Parametrization as mediation, or man and his fate

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Marcelo Tramontano: Ruy, we would like to start this conversation with your considerations of the historical construction of the notion of parametrization.

Ruy Sardinha: Beyond issues related to the production, design and representation of architectural space, largely revolutionized by the introduction and development of new digital technologies, the entry into what some have been calling the "age of parametrization" demands great analytical effort in order to grasp its various biases. As a background, we have the idea that a reality, a society or complex - or multiparametric - natures could no longer be grasped by traditional analytical methods - analysis understood herein as the division of this complexity into simpler units. Instead, they would require more appropriate methods and instruments, from the so called complex thought to the multiparametric design or technology. The search for greater control over the production processes and the effort to not let yourself succumb to the hazards and contingencies of life underlie this background. Old issues accompanying Western reflection on man's relationship with nature and with the artifacts created by him since the dawn of the great ancient civilizations are reissued.

It is worth remembering that in ancient Greece, *techne*, which was creating the necessary knowledge of what did not exist in nature, dependent on human will and action, will also chair the operative actions - such as agriculture and medicine - able to conduct nature to distinct ways. Such operationality aimed at, among other things, freeing man from random domain and contingencies. This need of operational acquaintance about nature posed to man the need to deal with hazards, with contingencies. That is why another meaning of *techne* opposes technique to *tykhe*, which is chance, contingency, suggesting that technical knowledge prevents man from the contingencies of chance. We can thus observe that, from its

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beginnings, there is a tension between freedom and determination in the development of a knowledge that tries to deal with contingencies, with chance, with what man does not control, what escapes its control, involving the need to prevent against these hazards. Well, we are dealing still today with this tension between chance and determination, with the need to control that which escapes us. Thinking therefore in technologies or methodologies that can encompass the various parameters that make up the reality poses or renews the issue of control when dealing with contingencies.

Watching the history of this polarity we realize the trend of a controlling reason, an instrumental reason that can, on the one hand, to prevent and, moreover, anticipate the very course of nature. We realize, too, that this polarity begins to gain greater emphasis since the advent of modern science, and especially from the time when nature becomes mathematized or mathematizable. The medieval universe was endowed with meanings, predetermined places laden with very strong symbols, in which qualities predominate, and where the bodies occupy certain places in the space for its qualities or by divine will. But from some stage, this spatial sense begins to be desacralized, and it is important to note that more than a desacralization, there is a mathematisation of this universe: the universe comes to be seen as homogeneous universe or at least endowed with mathematical characteristics.

Galileo will say that mathematics is a language in which God wrote the world. The use of mathematics by philosophers, scientists, thinkers, in the fifteenth and sixteenth centuries is very different from how we understand it today, because mathematics at that time was almost mystical, linked to the concepts of natural magic, of the magic powers of the world. But what I find interesting here is the idea that it is possible to apprehend the nature, the universe, from a set of parameters or mathematical and numerical coordinates. This idea that the world is expressed through a set of coordinates and, since one knows these coordinates, which are variable, one can control the world and understand it a little better, allowing prevention to man and also to rule the world, was a strong concept at that moment and it has created a whole tradition. So it seems to me that present days emphasis on parameterization recovers slightly this tradition.

Marcelo Tramontano: What would you emphasize on the period between the sixteenth and nineteenth centuries, when technological thought and production linked to it grow stronger and become consolidated?

Ruy Sardinha: In Antiquity, there was a distinction between the knowledge of nature - *physis* -, science - *episteme* - and the knowledge for manufacturing artifacts - *techné* or technique -, which were opposed, to a certain extent. From the sixteenth century, these two fields approach arising hence the concept of technology as acquaintance which requires scientific knowledge. At the same time, this concept makes more operational scientific knowledge. With the advent of capitalism and mechanized manufacturing but mainly the Industrial Revolution, technological devices gain an unfathomable importance. Of course this will also lead to great social and economic investment in these devices, and increasingly the world economy will depend on the production sectors of these technological objects. However, as it should be, this new moment also generates a whole symbolic and imaginary field. So the emphasis, from the nineteenth century, given by literature and the arts in general to the issue of automata and technical-scientific universe, shows how this combination becomes an important material basis of society, for better or worse. We observe a production, in the arts, that either praises, or demonizes this technical-scientific universe.

Another aspect to be considered that, to some extent, is due to the mechanistic view of nature and the ongoing mechanized manufacturing in the nineteenth century, is the hegemony of natural sciences objectivating and positivist vision. Conceiving nature and society as large engines, equipped with gears, with specific modes of operation, will be a huge array of modern thought. It finds its peak, or its moment of glory and at the same time, of inflexion in the nineteenth century, at the second Industrial Revolution, with all the technical-industrial and cultural universe of the nineteenth and twentieth centuries. This vision becomes a model for

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the then newly created Human Sciences, although the universe of Humanities prove to be necessarily more complex and indeterminate, indicating the need to build methods more suited to its apprehension and understanding. Perhaps - and this may be an important issue for us to think our current dimensions - Human Sciences did not let be apprehended or fully understood by the positivist methodological tools of the hard sciences. That seems to me to be, today, one of the great issues of scientific thought: mechanization, or mathematization, or that more positive thought, does it apply to human universe?

In the nineteenth century, a limit for this positivist view was the notion of the unconscious, or even of the libidinal universe. How to translate, using parameters or criteria from the exact sciences, what is put beyond or before a given rationality? How to embrace a reality that escaped the hegemonic scientific procedures? How to think about other dimensions of reality from other criteria? The advent of aesthetics as nineteenth-century philosophical reflection field is an interesting counterpoint: while a positive science tries to encompass the reality from its own procedures, another field of knowledge is constituted - the philosophical aesthetics - within the the philosophical field that, when presented as a field of knowledge, indicated the project boundaries of a positive knowledge and objectivating of the world. It would therefore be interesting to think the constitution of philosophical aesthetics or of the "art philosophy" proposed by Nietzsche as a counterpoint to the hard sciences.

Marcelo Tramontano: You mentioned nineteenth century, which hosted the consolidation of several ideas, including the meeting of technology with everyday life in many ways. It makes me think of two questions that maybe you can comment. One is with respect to the consequences of the Industrial Revolution, already in the eighteenth century, that is, of course, a technological revolution but well beyond that, a revolution in mentalities, a cultural revolution, and, of course, political. This process is consolidated in the late eighteenth century, becoming richer and more complex, and arrives at the nineteenth century strongly reverberating in how people perceive life. The very understanding of what is "being bourgeois" is based on a positivist and unambiguous worldview. Next, you mentioned a certain complexion of the world during the twentieth century, and made me think about quantum physics and how new aspects of reality began to be perceived, marked by indeterminacy and unpredictability with which it was also necessary to deal. Such proceedings are also reflected in the mentalities, although otherwise. But the hard sciences are questioned in this period by the formulation of the cybernetic thought, by theories on complex systems, by quantum physics itself, as means of approaching these places of knowledge previously unknown or obscure. How do you see it?

Ruy Sardinha: I think you're right. It is interesting to note how the questioning of reductionist view of scientific positivism occurred not only from the creation of the human sciences, but also in its own field, through research and analysis of the subatomic world. The discovery of the quantum, subatomic universe engendered a decentralization of knowledge, of established beliefs. Suddenly, the intimate structure of matter showed up complex, uncertain, indeterminate, not grasped by traditional structures of thought. Hence, for example, the importance of paraconsistent logic and development tools able to process large amounts of information. It is clear, then, that nature and the world are not made of stability, but rather of instability and uncertainty. This understanding also brings about a decentralization of the subject himself. And if in the nineteenth century, Descartes, with his *Cogito*, founded knowledge from a cognizant subject that gives meaning to the world, what is observed from these transformations of nature is almost a decentralization of the subject himself. He ceases to be a donor of senses to stand in this myriad of events and facts.

On the other hand, if we move slightly forward in time, we will find a series of historical events that question the old beliefs on an emancipatory Reason, in a Reason that enables knowing the world, bearer of social welfare. The eighteenth century's Enlightenment project of emancipation by a rational pathway starts being questioned by the dimensions of history. The advent of the two World Wars but mainly the World War II represented a turning point in this belief, because a war can also be seen as a huge laboratory of technological, industrial trials,

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since scientific thinking invests heavily in the war apparatus. However, unlike the futuristic dream of *tabula rasa*, of the war making a big asepsis enabling the emergence of the New - this latter connected to the ideas of emancipation - what we saw in World War II was the possibility of total destruction of humanity, concrete and real. So it is interesting to note that, at first, quantum mechanics engenders a certain decentralization and instability, introducing the need for new knowledge. But then we can see, in social and political terms, distrust on the direction that scientific development was taking.

Of course, we can also remember another important discussion of that time, about if the responsibility of this process was in a controller Reason or in the uses that were being done of this knowledge. Not surprisingly, the 1960s will discuss the social and political uses and the ethical dimensions of scientific and technological knowledge. And then begins a whole review of these concepts and ideas. But anyway, in terms of society itself, an issue that remains an important legacy for the contemporary world is precisely this pendulum between a social and emancipatory use of knowledge and, inversely, a use that can bring destruction in itself. These considerations are similar to those related to uses of nuclear energy: they bring destruction, the atomic bomb, waste problems and so on, but they also bring the possibility to cure cancer, to provide treatments using radioisotopes, to produce low-cost energy and so on. Basically, these two dimensions raise the issue that perhaps this knowledge is necessary, although one must have some precautions regarding its uses.

Marcelo Tramontano: As we know, the second postwar period spread a positivistic plague meticulously throughout the world, on actions such as the US Marshall Plan and all that followed it. Your speech reminds me that there was, behind that, a clear aiming at controlling many spheres of life and consequently, a project of, say, tame indeterminism as a nascent form of understanding the world. These ideas and theories, such as quantum and complex thinking, bloom in mid-twentieth century, when the world is precisely wondering questions that stem from the discovery of the subatomic world. It occurs to me, then, that the war winners project brought in its wake an intention to submit thoughts that valorize indeterminism and consider the unpredictable as something desirable. Although not included in the agenda of the ruling groups of the time, these theories will, shortly after, find their place in the flowering of computer science, for the simple reason that computer is *per se* parametrized, and allows the manipulation of parameters to produce emergencies, in the sense given by Ludwig Von Bertalanffy and Edgar Morin. It is interesting, then, to think that these theories return to the agenda in the 1960s and especially in the 1970s, when computer infiltrates every corner of life and this political project, which exclude the unpredictability, has to be reviewed.

Ruy Sardinha: Indeed, the Second Post-War was responsible for the advent of a new paradigm that, coupled with the large financial investment in the informational media, will lead to what Laymert Garcia dos Santos called "the cybernetic turn". I am referring to the research and discoveries of the genetic code and the logic of life, as expressed in the book "The Logic of Life" by François Jacob, now designed from their informational dimensions. The expansion of this biological paradigm to other areas of knowledge, that is, the assumption of a common substrate to animate and inanimate beings, technological objects and social systems, such as economics, will lead not only to the concept of an encoded universe, now understood as the conjunction of several information systems in mutual relations, but also, once again, to the dream of a new synthesis, or common language, now made possible by cybernetics.

The emphasis on processes, on exchanges and losses, on interaction and intermediations redirect the issue of control: from the tonic of production to access and flows, leading to what later Jeremy Rifkin termed the "era of access". It is important to note how this entirely encoded world is also widely quantifiable - or parameterizable - therefore open to stricter control, at least in the creative minds of its creators. It is thus noteworthy how the issue of chance and contingency is re-signified by the notion of emergence.

That's when, shortly after the cultural turn, we will also have what some will call linguistic turn, derived from structuralism, showing how we are language. Man, that subject who, at a given

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time, was donating sense, is actually formed from the languages of previous linguistic structures. We observe, therefore, a shift of the language dimensions and, in a sense, of information. On the other hand, we can not forget that war revealed in a very clear way that a major clash between the rival forces took place in a kind of game of information and counter-information. Computer development is connected to the need, created by war, to translate an encrypted linguistic universe, so that he who could access that information would sooner win the war. We will see more or less from the post-World War II, but especially from the 1960s, a political or geopolitical dimension of information, linked to all the investment in the war, in translation and deciphering machines. Then from a scientific and biological point of view we will see the discovery of this information structure and of the genetic code itself.

The allocation of considerable amounts of money in the fields of information sciences will later generate the development of Internet, telematics, computer science, and so on. Thus, from the 1960s, it is clear the formulation of a new paradigm that comes from information and communication. It starts taking shape in the 1960s, but has a great repercussion on global economy from the 1970s. When the Fordist industrial framework of capitalism undergoes its great crisis in the 1970s, a technological possibility to restructure the economic basis on these new arrays is configured, as a lot of money was invested in this sector. We have then an economy that is also - and increasingly - translated in informational terms. Not by coincidence, information sciences, cybernetics, theories of communication and others theories will be emphasized at that time.

Marcelo Tramontano: I wonder how all these things, which consolidate from the 1970s and frankly converge in the 1990s, with the implementation of the commercial Internet in the world, become part of mentalities. How they start biasing worldviews, how they become an unquestioning part of cultures, of people ways of being. This explanation of life through the genetic code you mentioned reminds me that in the 1960s, when dealing with the issue of hygiene, there was much talk on a new being, the germ. Germs were invisible, and it was expected that ordinary people believed in the action of something they could not see, but whose existence had the seal of the scientific world. Overflows, then, from various fields of science, a number of assumptions to people's daily lives. They, in turn, incorporate these ideas in their daily speeches, pressured by advertising and mass media, which dictate perceptions of the world. All this change of the way we understand things, especially from the trivialization of Internet use, is supported by parameters, in the computational sense, and by the mediation of the very idea of parameter and parametrization, in a broader sense.

Ruy Sardinha: It seems to me that, at first, the idea of a world made up of units of information - such as the genetic code - will spread more and more, but they exceed man's ability to understand them. I.e. nature, society and the human constitution itself turn out to be formed by such a complexity, that man must construct artificial devices to assist him in understanding this complexity. Initially, shocks occur between the machine and man, a kind of arm wrestling trying to define who is stronger. A symbolic and very strong example in the imaginary is when a computer defeated the greatest chess player in the world, indicating that, within the human activity context par excellence, technological devices started being taken as mediators. I mean mediators of our relationship with nature, with others and with our own body. I mean a mediation able to influence or interfere with the formation of this imaginary. The possibility of having thinking machines allows, again, a reflection on what characterizes man's universe.

Also important in what you were saying about the creation of a new imaginary is the wide ease of access that people then had to these devices, economically speaking. One of the major developments of that time was the Internet transition from military to civilian universe. The perception that it suited very well in the entertainment universe of media and cultural industries helped to make it viable economically speaking. I remember when I was a kid, the sophisticated technological vision was present in 007 films - as indeed until now - but also in Batman and The Jetsons series. It stood as something almost impossible, located in a distant horizon, but at the same time it created a certain desire. From the moment that this desire

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became accessible to people's hand, it modified that inaccessible or apocalyptic vision that one had of such devices, as they greatly facilitated our tasks. A conviviality, a daily routine is created in using these devices, which will be increasingly important to our imagination. When computers became more accessible, many people who used to work with written text could not write directly on the computer yet. Many of them wrote by hand or typewriter and then someone entered their texts in digital files.

But back to the idea of mediation, I was thinking of how much the practice of medicine has been altered by the use of computer interfaces. That previous practice, in which the doctor observes the patient, auscultates him, makes an anamnesis, hears his reports on a set of symptoms and reaches a diagnosis based on knowledge of the body, through observation and touch, has been completely replaced by technological interfaces. Today, medical knowledge requires skill in reading digital images, ability to understand information technologically transmitted, and a professional who is not well trained in this type of mediation can come to totally erroneous diagnoses. It is important to think of how much some professional practices have been changed by the use of such new interfaces. And somehow it happens in architecture too. In fact, our daily practices are increasingly mediated by these technological devices. And what are these technological devices? They are a set of information, algorithms, and when I use these devices as a mediation between me and my body, between me and nature, I introduce this mathematizing universe as a dimension, if not of nature itself, but susceptible to intervene and dialogue with nature. Of course the physician will not develop software nor will design devices, but he must be able to translate in medical language the set of information or parameters represented there. And even though people do not discuss it clearly, the idea of having information tools mediating our relationship with the world, with others, has become a fundamental dimension of contemporary society.

Marcelo Tramontano: At this point, we could do a reverse exercise and think about the limits of this parametrized mediation, what do you say?

Ruy Sardinha: Yes, one question is what these medications do not cover? Or, in another way: what parameters escape parametrization? Because, indeed, not everything can be parameterized. Not everything is mathematizable, quantifiable, despite many attempts. That is, all parametrization is a reduction. The multiparameter universe is reduced to certain parameters, the graspable ones, those considered the most significant. So it is important to realize that despite the numerous advantages this universe brings, there are losses, there are things that escape it. One example is the idea of parametric urbanism. It brings us an initial question on what is urban, and then how much the parameters considered by the so called parametric urbanism are able to represent urbanity. Of course one can argue that traditional urban planning is also not able to, then we would realize that perhaps parametric urbanism can be a more comprehensive instrument than traditional urban planning. But regardless of sophistication or a slightly larger scope, it is still reductionist. Which is not to say that you can develop a method to produce urban space or to intervene on it encompassing all its aspects.

It is my feeling that questions such as "which parameters are left out of this process?" or "what elements parametrization does not handle with?" are important to approach critically these new practices and to seek advances. Another question is: "if the parametrized process can not encompass everything, would it be because certain things have not yet been parametrized?". This is another trend of the contemporary world, to naturalize certain behaviors, i.e. to assign genetic dimensions to certain things. We can take certain social behaviors as examples, the issue of sexuality among them. If I consider that sexuality has a genetic dimension, then somehow I can parametrize it, using DNA information in genes by applying certain procedures. It seems to be another tendency in the contemporary world the belief that certain aspects of our existence are not yet parametrized and therefore mechanisms can be developed to do so. But, in fact, can everything be targeted by parametrization? And moreover: what does it mean to accept that we must live with many dimensions that are not likely to be parametrized? Such questions bring once again the old dilemma between control

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and chance. They address the man's necessity to accept contingency, chance, improvisation, non-control, and this may be an eternal human question.

It is as if we brought to present time the situationists ideas concerning drift, and those about letting oneself be carried away by chance, thinking about how this non-control wake unusual situations able to tension the very idea of rationality or full control of the space. How to be lost by GPS times? If I have an absolute control over space, is there room for chance, for contingency, for losses? So we have this double dimension: on the one hand, the attempt of totally mapping space for georeferencing which, at least in its conception, tries to avoid hazards, and on the other hand, a real dimension that, despite this attempt, also leads to surprises. A good example is that couple in Rio de Janeiro a few weeks ago who wrote a wrong street name in a GPS device and ended up in a dangerous slum in the city of Niteroi. On the one hand, locative media as an attempt to control, and on the other hand, contingencies inherent to the very existence. I propose to reflect how much, in contemporary times, the everyday reality of these devices, which make a social and imaginary mediation with the world, which presupposes a certain control of this world, reduces the multifaceted universe for all this to get meaning. This reduction avoids encompassing a set of unquantifiable parameters or dimensions. Now: these parameters and dimensions are not yet quantifiable, or must we accept the existence of an area of uncertainty?

Marcelo Tramontano: A number of computing platforms, which handle with parametrization, has been designed so that their users have the possibility of emergence, of innovations, of surprises, so the unpredictable and the indeterminate can be inserted in their work processes. In the field of architecture, a great challenge for architects is to accept that emergencies and unforeseen events are desirable in design processes, because architects have learned that they must always determine everything in architectural design, and this determinism is the basis of understanding the architect as centralizer and coordinator of intervention processes in space. However, when using parametric computer programs to deal with complex realities, full of unpredictable and indeterminate aspects, such as urban projects, they can embrace much of what they would not encompass in traditional processes. I mean, good or less good, these methods provide the ability to identify, relate and understand aspects of things that perhaps using our technical knowledge and our classical *modi operandi* alone would not allow.

I am therefore seeking to link the two ends of our conversation. You started talking about the mathematization of the world since ancient Greece. At the end of all this path we are sketching here, we come to present day, a moment of computerization of the world, when mathematized information is being put in relationship and manipulated by computer. What I understand is that this is just another way - the one of our historic moment - to deal with that same old question. And in this computerized current way, the concept of parametrization is essential because the entire computing is based on the relationship between parameters via algorithms, which in turn command the devices you have commented and the actions they provide. So let me suggest you a final thought, as the completion of this exciting conversation: this attitude of mathematizing the world, trying to understand it and to give it meaning, would be a fate or a human desire? Would it not be about something that has always been pursued and that may continue to be pursued forever, in different ways each time, and in this present moment is conceived by and employs this technological and conceptual framework? To some extent, perhaps the will to deal with what is impossible-to-deal-with is part of human nature, the willingness to embrace unattainable dimensions of life, and perhaps this parametrized technological mediation, at this very moment, expand this possibility, even within its boundaries.

Ruy Sardinha: In fact, as you said, emergencies made possible by parametric processes allow decentralizing the architectural knowing. This means that the architect can review his knowledge field as from the use of such new technologies, which is not easy. It is not easy because it involves positions of power within the social universe - we are talking about multiple dimensions. But I want to draw attention to a fact you also mentioned that such emergencies are the potential emergencies within a certain technological procedure. A set of algorithms

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deals with a finite set of possibilities and therefore it would not be possible to observe an emergency incompatible with this set of procedures and standards. Emergencies are made possible by the technological apparatus we are using, which leads us to the following situation: this fact implies new issues and new challenges related to architectural professional practices because it allows to envision a set of things that the traditional practice fails to contemplate. In this sense, this issue has a heuristic dimension, internal to the architectural field itself. We are talking about architecture but this holds true for the various fields of knowledge. However, I insist that we should not forget that there are other dimensions and other emergencies which perhaps can not be covered by these technologies, and so we must, at all times, tense these technologies with these other elements.

As regards to the other question you propose, I think, yes, man or mankind stands before very old questions. So I started talking about ancient Greece and about the necessity to control versus chance, and man's relationship with nature. This journey from antiquity to the techno-science makes clear how much, in this man's struggle with what escapes him, humanity always builds answers or instruments to make the unknown a little better known. Perhaps what we see here is the contemporary reply to this big question. The awareness that Universe is formed by complex, multifaceted or multiparametric structures generates the need for new instruments to grasp the universe considering such complexity. The current development of parametric design and parametric technologies can thus be understood as responses to this new awareness. If we take the various worldviews throughout history, we will see how much technologies created and invented are always great answers to these questions, which are timeless questions. And although they are answers to specific questions, formulated in specific historical periods, these instruments can generate new questions. They can lead us to discover that, somehow, all this complex informational universe is but an illusion. This could turn out to become a new theory about the universe and create the need for new instruments to support that new worldview. We are in a constant movement that always introduces us new questions, and at the same time causes the world to reinvent itself. This is somewhat the fate of mankind.

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