure
01 Four scenarios: actors

A SHORT PLAN FOR THE PRESENT WORK

This work is an offer for further interpretation. It is an excerpt from an open-ended act of storytelling, based on my own sensibility and on contingent choices I made. The storytelling takes theoretical and abstract notions as its coordinating framework, and then zooms in to everyday concrete urban artifacts in order to explore how to possibly make sense of what we can see when viewed through the lenses offered by the abstract notions. The aim is to render these explorations into pictures that capture various kinds of spaces, on different scales, while being attentive to the modality of their "genesis," and to the coexistence they all maintain within one single, comprehensive space. There are heroes (actors) in my storytelling—hybrid creatures—but they remain absent. All I "know" about them is that they inhabit certain spaces and participate in certain activities that take place in these spaces. Through indexical characterization of these actors, the scenarios attempt to participate in their perception. It comes in four chapters: (1) Actors, Activities, Space, (2) Cities, (3) City Grid, (4) Urban Artifacts.

The first chapter consists of four chosen scenarios that are based on notions from different works by Rem Koolhaas (chapter #1: Stripped Identity), Henri Lefebvre (chapter #2: The Wild Edge of Society), from Donna Haraway's text "A Cyborg Manifesto" (chapter #3: Cyborgian Emancipation) and from Michel Foucault's writings on the notion of Heterotopia (chapter #4: Otherness). These theoretical positions are not treated in a strictly parallel manner, but rather as streams of ideas and thoughts that overflow from one chapter to another. The common background for all scenarios is a fundamentally new understanding of the relationships between humans and their milieus, and an articulation of this new understanding by seeing in the idea of hybridization a possible path for thinking in terms of openly multilayered and multi-connection interrelations.

In the scenarios, my heroes (actors) are represented by the characters of either real personas or by media creatures, those that seemed to be most suitable for designating their proper nuances of hybridity. My work attempts to view their theoretical stances by virtue of staged encounters with the actors. With this aim, the scenarios will personalize the stories, and suggest interpretations of the story lines that make explicit (by imagination) some of the individually implicated interpretations that are possible. Throughout the entire work, I follow a method that traces indexes of activities. I extract from the original texts of my actors entire lists of activities and transitions their notions seem to undergo, and those lists are treated as indexes that are to be meaningful. In playing with indexes, in composing and exploring different combinations of them, I seek to find similarities and affinities between the ways in which different story lines can be staged in the different scenarios.

The contingently chosen activities are visualized in a collection of images. To get more stability in this work throughout the chapters, the relations of space and activities are treated on different urban scales: that of the city, that of city grids, and that of urban artifacts.

The second and the third chapters each are a series of collages that use the images of these activities from the first chapter. The collages symbolize how space can be envisioned through activities, and imagine practices related to these spaces. The series of collages are produced by "calculating" with the code of these images, a procedure that allows for creating an unlimited collection of collages. The chosen collages that are used here as an illustration cannot count as final ones, indeed, there can't ever be a final one. This is my way to engage with space by attempting to depart from the perception of a flux of phenomena.

The fourth chapter of this work is a series of artifact images where the meaning of the illustrated artifacts is intentionally

first against taboo-izing abstraction as evidenced by direct use of 16th-c. concepts of thinking, and then against the discarding of inversion by directly using 19th-c. concepts. For we must embrace both abstraction and inversion if we are to cope politically [C] with the abstract and strong necessities [N] attaching to our artifacts, viz. the information technologies of our 20th-/21st-c. setup. We are arguing for a comparable component of contingencies [C] or politics in the 20th-c.-(N)C setup. We are afraid of tyrannical (N)N constitutions.

And now, let us do one last inversion, toward the 20th c.: information technology is, as any masterly artifact of the 20th c., an *evocative talk of fictitious things*, establishing a new abstraction of the *talk of things*, which we visited as *rational talk of animated things* in the 16th-c. context. We thus invert our BoT from 19th-c. reflection toward projection again. It must be stressed, as important for understanding the 20th-c. setup, that these new talks from the analytical void are neither fictitious nor results of intuition, but talks of any fictitious things (not one of *every*), of any story, and any intuition. Fictions are not there yet, they take form through ongoing negotiation. Objects have become pre-specific. Inchoate products, still to be specified. By articulations. They are articles. To be put into one's pocket, for creating one's production wherever it's wanted. That's what logistics is about (necessities anchored in abstract ground, in infrastructures, in the global system), and what constitutes the new necessities (N), able to articulate or negotiate the new (N)C.

Movies might be a good illustration to the kind of stabilities to be established when describing the actual cultural constitution of our BoT: to start with, Shakespeare's Renaissance theater unhooks the play from the animated medieval humans, and stages them anywhere and anywhen as self-reflections, i.e. as projections of animated, contemplated reflections. The observer's vantage point is necessarily outside of the animated, cosmic order of necessities. He is expelled from the medieval order, puts *all the plays* into his pocket, and projects himself as *not the other plays*. Explicates his play, creates a certain mask, takes on a personality, acts politically.

Today's cinema paradigm is symmetrical to Shakespeare's: the cinema records analytical reflections in the natural order, and stages them anywhere and anywhen as self-reflections, i.e., as projections of analytical reflections. The observer is positioned outside the natural order of necessities. He too is expelled, puts *all the recordings* into his pocket and projects himself as *not the other recordings*. Explicates his recordings, creates a certain brand, takes on an identity, acts politically.

hypertrophied. The everyday urban artifact is the small entity of a global process; they represent common activities and manifest claims for identity. They should be understood not only as physical objects in the city, but as making up a historical, economical, political structure of the city. Historically, the individuality of urban artifacts comes from the qualifications they give to certain activities. But with the process that generalizes distinct cities into global urbanity, this historical richness is rather devaluated and a new approach is necessary for understanding them. As an attempt, the last set of collages seeks for identity not through analyzing qualities in terms of quantities, but quantities in terms of abstract qualities.

ACTORS, ACTIVITIES, SPACE

"... they know everything about you except who you are..."
KOOLHAAS, 1995

"Like all men in Babylon I have been a proconsul; like all, a slave; I have also known omnipotence, opprobrium, jail." [FIGURE 01]
BORGES, 1949

STRIPPED IDENTITY

Stripped Identity resides where we find no standardization or rational order. Driven by the chaos of contemporary globalization, the overabundance of materials and information, cultural cacophony, mankind adapts into previously unseen forms of alienation: amoral and pragmatic multicultural hybrids, which move by instinct from individual differences toward generic similarities. Convergence is possible only at the price of identity.

The scope of such spaces is ubiquitously recognizable and easy to explore; one is guided by understandable symbols, within identical spaces, among activities

FRACTAL SPACE

TOPOLOGICAL SPACE

02 Stripped Identity/activities: to guide by symbols, by space, by activities, by action/fractal space: endless repetition of the same simple pattern
03 Wild Edge of Society/activities: to break up subordination, anonymity, homeliness, alienation/ topological space: indefinite multitude and cross-section
04 Cyborgian Emancipation/activities: to extend milieu, capacity, body, mind/incomplete space: velocity as a concrete condition

INCOMPLETE SPACE

and designed actions that are commonly well known. Everywhere, we find the same repetition of simple movements and simple patterns. The space is endless and fractal, repeats itself on all scales. [FIGURE 02]

THE WILD EDGE OF SOCIETY

The Wild Edge of Society comprises anything and everything that undermines any and every schema of totality. By principle, it stages the opposite of what is at stake, and presents a place where what conditions daily conducts and norms of behaving will be ignored, where hierarchical orders will break down, where by principle, minorities will get power, and where all depends upon questions of volition.

Such spaces constitute the opposite of stability, and they feature as an end stage of any attempt to linearize social entropy processes. The political activism of minorities forms a new stream of activities which all aim to break up patterns of subordination, anonymity, homeliness, and alienation. The indefinite multitude that constitutes its spaces is immeasurable, but it is possible to capture points of extremes that then allow mapping space in topological terms. [FIGURE 03]

CYBORGIAN EMANCIPATION

The adaptations into new forms of alienation diverge in two directions, toward human "machinality" and human "animality." In both directions, we are dealing with a question of social reality and emancipation that aims at breaking up the structures of existing dualisms, binary oppositions, and their logic of domination. Hierarchies can be disempowered by actively exploring and mobilizing the blurring borders. We are not natural or artificial, neither objects nor bodies, neither mental nor physical; we are an assemblage of all these factors, among many many others.

We are constantly extending our milieus, capacities, the agility of our bodies and minds. The permanent technical sustenance of our environments charges them with power, and we learn to cope with new velocities. This, we could understand as a

It's Not Simple

None of this is simple. But why should becoming a master be simple? Simple things are for tyros. A master is a chap who surpasses what you are capable of, and whose ways of accomplishing that remain opaque to you—until you have yourself risen to his level of mastership. There is no external reference once we have stepped out of a framework and begin to act on a stage, such as today's (N)C setup. How then to decide whether a supposedly masterly performance is actually good or not? That's the C question of contingency. As it always has been. There is no certainty, nor right or wrong. There are certain ways of negotiating. But safety and control are on the N side of Diodorus's master argument. Therefore you need mastership for maintaining your balance on an appropriately high level of abstraction. Your thinking needs to become acrobatic.

Objective Knowledge

And at all that, we exert ourselves at making things simple, and controllable, rather than adequate. Take the popular 20th-c. concept of Karl Popper's *objective knowledge* for an example. Objective, in 16th-c. (N)C, stands in contrast to objectivity, which is an 18th-c. (C)N concept. Knowledge is the (C)N *explication* of mastership, as opposed to the concept of creativity as an (N)C *implication* of mastership. So, according our hypothesis, while being in a 20th-c. (N)C setup, *objective knowledge* is an interesting concept—lifted from the 16th-c. level of abstraction straight onto the 20th-c. level. As illustrated by this very typical—and for me as an architect and engineer rather astonishing—quote: "But the Fifth Symphony as such just does not exist; although, admittedly, we often use language in such a way that we speak of the Fifth Symphony as if it were one of the existing things" (Karl Popper, *Three Worlds*, 1978, p. 147). Hullo, what *is* this? Putting it very friendly, we'd say that from a 20th-c. (N)C perspective he intentionally, strictly, and correctly argues by using 16th-c. (N)C logic, which of course is blind to 18th-c. (C)N due to lack of inversion and abstraction. Consequently he fights 18th-c. (C)N, shunting ourselves to 16th-c. (N)C as a reference, while himself remaining on the 20th-c. (N)C position. As for himself, he holds onto the powerful 20th-c.-(N)C-"master-of-logistics" position, demoting us to, and controlling us as subordinated 16th-c.-(N)C "masters of logic". And what's even worse: by blocking the access to 18th-c.-(C)N enlightenment, he eliminates contingency from the 16th-c. paradigm, and traps us in

concrete condition. Such a notion of space is constantly in change and can't ever be empty or full. [FIGURE 04]

OTHERNESS

Otherness is the external condition that is capable of giving freedom to qualities that appear to belong intrinsically to one thing or another. This liberating freedom is born in a space of primary perception and dreams, a space of otherness, some sacred and forbidden zone. Yet beware—this zone is inhabited by stalkers, by the ones that are released from commonality and taboo, but who come back and participate in everyday routines. Such spaces form a diffuse and promiscuous condition of borders and "in-betweens": where do we draw the line between sacral and profane, between legitimate and forbidden, between public and private?

The profanation of spaces (or practices) opens up an Otherness that is inevitably belongs to hierarchical regimes. The heterogeneous space that consists from gaps, discontinuity, and fragments hosts more values than any discreet zone that is clearly divided according to time or actuality. [FIGURE 05]

CITIES

We shape cities that shape us.
(PARAPHRASING EDWARD SOJA)

META CITY

What can be gained by projecting "cityness," the notion that contains any subsequent information and any multi-scalar ideas of "a city," onto one meta-level, the Meta City? Not in order to find an ideality of the city as a reference, nor its generic quality in any referential terms. But as a domain that were to host any abstract potential we can attribute to cities, as a kind of platform for speculation. The scenarios in this chapter take the sophisticated logistic urban infrastructures as they are expanding today, seemingly beyond bounds, as a starting point onto which we can render time-space fields of "specific" cities from what we know. [FIGURE 06]

The second chapter suggests a list of such "abstracted potentials" of cities we "know" (Singapore, Venice, Generic Venice, the Digital City, Jerusalem). They are explored and projectively staged in terms of their capability of providing relevant stages for our actors, or of developing into new actors, depending on our contextualization and perception of them. The staged projections of those cities are meant as "points in a moment," as extrusions from the cityness potentiality of what we call the Meta City. They are meant to be interpreted in terms of bi-univocal units (in short: bits), relevant to each other as well as to a projective imagination of cityness at large.

SINGAPORE

Singapore is a city that is completely regulated by the state, planned and built almost altogether from scratch. As a result of such a tabula rasa approach, almost all of its colonial and precolonial history has been erased. Singapore lends itself for a study of a political system that is altogether different from what we are used to treating as "natural," those political systems we call nation states. In Singapore, "There is remarkably little that is not the result of [...] carefully deliberated social policy" (Koolhaas 1995). By making use of the legacy of "Western" modernity, yet familiarity with its historical context—it seems—the state of Singapore has produced a new kind of city-creature, which seems to grow and develop as the heir of sheer "nothingness": "But the city is not sterile—it has a style—the generic—which can count on a huge support. Artificiality of Singapore is more and more accepted by Western cities" (Koolhaas 1995). Singapore seems to act as a kind of semantic laboratory, where the perplexing issues that define our age—such as racial coexistence of heterogeneous origins—can be tested in different modalities, before they are imported to Europe, and to other places in the world. Paradoxically, undifferentiatedness is the genuine essence of the city that lives on in a constant cultural gray zone, importing citizens from abroad to sustain its own continuation. A lack of differentiation overpowers the entire environment, and is an outcome of industrial processes too vast and dynamic to be structured. Singapore constitutes a kind of space that is produced by duplicable instruments, which in turn were designed for duplication: repetitive space as a result of repetitive action. It remains resistant to the traditional tools for urban planning: "The most dangerous and most exhilarating discovery is that planning makes no difference whatsoever." (KOOLHAAS, 1995)

HETEROGENEOUS SPACE

05 The Otherness/activities: to desacralize observance, time, actuality, hierarchy/heterogeneous space: discontinuity, gaps, fragments
06 Meta City/Cities

GENERIC CITY | SOCIAL PRODUCTION CITY | OPEN SOURCE CITY | HETEROTOPIA CITY

VENICE

Let us say that Venice is the city that has been created by nature, and produced by society. Nature itself doesn't actually produce anything, but it affords means for production. Society uses those means to make a final product. Nature creates, but it does not labor. Production is human, based on intention and purpose. In the case of Venice, nature provided a unique area, a set of small islands. The city of Venice did not just appear from nowhere, it was rationalized into being—by people. Through collaborations among a collective. Venice was able to erect waterways to enable business, and consequently, to enable the city to progress. The conquest of land from water was both a "top-down" and a "bottom-up" process. The desires of the Doge of Venice, and those of the city's aristocracy more largely, coincided with the rest of the aspirations by the Venetian society to achieve benefits from the seaborne trade. Humans, as social beings, produce their own life, collective consciousness, including its political, religious, artistic, and philosophical artifacts. The production of spaces cannot be traced back to some specific events or objects. Rather, it results from a multiplicity of various works, and from a diversity of forms. Social space is not a thing among other things, nor is it a product among other products: it subsumes things produced, and interrelations established, in their coexistence and simultaneity—their relative order and/or relative disorder.

a 16th-c.-(N)N, pure-logic BoT, something he explicitly called "Third World" in 1978. That's what "objective knowledge" and "open society" actually seem to be about. To some, such argumentation may seem artless, summary, or unkind. It might be, if looked at from a formal 16th-c. or an analytical 18th-c. viewpoint, which is what Popper would want us to adhere to. Uncomplyingly, however, we are busy establishing a 20th-c. algebraic argumentation, which means we are staying away from either truth-claiming, or any kind of judging. All we do is articulating positions liable to engender mastership, which in the eyes of "objective knowledge" and "open society" is obnoxious and must be combated.

Popper does not stand alone. He is representative of the BoT of the 1950–80 period at least. Lewis Mumford and his influential views on architecture and technology provide another example, such as from *The Culture of Cities* (p. 142): "Versailles essentially was a child's toy, precisely as their dynastic politics was, realistically considered, child's play." And p. 338: "If one can do without the others, it's the country, not the city; the farmer, not the burgher." Then p. 391: "Versailles, beheld on a large distance, is no more formidable than a horizontal factory unit." (The retort of course being, referring to Ledoux, that *factories* were palaces in their time, and opened up society). All this is incredibly and aggressively ignorant of mastership, and hardly understandable to whomever likes craftsmanship, likes music, likes engineering, likes science, likes thinking. Or take Saskia Sassen who, when recently asked, at a conference in France, whether she would prefer to be the mayor of Paris or rather Detroit, she off-the-cuff answered, with a smile: Detroit, because in Paris everything is perfect, whereas Detroit is where European artists are flocking to, and Urban Farming is a big thing.[3]

This BoT, this projection of actual logistical phenomena onto proportions, this tying of intuition back to Euclidean geometry, empathy, aesthetics, being friendly, being polite, being correct, optimizing, making no mistake, finds its expression in Koolhaas's Generic City and is unable to cope with 21st-c. developments. It is not the solution, it is the problem. With what we propose in this text, we do care for the mastership in making croissants, we don't for the generalization in turning out hotdogs. Only mastership will be capable of coping with the slums of our megacities. What else would? Certainly not generalization, which demands just to be trusted, and left alone about details.

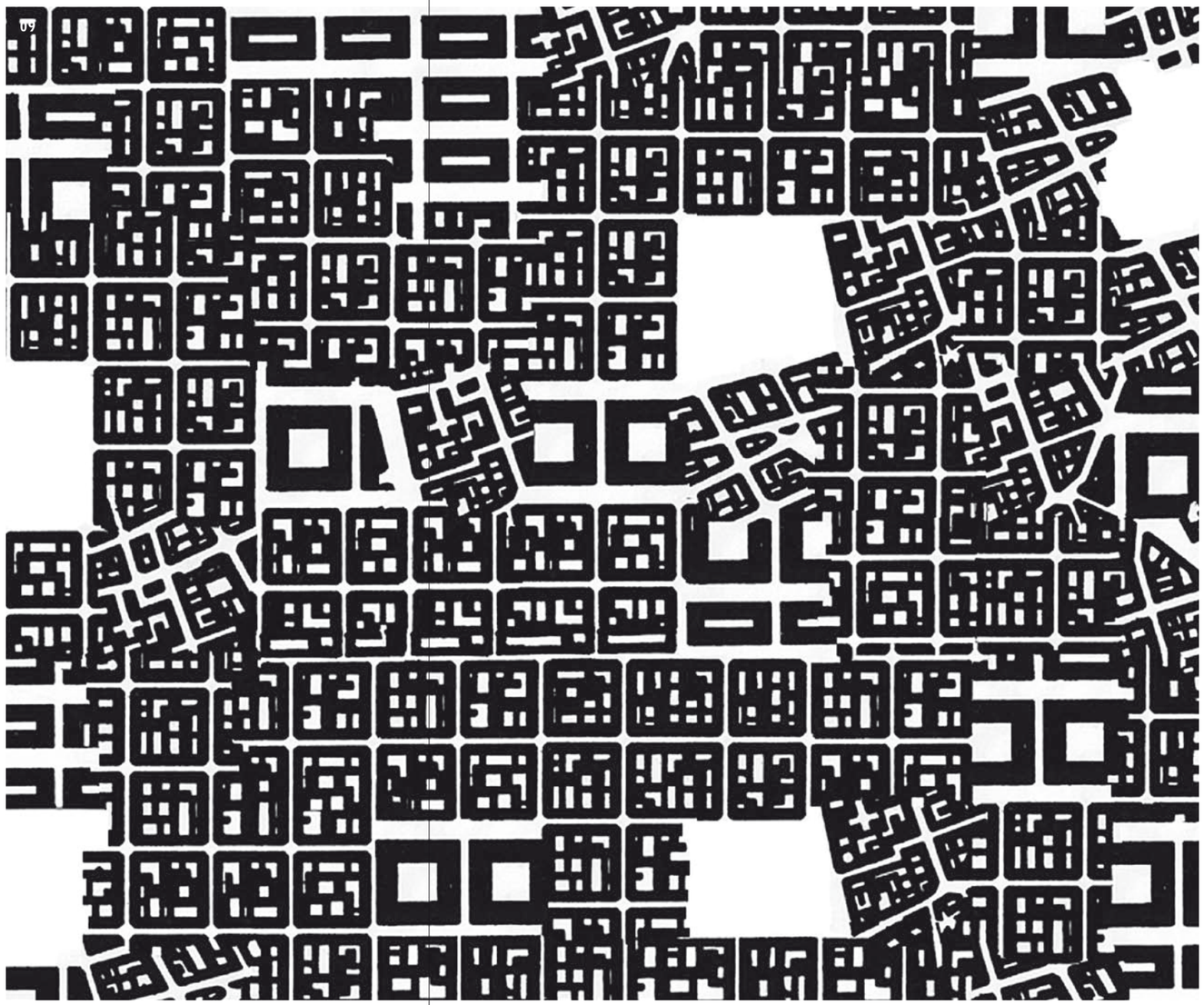
3 "Would you rather be the mayor of Detroit or Paris?" "Detroit. Detroit. I have zero doubt. Paris is almost perfect—I am joking now. Don't take it too literally. No, Detroit. You know, we have a sort of one thing, what is happening is, European artists are coming to Detroit, because there is a lot of space. It is a little like East Berlin, you know, after the wall came down, where artists just went and you just squatted in a building. Detroit has enormous potential: urban agriculture of course is a big one for Detroit—I smile, because it was an irony, but it is interesting. So I would rather be the mayor of Detroit." Lift Conference Marseille, July 6–8, 2011, http://www.youtube.com/watch?v=Ww4pYjLViFE 21:36ff.

GENERIC VENICE

If we imagine the existence of a mega-database, consisting of all the present city typologies, we can try to redraw existing singular cities, for example Venice. It is interesting to see which parts or city elements will be recognized as the authentic, and which ones will be replaced by the analogous. Can the parts that would be up for replacement be read as less significant in terms of a city's identity? What if the sensitivity for recognizing will be reduced, as the redrawn appearances offered by one such transformation, for example a "Singaporean" transformation of Venice, will increase/intensify how we will see? This very abstract experiment can help to map and visualize, a further development, a process of temporal change, and mark crucial moments of shifting perspective from the age of a city with its strong local identity, toward the potential genericness it hosts, or vice versa: from its genericness to a kind of "super identity," if such transformations ever were possible.

DIGITAL CITY

With the idea of a digital city, the city metaphor is used to stage an ideal space of knowledge, reason, meant to constitute the technological "location" of an ideal social order, the so-called virtual community. The regimes of classification and categorization, structuring the abstract and infinite data space into visible and sharp units, turn non-territorial data space into highly contested social places, as a kind of territorialization of thought. The implementation of information and communication technology was once (or still is) supposed to revitalize the democratic system. "'*Cyber-democracy' or 'electronic democracy' are the new tubes which should transform the stale democracy of passive spectators into an active and participatory democracy. At the same time, it creates a global public sphere*" *(Leggewie 1997)*. The whole structure must be explicit and transparent in order to be visible for the digitally emancipated "Netizen." But like a traditional city, the Digital City has a military origin. On one hand, new media technologies have become more accessible and easy to use; on the other hand, access to information that is generated by users is largely controlled by just a few companies/institutions. Could it be possible that the form of a "network society" turns out to host yet another, ever more powerful, society of control? (This paragraph is no literal citation, but it draws a lot from Apprich 2008).



07 Cities/Paris, New York, Barcelona/Grid: 0.5 irregular/0.5 regular
08 Cities/Grid: 0.7 irregular/0.3 regular
09 Cities/Grid: 0.3 irregular/0.7 regular

JERUSALEM

The celestial and profane Jerusalem. Jerusalem is a city of ethnic and religious heterogeneity, and needs to be attributed great cultural significance. The city's actual spaces bear testimony to its "layered" history, as its plateau in the Judean Mountains, on which it is built, has been carved by conquests, colonizations, and occupations. The layers of history reveal in different parts of the city instances of coexistence and conflict in a fragile, torn, violated, and instrumentalized context in the manner of a collage. The terrain consists almost entirely of borders, and immaterial residuals of invested hope. Otherness, hope, and violence almost fall together in this carved-up and disintegrated, militarized cityscape, especially as the impenetrable cease-fire line runs through the heart of it. Jerusalem, with its temples and walls, has a celestial importance for all Abrahamic religions. For Christianity it manifests the city as a physical reconstruction on divine recreation, as the New Jerusalem. The Earthen Jerusalem juxtaposes in a single real place, as the Holy City, the entire regulation of a totality of "cityness," aspiring to manifest the opposite of the chaotic disorder of nature. In its legacy, cities hold the promise of salvation. In all this, despite everything, Jerusalem offers, somehow, salvation. Pilgrimage and religious tourism can been seen as a collective, or rather collectively individual, experience of otherness, an event-space of Heterotopias.

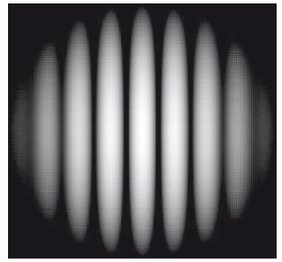
QUANTUM, 20TH C.—(N)C

If the reflections presented in this text happen to go against the—to some degree—common-sense concepts of "open society" and "objective knowledge," why should you then trust our argumentation above others? For it is optimistic, which is not trendy these days. It is challenging, which is offensive today. It is not consensus seeking, which is unusual. Indeed, a lot may be said against it, but surprising as it may seem, it is not new. The BoT which we offer an entry to, is a 150-year-old lady, a lady of elegance, holding artifacts that live on in electricity, information technology, and quantum theory. Let's pick out quantum theory, which may best help underpin her trustworthiness.

The Double-Slit Experiment and the Dimensionality of Time

[FIGURE F] The famous double-slit experiment, which illustrates impressively the difference between particles and waves, may serve as an introduction to quantum theory. If *particles* are randomly *projected* onto a mask with two slits, a screen behind the mask will show particles in a pattern inverse to the mask. We called this BoT 16th-c. (N)C. If however you inverse the situation on a higher level of abstraction and, instead of projecting particles, you reflect *not all the particles* (by opting for the wave instead of the particle perspective, which corresponds to the 18th-c. BoT of (C)N), what is being obtained on the screen behind the mask are patterns of interferences. Thomas Young, e.g., in his famous double-slit experiment (1802), showed up the nature of light as *reflections of waves*. Proceeding now to the next inversion, a 20th-c. (N)C setup, by just projecting *not all the waves*, we find ourselves on the micro-scale of quantum effects, and—a surprising and simple observation—on quantum level, 20th-c. particles, more precisely quanta, are not behaving like 16th-c. particles, they behave like 18th-c. waves. And some further thinking brings about the 18th-c. paradox: how can a single quantum "know" about other quanta yet to come, when they take part in the formation of patterns that are "not there yet"? In other words: how may predictions be made regarding the scales that reveal quantum effects? The answer is simple: by incorporating, in a single point, an overlay of *not all the possible quanta that are not there*. That's why the setup cannot be measured without affecting it: mensuration changes the possible waves. That's why the results obtained depend on the questions asked. That's why the screen is no longer analytically reflecting, but projecting a quantum space. We suggest calling it dimensionality of time.

F



The pattern of interfering waves can be read as reflections of waves, or as probabilistic projections of quanta.

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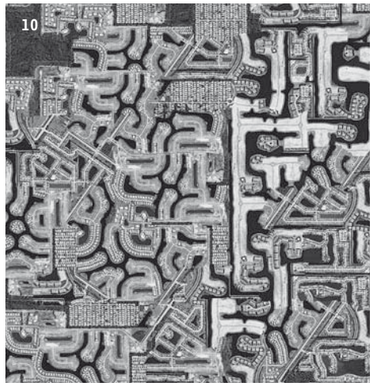

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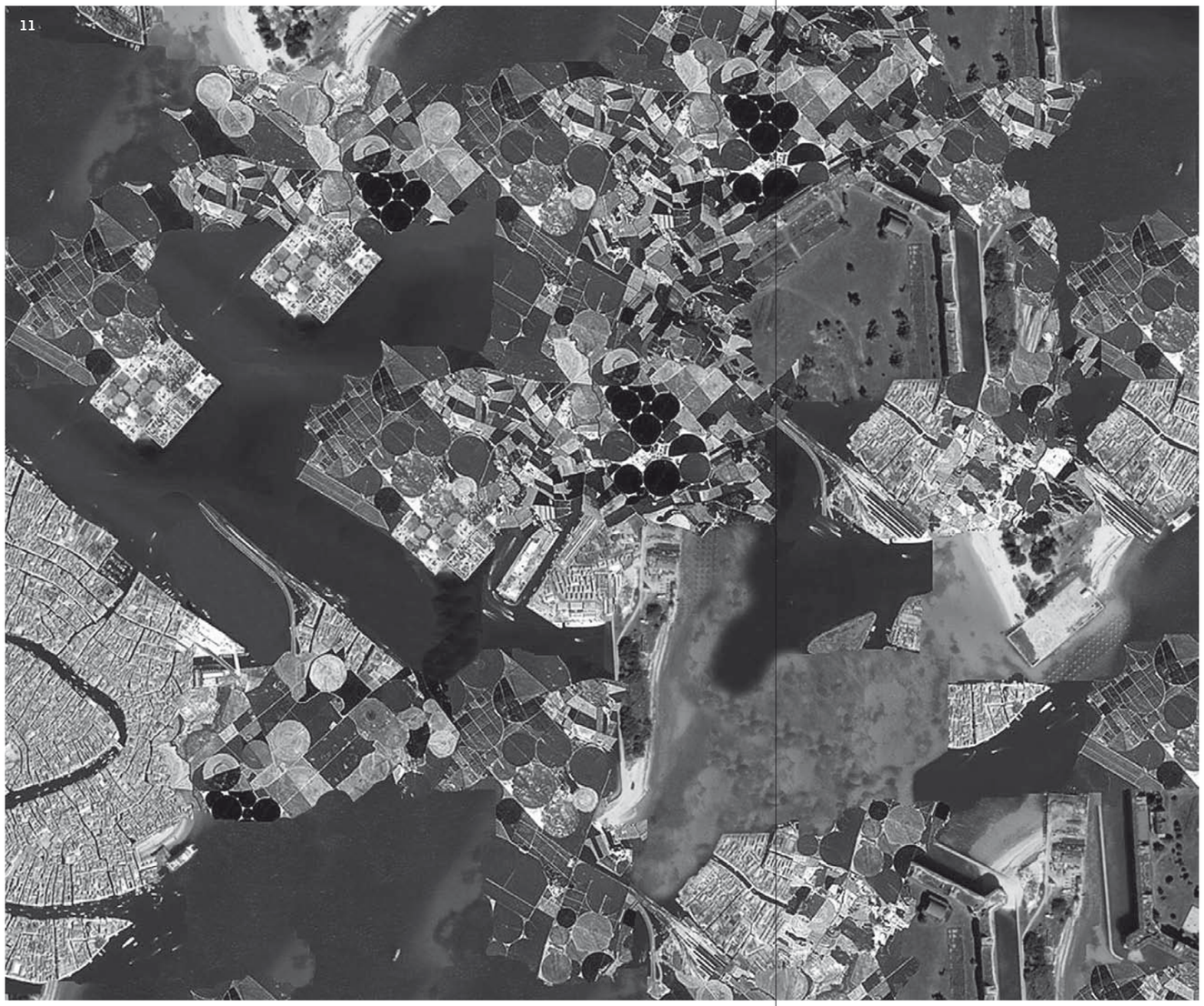


10 Artifacts/Generic City/collage: iterative city
11 Artifacts/Production of Space/collage: volition space
12 » Artifacts/Cyborgian/collage: communication engineering
13 » Artifacts/Heterotopia/collage: Heterotopia with Mecca

CITY GRID

The way in which a specific city can be interpreted and distinguised depends upon a city's "image-ability" and "read-ability." In the days of Open Source, the interposition of information fluxes that are constitutive for a city becomes the most determinating factor. It affects those aspects that had been the decisive ones in the past: the notions of the City Grid, and the City Artifacts. For humans as "users," one of the ways to perceive information is by attending to it through an internal perspective organized around visual elements: paths, edges, districts, nodes, and landmarks. Those elements *en masse* constitute the city grid, or city pattern. They contain information that contributes decisively to a city grid's, and the city artifacts', image-ability and read-ability. The possibility for retrieving information, in order to use it as the means for creation, depends on an individual's skills and a kind of strictly personal "urban literacy."

According to the narration of hybridity, three cities were chosen for our narrative that present their city grid (1) as a symbol, or (2) as a congestion, or (3) as a logo.

SYMBOL: THE HETEROTOPIA OF ILLUSION

Haussmann's renovation/Paris. The world-famous geographical point for romantic trips, the city as a "honeymoon hotel," the epitome of a contestation between mythical and real space.

CONGESTION: MAN-MADE ARCHIPELAGO OF ARCHITECTURAL ISLANDS

Manhattan Grid/New York. Where commercial interests have enforced to treat each block of the grid as singled-out of the whole, as "one block alone." This has instigated and fueled a kind of vertical ego that is now proper to each block, and as we can see by now, it has generated a kind of three-dimensional anarchy and an incredible variety of human behavior.

LOGO: OVERSIMPLIFIED IDENTITY

Example/Barcelona. Its old and singular city growth through the process of consolidation due to tourist branding and an overflow of landmark architecture. In consequence, Barcelona no longer "improves" or "develops," instead it "abounds."

This chapter results in a set of grids, built from the same simple patterns, but arranged into various configurations. Such adjustments of specified pattern appearances present us alienated visualizations, and through that, different hypothetical "perceptions" of the cities. [FIGURE 07–09]

URBAN ARTIFACTS

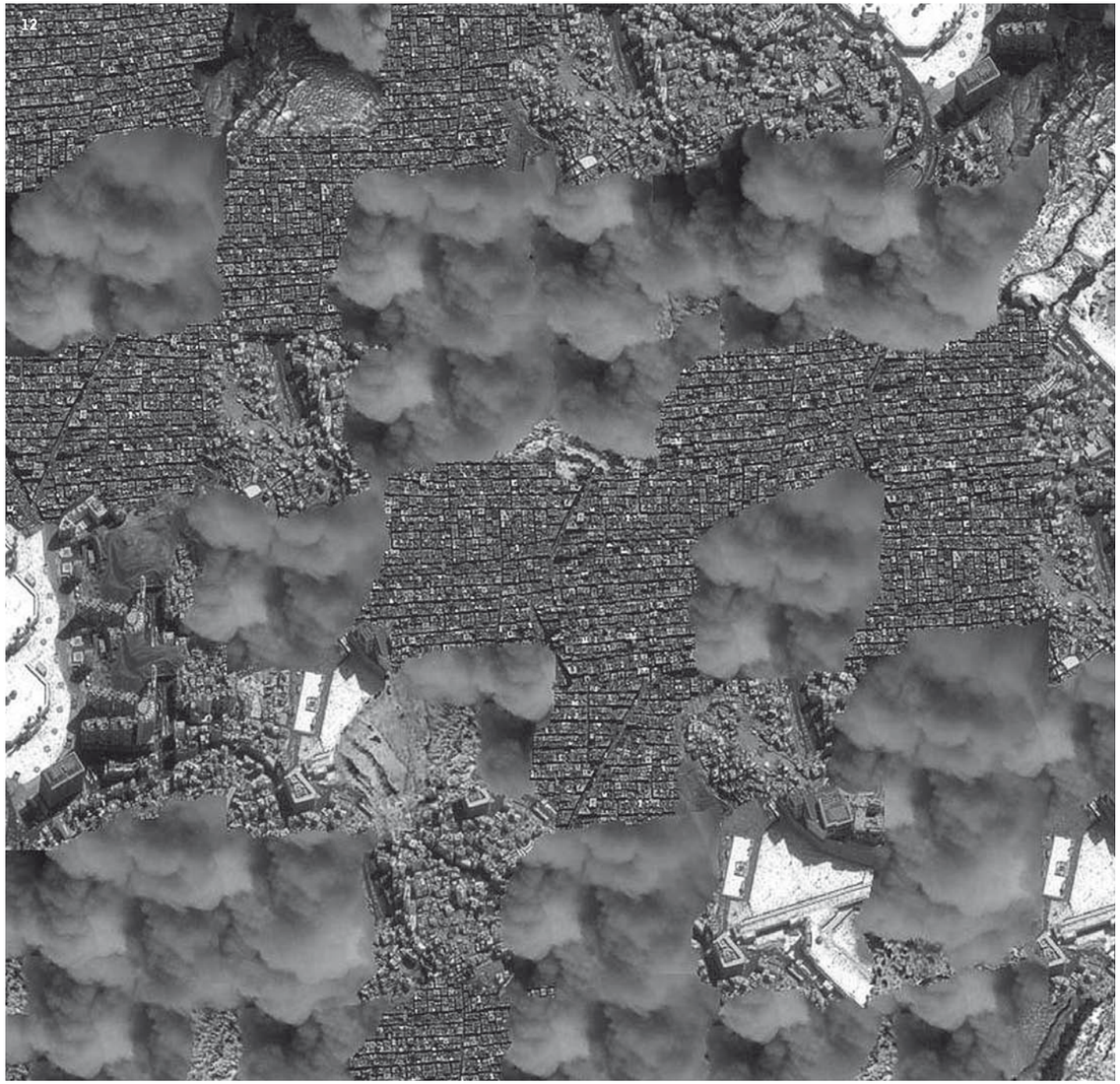
Utopia as a practice.
(PARAPHRASING FREDRIC JAMESON)

Over three hundred satellite images harvested from the Internet, mostly by Google Earth and the NASA website, constitute the data of a peculiar collection of cities as artifacts. [FIGURE 11] They are images that present urban artifacts as a kind of "evidence" on the surface of the Earth, distributed according to preassigned story lines. They are the product of paradigms taken: city patterns, infrastructure, entities of all sorts, nature urbanized. This chapter arranges their "evidence" into groups, such that they can be re-arranged into meaningful collages. These arrangements of artifacts were done not according to geographical proximities, but according to possible imaginary affinities. This is an attempt in learning to see global phenomena through a practice within the abstract, of patching and overlapping pieces into one image and forming "wholenesses" from parts. The hypertrophy value of iconic artifacts probably can exude an essence of phenomena and new kind of diversity out of the Generic. [FIGURES 10–13]

In classical physics the "state" is complete; it is never complete in quantum physics. In classical physics, object features are *revealed*; they are *produced* in quantum physics. Changes of state *are dealt with deterministically* in classical thinking; they are *dealt with non-deterministically* in quantum thinking: they are at once continuous and discrete; observables do commute and don't; classical physics deals with qualitative features, quantum physics with qualitative values; outcome facts are *potential* in classical thinking, they are *probable* in quantum thinking. All this is exposed in more detail in *QED (Quantum Electrodynamics): The Strange Theory of Light and Matter* (1985) by Richard Feynman; and many of these ideas pop up in Jorge Francisco Isidoro Luis Borges Acevedo's inspiring short stories.

An astonishing view of our urban life may also be obtained from considering cinema, TV, electricity, and computing—all the 20th-c. infrastructures—not as analytical reflections of nature, but as *probabilistic projections* of natures. Which turns the currently so prevalent misanthropic mood inside out! Or from reading Wassili Kandinsky's *Point and Line to Plane* (1926) as a projection of probabilities in non-homogeneous space, or as an *engineering of bodies-in-time*. And there we are, with our view on urban life, at a point we think is corresponding to our time.

12



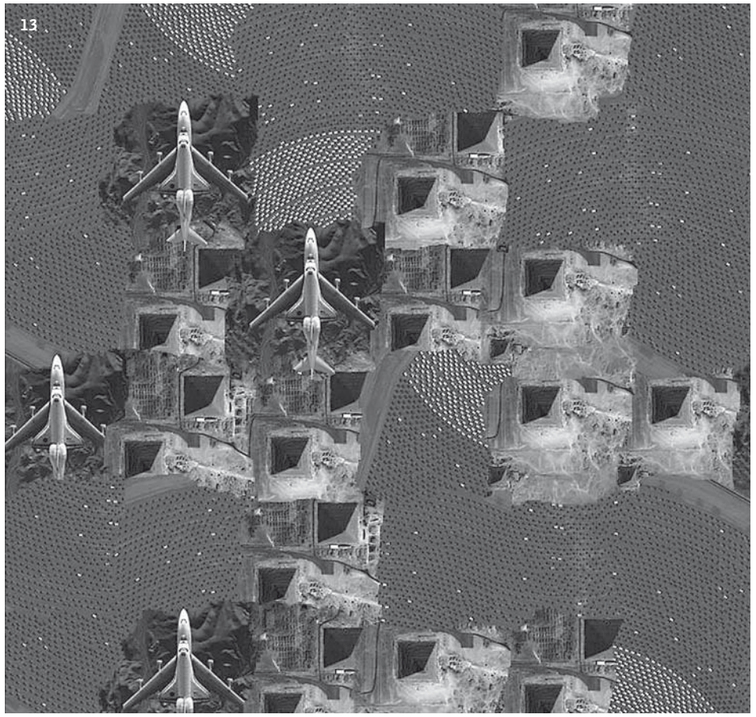
INFRASTRUCTURES AND FUNCTIONALISM

After developing the algebraic-geometric setup of the 20th c., and after gaining some experience in describing actual phenomena, let's get back to information technology and architecture, and their present-day tools and artifacts.

Shape Grammars

A very powerful and widely used tool in architecture and urban design are shape grammars, originated by Stiny and Gips in 1972. By their title and time of origin they directly call up the so-called linguistic turn, Noam Chomsky, and the general linguistics of Ferdinand de Saussure (interestingly not actually his own, but those of a posthumous publication initiated by his students in his name, referring to a linguistic model Saussure himself did not publish, unsatisfied after having worked his whole life on it). Shape grammar is an artifact of the BoT we associate with the second half of the 20th c., calling it post-structuralistic. The interesting phenomenon is that shape grammar is restraining the universal algebra of the 20th-c.-(N)C BoT to patterns belonging to Euclidean geometry, by solely imitating Hilbert's (1891) graphics—without openly referring to him—and ignoring his algebraic part. This analysis shows up the very scheme we discussed with regard to Popper: dragging 16th-c. (N)N straight into the 20th c., which allows modeling 16th-c. Palladio reduced to (N)N. Since the 16th c. is articulated by Euclidean space, so is its architectonics. Trying its paradigm upon an 18th-c. infrastructure results in deadlock, because elements, instead of being projected into an ordered space, are competing for space. Architectural artifacts may be modeled in Euclidean space, but infrastructure cannot. So shape grammar uses 20th-c. technics for falsely promising 16th-c. (fake) mastership, and fighting 18th-c. dynamism.

13



Parametrism

When looking for a setup inverse to shape grammars, parametric modelling is the answer. In a 20th-c.-(N)C landscape, it promises to control complex systems with but a few numbers. But remember what a system is: a fictitious thing of rational talks (18th c.). And mind the makeup of our present BoT, with all the computing around: an evocative talk of *all the fictitious things*. And keep in mind all the inversions, negations, and abstractions. And now consider the undertaking of parametric design, of controlling systems through numbers that represent but a very few parameters. Not only is thereby evocative talk getting reduced to rational talk. Parametric design likewise controls, and reduces to numbers, the infinities and self-reflections of the 18th and 19th c., and thereby their transcendence as well, which we called the natural order. Such a design's formal and logical affinity to nature (we call it "learning from nature") is an implicit fight against the 19th-c. natural order, played out on a 16th-c. platform of abstraction. Such thinking is

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inadequate to the 21st c. with all its masterpieces and super-powerful artifacts. It resembles toying with a potentially pernicious tool while ignoring where the trigger is. Such convenient 16th-c. rational talk, fine for a small world with about 0.7 billion inhabitants, can be no answer to today's rapidly expanding world of 7 billion.

The Play

So let's see what we got today, and which algorithms may, to today's architects, be found adequate and worth researching. We'll start with the algorithms taught by the 19th c.

SELF-FICTITIOUS THINGS OF RATIONAL TALKS, 19TH C. PCA, the Eigenvector, or Who Am I?

[FIGURE G] One particular, prototypical algorithm makes self-fictitious things generally applicable: principal component analysis (PCA). Take a cloud of *fictitious points of rational talks*, and try to make sense of them. PCA helps find that cloud's main, secondary, tertiary, etc. axes of balance. What will these axes do for us?

1. They allow us to establish a new coordinate system
2. one providing maximum contrast
3. which is your private reflection of the world
4. based on such reflections, rational talks are rendered to the world
5. thereby you become a fictitious point of rational talks in the cloud, reflecting all the other fictitious points.

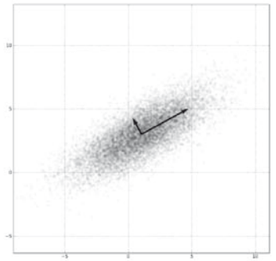
What we find here is the (N)C-BoT of the 19th c., and PCA is a generic articulation to the necessity-part N of it. Any apparatus, any system—meant to provide stability to the world—may be seen as a certain dimensionality, a certain fiction, a certain N, each striving to gain contrast, keep rationality in negotiation with all the other apparatuses. This is the contingency-part C of the master argument.

What is most explicitly articulated by PCA is the individual, political person (C) in an economic environment N. PCA helps us to a clear and wide entrance to the BoT of political economy, capitalism, and national state.

It is important to realize: every machine we design, any system we set up, may be transformed into one single dimensional line. Each component or, rather, each feature of the system is represented by a rational number for its position (magnitude) on this dimensional line (multitude). The interplay of the system's features is orchestrated by arithmetics on these numbers. The 19th-c. setup is that simple and abstract. The PCA is a prototypical mathematical artifact of that thinking. A generic designer of systems. Available on every computer today. Just check how PCA is being used. It is very popular in analytical works in sociology and economy, and the level of facticity or truth associated with these fictitious linear machines is amazing. Whenever we see illustrations of clouds of data points and centered lines, we are right in the middle of this fictitious thinking.

The PCA and the eigenvectors were the topic that most fascinated last year's students. So we named this book, reporting their research, *EigenArchitecture*: thinking of architecture as *self-fictitious things of rational talks*.

G



The eigenvector as the most-balanced dimensionality of a set of data.

H

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix}.$$

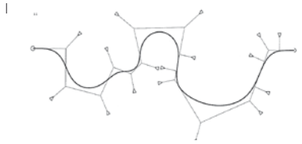
A matrix of coefficients ready for an arithmetic on dimensionalities or cardinal numbers.

Matrix, or How to Talk?

[FIGURE H] Using the formula $ax_0 + bx_1$ to describe the dimensionality of a system, we take two coefficients or names, i.e., a and b, for describing the dimension as a straight line. Therefore we are talking about *analysis and linear systems*, which we introduced as *fictitious things of rational talks*.

Now, in a further step, toward non-linearity and the 20th-c. BoT, and in accordance with the symmetries we experienced with our BoT, we expect to be leaving the natural order of reflected linear movements. By this symmetry operation we position ourselves in abstraction to Kepler, who quit the cosmic order of reflected stability and projected linear movements, as described above. But what is it that we project in the 20th-c. BoT in abstraction to the linear movements? The term *non-linearity* doesn't cut it, even though much of the looked-for mathematics lives in its neighbourhood. So, sharpening our precision: according to the algebraic skeleton of our BoT, taking the next step requires an inversion and a negation; therefore we are in search of the interplay between *not all the other fictitious things*. By searching for *not all the other fictitious things* we are stepping out of the natural order of moving things. We are definitely out of analytical specificity. And we are putting at least two of these pre-specific natures on stage for a joint interplay. These on-stage entities cannot engage themselves, lest there be movement, which would land us in specificity. In a better script, the entities, not engaged and in that sense still "unborn," must self-reflect. But they still maintain relation in the dimensionality of time—a probabilistic relation that comprehends their self-reflection. They meet as mutually outrageds—outraged, not engaged: a play of outrage by non-born *pre-specific bodies of any-movements*. Or: an *evocative talk of fictitious things*. And on the strength of the symmetries experienced in relation to our BoT, we expect a new abstraction of numbers: a rational number', suspecting we may find it in the numerical ideality of algebraic integers introduced by Dedekind in 1872/88. Thus we are exiting the natural order and entering, we'd say, the universal order.

I



Animate Form by Greg Lynn, 1999.

Orchestrating the 20th-c. mathematical masterpieces around our distinction of necessities and contingencies, we would associate logic and geometry with necessity, and algebra and arithmetic with contingency. In Augustus De Morgan we meet an interesting promoter of keeping magnitudes N and multitudes C distinct. We shall keep this distinction even when dealing with ordinals (N) and cardinals (C), remarking in passing that this strongly differs from Cantor's set-theoretical treatment of cardinals as necessities (N), and fictitious things, the dimensions (C), as geometrical lines (N).

So this is our question: how do fictitious things, as arithmetics on a linear axis $a + bx$, talk mathematically on stage? Keeping in mind that that term is not a particular function; in our reading it is an any-function, able to operate as a dimension for the arithmetics of any system, as described with the PCA. The question is: how can a vector of cardinals (a_1, b_1) talk to (a_2, b_2)? And the answer: by calculating with vectors, as introduced by Grassmann in the 19th c., and popularized in the 20th by Whitehead's *A Treatise of Universal Algebra with Applications* (1910).

Two interesting things in this context: Grassmann is dubbed a linguist in the English Wikipedia, a mathematician in the German. Then, the German term *Vektorrechnung* (calculating with vectors) is commonly translated as "vector analysis," which is the straight opposite: calculation is projection, analysis is reflection. And a look at Grassmann's masterpiece, *Die Lineale Ausdehnungslehre. Ein neuer Zweig der Mathematik* (Theory of Lineal Extension: A New Branch of Mathematics, 1844), shows how the argumentation works: it is about reflective geometry of the exterior as an inversion of the projective Euclidean geometry from the interior. For Grassmann, vectors are fictitious things, and not rational talks as the term "vector analysis" would suggest. If we then talk about "vector analysis" in the 21st c., we find ourselves looking at a masterpiece from a 17th-c. perspective, while trying to overcome 17th-c. geometry. Interesting then that Grassmann was widely unknown in the reflective 19th-c.-(C)N environment, becoming constitutive only in the projective 20th-c. (N)C. Which shows the struggle we are caught up in, adjusting ourselves to the right level of abstraction in the 20th c.

We take Grassmann's vectorial calculation, an arithmetic on cardinals, for letting fictitious things talk on stage: (a_1, b_1) (a_2, b_2).

As with PCA, we can add more and more dimensions to systems, for rendering them more adaptable to the fictitious points: (a_1, b_1, c_1 … n_1). We are still able to put them on stage, and they will have the "Grassmann talk."

Now to the next step: introducing self-reflection to vectors. For specifying a two-dimensional linear system, we need at least two fictitious points ((a_{11}, b_{12}) (a_{21}, b_{22})), to be written as

$$\begin{vmatrix} a_{11} & b_{12} \\ a_{21} & b_{22} \end{vmatrix}$$

Such self-reflective vectors are called matrices, and there are arithmetical operators for matrices.

$$((a_{11}, b_{12})\,(a_{21}, b_{22})) - ((a_{11}, b_{12})\,(a_{21}, b_{22}))$$

For specifying an n-dimensional linear system, we need at least n fictitious points. The arithmetics on these matrices remains unchanged, and we are still in the natural order of linear systems.
In CAD such matrices are constitutive, and used for translation and transformation of the two- or three-dimensional geometry of objects.

[FIGURE I] Greg Lynn's *Spline* (in *Animate Form*, 1999) may be a good illustration of what a high-dimensional, linear natural space is: taking the anchor points of the spline as dimensions of the linear space, and the curve of the spline as a transformation of this

linear system to Cartesian space. But in contrast to what Lynn describes, there is no fundamental difference between the two constructions above. The main one in the center is just a slightly different, more flexible renderer of systematically the same kind of an n-dimensional linear space. A slightly different machine or fiction.

Riemann, or What to Look Like?

In yet another step further: what happens when working with an *infinite-dimensional linear space*? What does the world look like when any point reflects the whole world? Reflects the natural order? What does the world look like if there are no longer points in space, but the world's points themselves are dimensionalities of space? Not projective particles, not reflections of waves, but *projective quanta*? That is what Riemann's geometry (1854) is about, and what improperly is called non-Euclidean geometry. And that's what Richard Dedekind's numerical ideality, i.e., the algebraic-number bodies (*Zahlenkörper* in German, usually translated as "fields") are about.

Currently we are following the hypothesis that we are able to expand a *finite vector*

$ax_0 + bx_1 \ldots + nx_n$

where each coefficient a, b … n needs n values of fictitious points to become a specific fictitious point, to an infinite vector

$ax_0 + bx_1 \ldots$

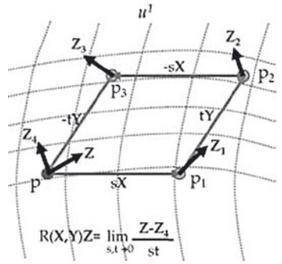
where each coefficient a, b … needs an infinite number of fictitious points to become a specific fictitious point.

In a two-dimensional world, looking at two points at least is required that are able to talk (mathematically) to each other—elementary stuff. In an n-dimensional world, looking at a minimum of n points is required, which is advanced stuff. In a real world, the requirement is looking at an infinite number of points that talk to one another, i.e., the whole world. We must balance their talking through algebraic geometry. Master stuff.

This shows that specific talk on principle is impossible when the whole world is on stage. But it is still possible to operate on these algebraic terms in a non-specific way. It is possible to operate with not-any-fictitious-points, represented by so-called polynomials such as $ax_0 + bx_1 + cx_2 + dx_3 \ldots$. Affirming the infinity of the polynomials, we need immediately a new understanding of the coefficients (a, b, c …). They cannot be specific either, whence they cannot be rational numbers. They must be treated in terms of numerical ideality, being, as the polynomials, as yet unspecified. These evocations, polynomials, and ideal numbers, do not have a specific name, as rational projections do have; they have *unspecific names to be negotiated* (by probabilities, we'd say).

[FIGURE J] What is the mien of these evocative talks stripped of specific numbers or specific names? Under the assumption of *continuity* (cf. Dedekind again),

J



An illustration of Riemann's continuous curves, 1854

they mutually effect their dimensional spaces. Such is the beauty of Riemann's geometry, opening up the universal order. Thus elegant, and thus abstract.

EVOCATIVE TALK OF FICTITIOUS THINGS, 20TH C.

Morphogenesis

What is a Turing machine? We would say the Turing machine is a polynomial. The infinite stream of this machine is one single infinite polynomial. The whole world in *one* evocative point. There is this one point within a universal nothing. That's frightening. How to get stability? The answer of Turing, Gödel, Russell , et al., is: by logic. They did not trust Boole's or Dedekind's idea that the infinity of polynomials could be stabilized by the infinity of other polynomials. The Turing machine is one polynomial stabilized by logic using rational coefficients. And like Apollo, which took a single picture from outside our world, Gödel and Turing observe from outer space how to live within one polynomial constituted in natural, logical order, using rational numbers. This is what is called calculability. A desperate attempt at specifying the pre-specific, to treat evocation as rationality. Significantly, Gödel starved himself to death, afraid of being poisoned.

BOJANA MISKELJIN

EIGEN-WINDOWS

AS A REFLECTION OF SINGAPOREANS' CULTURAL DIVERSITY

Information is everywhere. Gregory Bateson described information as "a difference which makes a difference" and in reference to that, this thesis is focused on how difference can be articulated in order to engage individuals to appropriate new qualities. The thesis explores how information can be extracted from the shared material world and transferred into a shared immaterial world of bits, and how it can be rendered back in a way such that, when it manifests in the material world again, it may "operate" within an individual's immateriality as a "desiring machine." This project has taken much inspiration from a text by Herzog & de Meuron ("The Virtual House," 1997).

The thesis is interested in learning about where the "cut" (the term "cut" is associated with a procedure from conceptual mathematics known as the "Dedekind cut," which allows for a conception of irrational numbers) operates inside the endless rationality of people's lives, and evokes their irrationality as a second infinity of their existence. It tries to understand where "that turn," from one world to another, takes place: from being "here" to being "there." What is that invisible flow, that sensibility, which Gilles Deleuze named "intensities," and of which he tells us that it keeps worlds together?

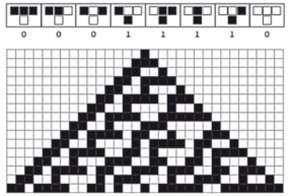
The context of the thesis is the cultural diversity among Singapore's inhabitants.

Whereas Turing outed himself as a homosexual, was forced to take drugs by court order, and took his own life because he feared the drugs might lose him his intellectuality.

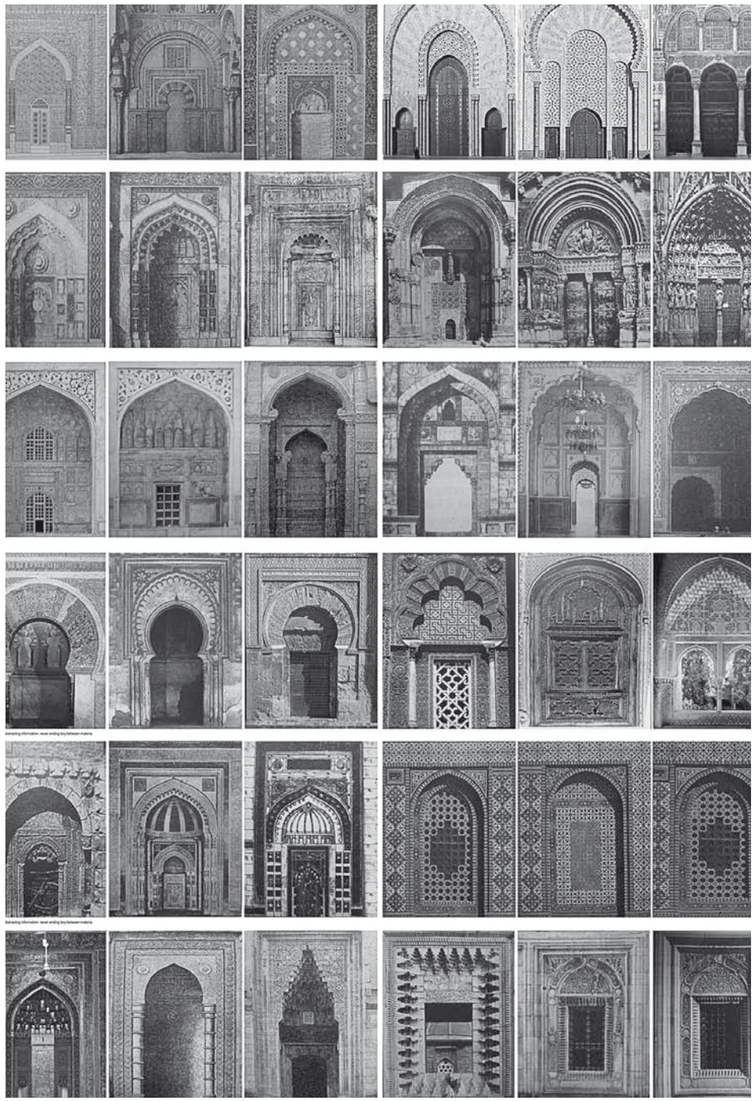
Shortly before his death, Turing accomplished a further major step. As a cryptographer he put several such pre-specific natures on stage for evoking biological phenomena, and started a field of research, called morphogenesis (1952), with vast influence on today's biology.

What is morphogenesis? To determine that, let us first look at what it isn't. There is a little trick for making the abstract Turing machine more intuitively practicable. Instead of taking the machine as an endless one-dimensional sequence, take it as an endless two-dimensional grid. Thereby each element receives not only two but four neighbors, without the principles of the machine being affected. Identical thinking, identical operations. But now we are able to consider this machine a Cartesian map of rational talks reflecting fictitious things (but, however, of course not abstract enough for the 20th c.). Thanks to this natural setup certain events may now be evoked in a familiar Cartesian space, and, following logical principles, they spread out over the map. And results look very natural indeed. Perforce, since it is a tautological setup. A panopticon. We are in

K



Cellular automata, a spatial grammar by Stephen Wolfram, 1983.



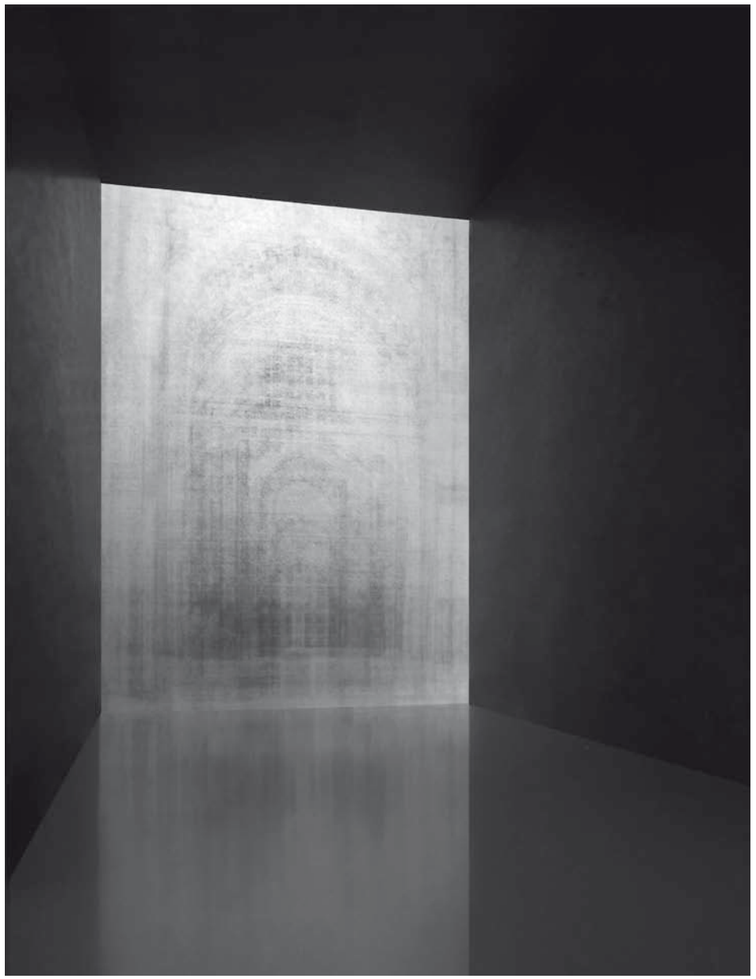
ARTICULATING IDENTITIES: EXTRACT, ABSTRACT, AND MULTIPLY

Singapore has grown into Singapore, throughout the past fifty years, by assembling different cultures such as Chinese, Indian, Islamic, Malay, and European. This thesis is focused on how the rich heritage of these cultures, which dates far back in time, can be cultivated—represented and multiplied with each other—into Singapore's actual and virtual cultural identity. How can we create an abstract space that is capable to actively remember these legacies, which all together make up the particular culture of Singapore? I conceive of such an abstract space as conceptual, and as manifest in the concrete structure of the architectural space as it actually exists. The concepts I work with to explore this abstract space are devised to capture, memorize, and integrate diverse components of Singapore's culturally disparate identity. To this aim, I attempt to translate architectural structures into informational structures, which I can treat by computable concepts. In other words, I attempt to treat the concrete architectural space as abstract. I will create a series of instances capable of expressing such an abstract space. I look at these instances as actualizations of the different gradients of the translated information. By exposing these many instances as apparently the same, I intend to engage anybody (not everybody!) to identify virtually with the same abstract space. Anybody should be able to recognize the culturally specific identities as familiar, even though they are in a new composition. Like this, recognizing something as familiar will inevitably also evoke the recognition of something new at the same time. Furthermore, my thesis experiments with whether

the game of cellular automata, Conway's *Game of Life* (1970), or even *A New Kind of Science* by Stephen Wolfram (2002). [FIGURE K]

It means thinking in natural order explicated into universal order, so as to be able to look better—rather to reflect better—on phenomena, but still from the perspective of rational talks. (N)C—(N')C—(C)N—(N)C. What is missing, however, is abstraction. Computers (N')C are treated as machines (N)C. Getting faster and faster, and our (C)N reflections more and more detailed. But reflection is no longer one of rational talks, it is a self-reflection of our logical evocations. It is a tautological setup. So we are not looking at details of natural phenomena, but at the increasing speed of logical operations. That's what simulation is about: evocative talks (N')C intuitively (C)N-synchronized with familiar rational-talks-(N)C.

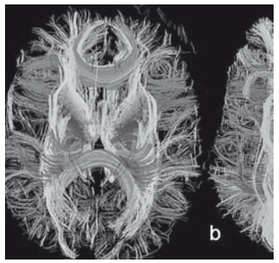
This term (N')C—(C)N—(N)C might be the driving force, the dýnamis of the expansive phase of an (N)C setup, which we addressed as (N)CL, and associated with the 3rd c. BCE, the 16th, and, hypothetically, the 20th c., those periods of colonizing new spaces built around numbers, rational numbers, ideal numbers, around syllogistic, logic, logistics, around geometrical analysis, analytical geometry, algebraic analysis. We got



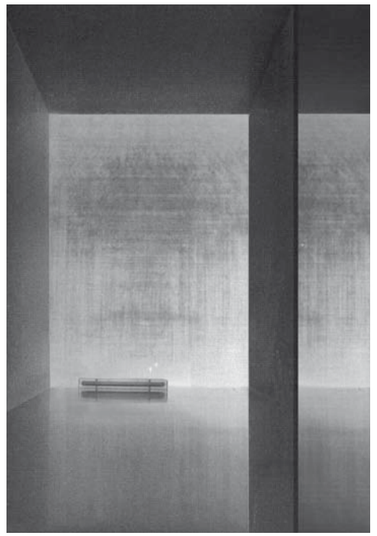
Hellenism, imperialism, and might collocate globalization along this line. All these expansions populate the new, wide plateaus of the new necessities N' by the old contingencies C and the old necessities N, which expire as they butt against the limits of the old thinking, starting to self-reflect it. That's when, on the level of self-reference, logic hands over its primacy in determining contingency to algebra, and we move from (N)CL to (N)CA, from Renaissance to Baroque, e.g.

[FIGURE L] And indeed, adducing today's masterpieces, they explicate the human genome, simulate the climate of our planet, the risks of our societies, the functioning of our brains. And with due respect for all these masterly artifacts, they will end up in the cultural constitution that the late (N)CL setups always end up in: evocative talk is *not 'not all the other rational talks'*. They will collect all the fictitious things around a centered void. We shall find that life is not any of these intuitions, climate is *not any of these intuitions*, thinking is not any of these intuitions. The void is what we called evocative talk. An exact abstraction to the Baroque cultural constitution of people quite as bright as we, who collected all the *animated* things around a centered void, in order to address the questions of *their* time. A void that developed into the rational talk to which we are so used today.

L



Diffusion-spectrum imaging illustrating the complexity of neural connections in the brain.



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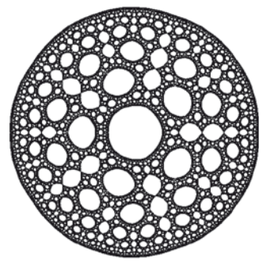
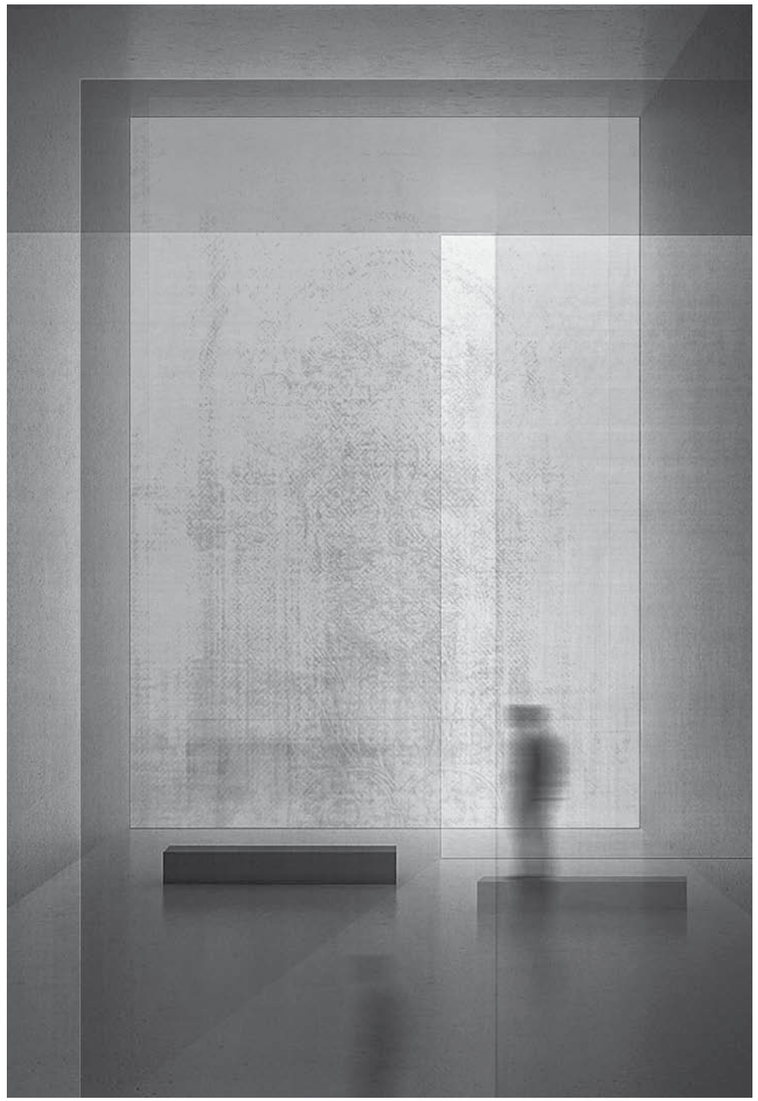


A fractal map.

[FIGURE M] Another popular rendering of calculability or the limits of natural order are fractals, as prominently illustrated, e.g., by Mandelbrot (1980). They represent a two-dimensional field of instances of a recursive function which, depending on their position on the map, create series of numbers. The color of a pixel on the map is determined according to the behavior of the number series. If, e.g., their total after ten iterations exceeds a certain value, the pixel is black, otherwise white. That's it, and thence there sprout these amazing naturalistic forms. So fractals are straight rationalizations of the evocations of infinite polygons. One is either inside the natural order (the black pixel—Koolhaas's Generic City), or one is out of it (the white pixel—Koolhaas's Junk Space). Cf. Douglas Hofstadter (1979) for further discussions on calculability.

Yet another prominent source of globalized projections exists. Instead of evocating rational-(N)C-talks, fictitious-(C)N-things are evocated. Which lands us right in the game of grammars, parametrism, genetic algorithms, neural networks, etc. A game not very different from the discussions above, projecting *topographies* into universal space—the focus in this setup is on "projected into universal space." The term for this mode of expansion and colonialization is (C)N—(N')C—(C)N—(N)C. We'd further say



and how identities can be extracted from their natural manifestations—the architectural space, in my case—and raised into a new form of expression; not by making referential relations rooted in a memory one seeks to preserve, but by simply linking it up with whatever inspires one to create a new expression. My guiding questions revolve around, what inspires one to question representation?

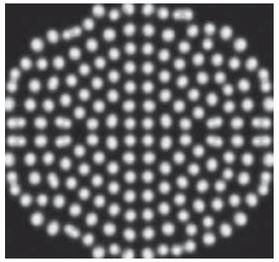
THE SPECIFICALLY SINGAPOREAN SKYSCRAPER: A HETEROGENEOUS ARCHITECTURAL CONCEPT

Can we turn the architectural form of "a skyscraper" into an architectural concept of a specifically "Singaporean Skyscraper," such that it is capable of reflecting Singapore's cultural diversity expressively? This thesis focuses on experimenting with windows as points of intersection, where different cultural identities compose their expressions. So conceived, windows acquire a pre-specificity and stop being merely generic units. Within the corpus of all of Singapore's windows, they acquire a generically specific identity, "a Singaporean window"—at once less schematic, more abstract, and potentially more singular. We can treat "a Singaporean window" as a new architectural unit, and combine its instances into a collective whole as a skyscraper. Of this skyscraper, we can say that it incorporates abstractly, and hence virtually memorizes, all the cultural identities of Singapore that have been translated from architectural structure to an informational structure.

that the (N)C—(N')C—(C)N—(N)C mode dominates the first half of the 20th c., and we would, varying the common acceptation, call that mode *structuralism*, whereas the (C)N—(N')C—(C)N—(N)C mode dominates the second half of the 20th c., and we'd call it *post-structuralism*.

But back to Turing. What did he do so differently from all this, when he introduced morphogenesis in 1952? Why is it new and groundbreaking? He simply layered, in probability space, two of those logical natures—with all the implications discussed above—and merely asked for their difference. His question was not about what each of them was. Therefore his is not a logical talk within a nature, but a talk between different natures. With amazing results: by just contrasting one slowly-and-intensely-evoking nature against another fast-and-smoothly-evoking one (cf. reaction-diffusion diagram), patterns are obtained that are much more adequate to something like, e.g., biological phenomena than anything before. And unlike with fractals, it is *not excluding anything*. With these algorithms—other than with structuralist and post-structuralist simulations—*the fictitious things are not there.* They are treated as "not-being-there," similar to the things and the lines in prior (C)N setups, as in the Pythagorean-Euclidean and Renaissance BoTs.

N



Morphogenetic pattern implemented by a reaction-diffusion diagram.

In my final thesis I make use of well-known window designs from some of the diverse cultures that form Singapore's identity (Indian, Chinese, Islamic) and "recycle" them into a new unit that is genuinely abstract—my own articulation of a "Singaporean Window." Such an abstract unit is capable of instantiating windows made up of the many windows: each of its instances exemplifies its own and singular kind. A "Singaporean Skyscraper" is composed of the abstract unit I call "Singaporean Window," and articulated as an open vertical pavilion. Like this, a "Singaporean Skyscraper" is specific, yet truly heterogeneous. Like this, I hope, it will be capable of reflecting Singapore's diverse cultures.

The programming tools with which I work are Eigenvectors and PCA (Principal Component Analysis). The input data used are the images of windows, niches, and portals of iconic buildings of Islamic, Indian, and Chinese architecture. They represent the abstract Universes that together make up the "liveworld" of our new one-of-a-kind unit, the "Singaporean EigenWindow."

IS IT POSSIBLE TO TAKE A PERSONAL POINT OF VIEW WITHIN THE GENERIC?

When abstract one-of-a-kind units are combined, they are capable of producing variants of "wholenesses" within any given reality. Accordingly, the thesis focuses on the question of how one could grasp such "wholeness"—since there can be a whole range of possible ones. Such a notion of wholeness is approached from the point of view of proportions—principles that organize abstract units by rendering them into an open-ended number of articulations of wholeness—such that they can express any (not every!) given reality.

The thesis tries to find ways of how one can dream about abstraction as generating an abundance of opportunities capable of involving as many desires as possible. Moreover, it intends to explore: what are the conditions that make it possible for people to work in such a complex and high resolution setup that extracts and multiplies so many abstract details as potential "cuts" (in between rationality and irrationality); can the "cut" be conceived as a tool for "turning something into another thing"; can we think of the "cut" as an integration of abstract units which evokes a new perception, a new point of view. Consequently, the thesis tries to discover if and how, through a collection of "cuts," a new meaning can be evoked, in a personalized manner.

To sum up: the thesis investigates how we can incorporate standards in an affirmative way, without subjecting (1) the needs and desires of a singular person to the conformity presumed by standards, and (2) our design to the principles which the standards dictate.

O

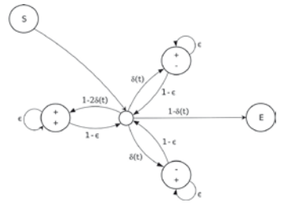


Diagram of a Markov chain of an element of evocation, and the space of probabilities toward its neighbors, 1913.

Markov

[FIGURE N] One might object that implementation always happens within Turing-machine logic; that morphogenetic algorithms are still finite algorithms, as are the ones attaching to the fractals. However, there is a crucial point: we establish a new level of abstraction, with new numbers. It must be done with much care and circumspection, not giving in to the facile temptation of unthinkingly explaining new phenomena through old, lower-level-of-abstraction paradigms.

But there is help, from the symmetrical 17th-c. setup and its introduction of the rational number. Remember: rational numbers are *rational talks of animated things*, whereas animated things are made up of *not all the other numbers*. Integrals and differentials are the arithmetic that applies to these rational numbers, a new arithmetic that is symbolizing, and working with *not the infinite series of numbers*. But when rendering results into *numbers as series of things*, after a certain number of iterations, one that will produce the degree of precision wanted, you must say: Enough! Quite as in our school days we were taught how to deal with integrals.

Now, how do we treat infinities? Just operate on the next-higher level of abstraction, on the negative of infinity. And for bringing everything down again to a lower level of abstraction, just say when it's enough. The advantage of this thinking consists in that, with the help of this abstraction, you may obtain stabilities on the lower level of abstraction—in the case at hand the stability of a series of numbers or things—unobtainable without that abstraction. For people not thinking on the same level of abstraction, such calculations appear as magic indeed.

Thus, in a natural order water can rise through the piping of our infrastructures, in clear contrast to the cosmic order, where the water movement is always downward, and great aqueducts are built for providing cities with water. Hence, in a universal order, a light bulb simply emits light, whereas in a natural order light must be obtained through burning some stuff.

[FIGURE O] And now for Google, the social media, and the *non-content indices to the content of the world*. All of them working, symmetrically to the foregoing discussions, only on the level of abstraction on which everything is indexed, and connected with everything else. In the 20th c. we learned how to symbolize, and operate, on the basis of this new infinity. It's called coding. As computer scientists, we would call the lower level of abstraction "rendering level." Markov in 1913 made a significant contribution toward rendering techniques on this lower level of abstraction, by greatly facilitating, after a few iterations, the saying of "it's enough," a procedure nowadays adopted into all our renderings, and by Google into its PageRank. Thus we are, actually, in a position to deal with all the explicit content of the world within milliseconds. If one puts up with the

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**Websites:
http://www.flickr.com
http://virtualhouse.ch**

non-reference to content of our indexes, with moving within indexes and thereby exposing asked-for content indirectly and evocatively, and not by representation. We are evocating the appearance of content with every question put to Google or Wikipedia, with every pixel on the computer screen, with every glosseme of this text—to use an important concept of one of the truly algebraic linguists, Louis Hjelmslev, who invented an entire system along such probabilistic terms, which he called "glossematics" (1936).

At that, the problem we are forever grappling with is pitfalls: the conveniently and temptingly mistaking particular results for real, trusting them at face value, taking them as pictures, as signs, as phonemes, as answers. So convenient to ignore their level of abstraction. So easy to forget that they are evocations by mastership, stimuli for further thought.

Self-Organizing Map

[FIGURE P] Now, to wrap it up, a look at the most advanced generic and—according to our current lights—most promising algorithm around evocation: Teuvo Kohonen's self-organizing maps (SOMs), introduced in 1982. SOMs have become quite relevant; but unfortunately they were received, and are being discussed, as are neural networks, cellular automata, or fractals. Which means their specific potentialities are shrouded by a lack of abstraction. SOMs are not—as they have been made to appear—talks within a nature, but talks between natures.

So let us discuss SOM as a Cartesian map where each pixel represents a vertical Turing machine. The setup used is comparable to that underlying our discussions of morphogenesis and the layering of natures. Our case at hand is marked by a matrix of natures, each of which is indexing all the others. It explicitly represents the basic connectivity of nature, whatever it be. Once again: SOM can do without preordaining any connections of whatever kind, thus differing from the structuralist or post-structuralist approaches typical of neural networks, cellular automata, or fractals. SOMs play with, talk to, or articulate *not all the other connections*, or, one might say, they talk with the pre-specificity of *any connections*.

Now, when a SOM is being exposed to a some nature, e.g., to a stream of data from our real nature, its connectivity of natures then adapts to this particular nature, whatever it is, and however it is structured. It may then be said that the SOM exists within its own nature, thus engendering its own kind of ordaining connections. And when asked about its nature, the SOM will answer as precisely as possible, from within its existence inside its nature, as to what—regarding the question—the structure of its nature *is not*. Such infinities ultimately are non-implementable. Give thanks to Markov, and say, at a point you think adequate and that depends upon your mastership: Here's enough!

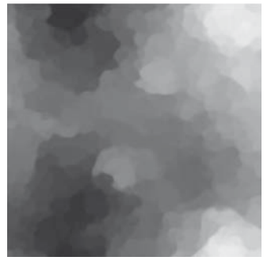
Neural networks are logical reflections on natural phenomena. SOM is *not any reflection*. It projects evocations. Put a SOM on a stream of data from our real world, and it will evoke further data. As in questioning Google, no final answer results, but an evocation of a new answer to the world. Our experiences with SOM are amazing:

1. SOM may be fed with any design, engineering, or analytical task
2. SOM produces a most-reasonable next step
3. and with it, one always betters the statistical optimum
4. without knowing why.

That's the stuff we think our future world and upcoming universal order is going to be about. Not about scarcities, or about just distribution of limited resources. It will be about primary abundance, and about intellectual challenges. About evoking the most promising questions, about cultivating the sediments of masterful articulations, indexed by machines. *Architecture is about evocation of 'not the other worlds'*. It is about creating identities. The world, in this view, is rich, and not restrictive, either culturally or intellectually. A clear path out of the current, all-pervasive, misanthropic generic setup.

We are not saying grammars, neural networks, genetic algorithms, cellular automata, parameters, etc., are not working. What we are saying, rather, is that they are working too well. Indeed, optimizing our entire world is not a problem. The problem—if this term be used at all any longer—is that the problems are for the computers, and that those are solving them with ever-increasing speed. The problem is that optimizing our world is not a problem. The problem is that the necessity N, which is affine to economy, must be tied to a corresponding C, to contingency, to politics. It falls to us to use all the computing power we've got, and to keep asking for next steps within our nature, whatever our nature is. The computed answers, which will appear as necessities N—they

P



A self-organizing map, clustering self-reflective vertical Turing machines.

are calculated, after all—will be *what they are not*. We then decide, and reconsider, and play the contingency part C. This is how mastership may be cultivated today.

That was a handful. That's where we stand. Did it get you interested? Then enjoy the artifacts articulated by our students throughout our past academic year, 2012. More of it will be coming … Be seeing you …