We are what we do

We are what we do. Designers design. In the act of designing, they constitute themselves as designers. Some design without any exposure to theories of design-and even without knowing what the word "design" means. Others find out-or do not-that after studying for many years that no matter how much theory they've swallowed, and no matter how many assignments they carry out, what they do is not design; that is, they cannot constitute themselves as designers. They remain at the level of skillful craftsmen and can become quite good at what are usually called production tasks. This is especially noticeable in our days of intense technological development. It embodies the old distinction between doing and being aware of how and especially why designers do what they do. At this juncture, a question begs our consideration. What is design? Better yet, what does a designer do? In particular, what distinguishes the designer from the craftsman? Since design continuously changes, each definition risks questioning by new design experiences. Still, it is worth asking if we want to understand why people design.

On the semiotic condition of design

The word "design," of Latin origin, means "from the sign," "out of the sign," "on account of the sign," "considering the sign," according to the sign," through the medium of the sign." I quote from the reference section of my book, *The Civilization of Illiteracy* [1], and I do so not by accident (or lack of ideas). The chapter entitled "The Sense of Design" is dedicated to the definition and foundation of design in this new stage of humankind that I call "the civilization of illiteracy." It places design, as a well-defined practical experience of human self-constitution in the broad perspective of a new pragmatic framework. In other words, it relates the activity we call "design" to other activities-programming, communication, networking, sports, entertainment, cooking education, military, politics-that define the post-industrial age. And it does so by trying to define commonalities among these activities-such as decentralization, non-hierarchy, parallelism, distribution, heterogeneity.

The subject of the book is the dynamics of change, that is, the future. (Actually, any human activity is future oriented.) The position expressed in my book places this contribution to a discussion on design foundations in a difficult perspective. Foundations imply permanence. One of my major theses is that in our new civilization based on integrating means and methods, such as digital, genetic, networking, interaction, etc., permanence gives way to transitoriness. In other words, I indirectly claim that to discuss Foundations (*Grundlagen,* as the Germans call them) is to ignore the dynamics of change that today makes any attempt towards permanence impossible. To make things worse, I projected an understanding of "foundation" that identifies the *sign* as fundamental to any design activity. (Max Bense [2] did the same, although from a different perspective.) Furthermore, this understanding implies that the consciousness (awareness) of design is part of design, since nothing is a sign unless identified as such in awareness of its semiotic condition.

Please notice the difference between what has the nature of a foundation-such as the foundation of a house-and what is fundamental-we are self-aware living creatures. Indeed, for those who define themselves as *Gestalter*—i.e., makers of *Gestalt,* the German word impossible to translate

into English or French or any other language-the pragmatics of design is different from their own. *Gestalt* is an entity different from the sign. It is associated with an activity of structuring. The sign—more precisely, our practical experience with signs—is rather part of the infinite process of consciously associating an object (from the universe of our existence, i.e., nature and culture) with a representation with the aim of making the sign pragmatically relevant. If you allow, the *Gestalter* works on a subset of design, more precisely in the formal universe described by the *Gestalt* laws [3, 4]. It ascertains laws of perceptional organization (proximity, similarity, continuity, closure, obviousness) and served as guidance to designers (among others) attracted by a model in which the relation between the whole and the parts is essential. It is very challenging work, and it explains why and how German design, based on the laws of perceptional organization of *Gestalt* theory, dominated the design world for a long time. It also reveals that we deal here with the *Zeitgeist*: the meeting of the minds of brilliant *Gestalt* theoreticians (Kofka, Wertheimer, Lewin, among others) and of designers willing to embrace the scientific foundation of perception proposed by those scholars. But it also reveals why, in recent years, German design has had to reinvent itself and escape from the firm territory of its glory in order to re-ascertain itself from a new cognitive perspective that transcends Gestalt psychology. That *Entwerfen,* yet another German qualifier for design, conveys a different meaning from *Gestalt,* relating to a different practical experience, is evident (even to non-native speakers). *Entwerfen* [5] reflects the practical experience from which it originates: the framing that "unwarps" a sheet of fabric. With its allusion to the loom and the shuttle, this experience bears the rationality of the Industrial Age (in the word, we discover the traces of the activity it defines, i.e., of the practical experience through which some individuals constitute their identity).

Like the practical experience of hunting and gathering food, rooted in the relation between the self-constituting hunter (gatherer) and the hunted (whichever animal, including other human beings as in the case of cannibalism), the "design" of that particular time was based on immediacy: select (from what was immediately at hand, such as the human body, stones, sticks) and use it. (I use "design" in quotation marks because here we deal with incipient design activity.) Hunting processually embodied skills, experience, and knowledge. In other words, it becomes an entity subject to mediating elements. At the same time, various forms of sharing experiences-what we call communication-evolve, as we see them embodied in cave paintings, for example. They are also embodied in signs: pictures, shapes, volumes. Finally, experiences pertaining to the relation to forces unknown result in signs of rituals.

I do not want to walk the reader through the history of successive pragmatic frameworks. But I want to make the reader aware that design and agriculture relate to each other differently than design and manufacturing, as well as design and the digital, do [6]. What remains constant is the fundamental semiotic condition. By this I mean the following: In doing what qualifies an individual as a designer, one gets involved in a process, which in semiotics is called a semiosis, i.e., sign process. Within the process, representation—in visual forms or, more recently, in multimedia expressions—communication, and signification are pursued and finally embodied in the design (even if the design is an idea, a concept).

That semiotics is a metalanguage in respect to design (but not only to design) does not have to be explained here. What must be stated is that design has a semiotic condition, as opposed to many other human practical experiences. Hunting does not have a semiotic condition; neither does,

gathering. They take place with a certain directness, with no need of mediating elements. That design has a semiotic condition is its fundamental characteristic. It does not turn design into a science; it does not make design a form of applied semiotics; but it gives design a definitory characteristic without being reducible to semiotic praxis. Design is not the only human experience with a semiotic condition. Mathematics is semiotic in nature, medicine is, and so is computer science, at least in its so-called symbolic processing aspects (to name a few).
All this being said, we now need to look at the relation between design, the world (or reality, if you will), and our understanding of this world. Design work takes place within a given *Weltanschauung* (i.e., world outlook). I do not reduce this conception of the world to the usual historic aspects. It is obvious that in a given historic context, design is part of the many interactions defining the context, i.e., is influenced by and influences the context. Neither do I take the simplified view that design shapes the world (i.e., design as a mold, as Herbert Simon saw it [7]). Rather, I am aware of the fact that in every design we find not only what concerns people at a certain moment (the *how-to* aspects), but also the self-consciousness of the domain (the *why* aspects). What interests me in particular is the formative and normative power of the conception of design.

The dual nature of reality (and of design activity)

Design, from its beginnings as craftsmanship in various forms and as the activity of selecting things from the surroundings, to the time of Newton and Descartes (the 17th century), embodies the awareness of the world in rather static terms. Since Newton and Descartes, that is, since the time the world is explained through the deterministic sequence of cause-and-effect, design embodies this rationality. Indeed, design is focused on the physics of phenomena and results in a tremendous number of artifacts of all kinds that ascertain the reductionist-deterministic view of the world. It is a functional perspective. Its implicit determination is clear: Reduce goals to a meaningful level; apply the understanding of cause-and-effect to each action. This is a clear-cut functional perspective that eventually will result in the pragmatics of industrial society. Descartes had already perceived the human as a machine. It took the Industrial Revolution to instill the denomination of this view. Machines are without exception reducible to parts. Among the parts, cause-and-effect connections facilitate function. Design itself-the design of machines, messages, dwellings, even life-became part of the action-reaction sequence; and eventually this epistemological condition will be expressed in the fashionable formulation “Design is problem solving.” However, through all this time, there is another dimension of design that coexists with the problem-solving dogma but which does not come to expression in design theories or in design discourse (including the designer-client relation, i.e., the presentation industry). This dimension is *anticipation.* Designs from the contexts of rituals-acknowledging the relation between the human being and the unknown, unexplained, and sometimes threatening-bears a certain mysterious dimension and the hope for future well-being. They project an expectation of successful effort. Their rationality is the same as the rationality embodied in the ritual. In some ways, still to be explained, they express that characteristic of the living that distinguishes it from the non-living, and which we call *anticipation.* So does the current interest in branding. The brand is after all the dynamic representation of an identity; the stem cell the unfolding message of any human activity.

Actually, this is where I should have started: design as anticipation; better yet, design as an

expression of anticipation. But it is difficult to address anticipation without explanation. Moreover, it is difficult to address it from within an understanding of design that adopted the causal sequence as its implicit outlook of the world (including the world of human beings and their actions). As Einstein once put it (in reference to science): “No problem can be solved from the same consciousness that created it. We must learn to see the world anew.”

What does anticipation mean? As a first definition, anticipatory systems are systems whose current state is determined by a future state, not by a previous one. Within the context in which the ritual (and the design associated with it) emerges, the future state is the future that the individual associates with forces outside his understanding and control. The only rationality available is that of computing the benevolence of such forces through ceremonies (sacrificial, for instance). For the designer who shapes machines and who is dedicated to functionalism, this does not make sense, or no sense other than cultural. Indeed, the machine embodies our physical knowledge as we use it to make things that function, to make machines from elementary parts (which themselves are machines), to make the future possible, independent of external forces. In each machine, the past determines the future: press a button (switch) and something (hopefully what the designer and the engineer had in mind) will happen. The cause of the movement is clear: the engine is connected to a source of energy. Or, take a message, put it into some form (aesthetically relevant, psychologically efficient, culturally acceptable, economically feasible, etc. etc.), so that it can affect the reader: “Buy red sneakers.” “Vote for the Green party.” CAUSE and EFFECT, the meta-machine of every machine, entails the assumption that designers shape the future through architecture, interior design, furniture, household appliances, book design, fashion, messages of all kinds, TV programs, etc. etc. You name it, design delivers! The behavioral, functional model splendidly refined in the last century is implicit in this practical experience.

As long as we accept the reduction of reality to the laws of physics, this model of design, grounded in the scientific assumptions of reduction and determinism, works fine. Museums all over the world, design collections, books, videotapes, and CD-ROMs testify to the heights of this particular practical experience of design, In its more refined expressions-such as the Bauhaus, the Swiss school of typography (the Basel School of Design), the Ulm Design School, the fabulous design experiments in what used to be the Soviet Union (El Lissitzky, among others) and its European acolytes, the Cranbrook Academy of Design, and many other examples-this reactive form of practicing design eventually spilled over into anticipatory design. When, for example, the Rhode Island School of Design was founded (ca. 1877), the idea was simple: textile mills were in the vicinity. They needed qualified operators able to supervise the production of increasingly demanding products. But-and this is the genius of the School’s founders-they anticipated the possibility of new uses for what the mills produced. In other parts of the world (England, France, Germany), the same idea led to new programs that anticipated what engines might do, what electricity would eventually make possible, what the telephone would become. The driving force was not only the past, (technological achievements), but also the future (technological possibilities). The visionaries in effect broke through the barrier of reductionist determinism and their work no longer solved problems, but generated problems! They were no longer in the *service* business, but contributed to the multiplication of possibilities implicit in a given product [8]. They freed themselves from the chain of cause-and-effect in order to question styles, ideologies, paradigms, schools. They became pro-active. Buckminster Fuller [9] makes

for more than a simple reference or footnote. His theory promised, at its outset in 1927, to make possible a design education than challenged the prevailing economic patterns. He called it Anticipatory Design Science. For "anticipation" itself, Fuller chose the word "procession:" the influence of one dynamic system upon another. In 1950, he detailed an outline for a course, and in 1956, he taught the class at the Massachusetts Institute of Technology, as part of the creative Engineering Laboratory. The eight modules of his course can be seen as part of the broader system of *Synergetics* that eventually became his masterwork. Arguing from examples-as I partly have done-is sophistry at best. (Actually, one can never succeed because there is always the next example in every induction that throws the argument into the flames.) Instead, let us first go more deeply into what anticipation is.

Anticipation is a characteristic of the living. It results from the dynamics of existence. In a succinct description, anticipation is the "physics" of life as this unfolds in its many varieties (the lives of individuals, of groups, communities, species, inter-regnum life, life at the level of the universe, extra-terrestrial life, etc.). The living is, of course, subject to physics. We are matter and energy; we have weight; we have various properties (density, viscosity, permeability, etc.). But the living is also subject to its own "physics," i.e., anticipation. The stem cell is in anticipation of the possible individual to unfold from it. The physics of the stem cell is relatively trivial. The anticipatory dimension of the stem cell is extremely complex. Let it be noted here that some of the few scholars who have actively studied anticipation associated it with complexity (e.g. Robert Rosen, *Anticipatory Systems,* Pergamon Press, 1985). Indeed, as we reduce what is around us or what we want to do to smaller elements (matter reduced to atoms, electrons, protons) or to certain operations (building a machine, to the smaller operations on a production line), we gain insight into those parts; but we lose sight of their interrelations. We give up the full notion of wholeness in favor of fragmentation. Consequently, we end up with *simple* elements or tasks at the expense of acknowledging complexity. We can no longer explain how, in human experiences, the whole is more than the sum of its parts. Yes, leaving out organization and process makes things easier to comprehend, but it also takes away the life quality of design. In addition, it erases the notion of purpose. Things appear to us as existing, but not as having purpose. The elementary stem cell, around which so much discussion is generated, can guide some of our interrogation into design. Metaphorically at least, one can ask questions of design in respect to the stem cell: Who? What? How? Why? Where? When? What for? The last question pertains to purpose. The answer to it can only start with "Because!"

Design and purpose

It is not my intention to speculate on such fundamental questions. I only want to make the reader aware of a universe of questioning that reaches to the foundation of our existence as *living* entities. The understanding of a foundation (or many foundations) of design, or of successive foundations, is connected to our understanding of the living. Wind, sun, light, and water shape stones. We are very good at describing how this happens, and also good at performing similar operations-think about polishing diamonds-on whatever we want to shape (based on a given design, or in an act of projecting mental representations onto some object of our interest). At this time in the never-ending story of human activity, human experiences take place on a scale that was previously impossible: the extra-terrestrial (think of the Hubble telescope and the design aspects of its fixing) and the nano-domain. Moreover, we are no longer limited to the action-

reaction practical experience of existence, but we pursue pro-active, anticipatory activity. Because we indeed project awareness of the living upon the physical. We ask whether what we design and eventually build (AI programs, robots, ALife artifacts of all kinds) might reach a level at which we no longer distinguish between our own condition and that of these artifacts. We endow what we conceive of with "life"—this is the claim of those researching the complexity of life and conceiving of a realm of the artificial that is not effectively distinguishable from the living. Regardless of the domain, in order to make this life component viable, we have to endow it with anticipation (no matter how limited or trivial).

With the help of physics and sciences rooted in physics, we make headway in the spectacular cosmic exploration program. We are also good at calculating how a stone thrown in a certain direction moves; or better yet, how to "throw" in the "sky" various objects (rockets, satellites, etc.) and calculate their trajectories. We also experiment with computers and networks, generate nuclear energy, and make progress in genetics and the synthesis and production of new materials. Advances in medicine and agriculture, in transportation and urban planning are based on the same premise. In all these endeavors, design is present in some form or another. Probably the computer-based description of design as interface tells us best where design can claim its share of recognition in a world that calls itself in a scientific-technological revolution, but not necessarily a design revolution. But here is where the understanding of design as anticipation starts to make sense. Think about it: Medicine practiced in the spirit of physics amazes us through artificial components and extraordinary surgical prowess. Anticipatory medicine would help the patient pre-empt the need to be repaired like any other machine!

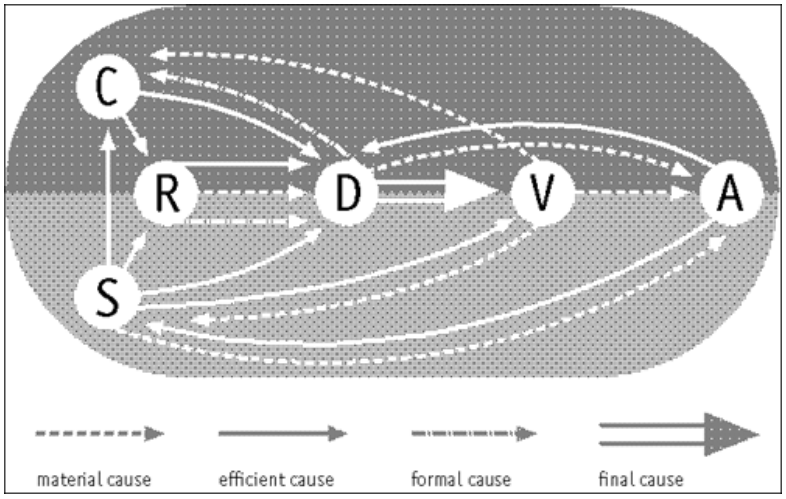
Anticipation as a characteristic of the living results from a dynamic different from that of physical systems. The cause is not outside-take a stone and throw it-but inside. As we know from biology, life originates from life, and differentiation takes place on account of living energy. Self-replication is the major characteristic here, and this self-replication concerns not parts, but relations among them. Instead of having an arthritic knee replaced with a titanium prosthesis, cartilage will be able to self-replicate. Living systems are defined by metabolism (a specific exchange with the surrounding environment) and by a function that Rosen defined as self-repair. In this view, organisms are (M-R) systems, constantly engaged in their own reconstruction. They are relational, not functional, entities. Indeed, the focus on *relation*, not parts (as in physics and our concentration on the machine model), and function, is fundamental here-and essential for understanding design as anticipation.

But all these elements are still at a level of generality well above the concrete nature of the design experience. All we know is that in the physical realm, design can serve as an organizational mechanism. But we also know that there is no spontaneous self-organization of the physical world. Moreover, as a human practical experience, design is an instance of the self-constitution of designers, as well as of those who encounter it. To select a design, to live in a designed context, to produce designed objects, to be addressed by design messages is to experience design (actively or passively). But only the living designs, and only the living experiences design; that is, the living can make the distinction between what is designed and what is not, moreover, what is well designed and what is less than well designed. Therefore, together with the realization of the physicality of design-impossible to transcend even in the immateriality of information-we are subjected to its anticipatory characteristic.

The functionalist view and practice of design is focused on the questions pertaining to the *How?* of this world. The relational view of design pertains to the *Why?* aspects or our existence and activity. The *Why?* implicit in the metabolism and self-repair system are in the first place an expression of self-preservation. But outside this level, we deal with the causes of human actions. This being the case, every time a cause lies in the past, determination is regarded as proceeding from past to the future. However, causes pertaining to life can lie in the future. In this case, design driven by the internal causality of the living (entailment, as Rosen aptly called it) is no longer in reaction to something, but is pro-active, before that something happens. From all we know about human considerations of causes (and causality in general), Aristotle's model comes closest to allowing us the understanding of the unity between causes from the past and causes in the future, i.e., the unity between reaction and anticipation. Here is the classic example of Aristotle's answer to the *Why?* question related to a house (the reader can substitute his own examples):

- Material cause: material with which the house is built, matter
- Efficient cause: the builder, the fabricator
- Formal cause: the blueprint (external/exterior, internal/interior
- Final cause: it has a purpose

We can use the understanding of an anticipatory perspective in providing a diagram for the practical experience of designing, i.e., how designers constitute themselves as professionals with a clear purpose and an associated set of methods, operations, evaluation criteria, and everything else that is called design knowledge. (The diagram is structural-relational.)



The relational systems model follows the path of diagrammatic reasoning. It captures the organization associated with the praxis of design and displays the unity between the relational and functional aspects of this practical experience. Take note: not the function of design, not the relational nature of a designed artifact, but the relational-functional aspects of the human activity called design. After examination of this diagram, it becomes clear where design's semiotic condition is significant:

- to identify material causes (transformation of materials, including financial means, in making them part of the defined entity)
- to identify efficient causes (actions that make the transformation of materials actually happen
- to identify formal causes (the blueprint, the algorithm, the procedure according to which actions lead to designed entities
- to identify the final cause (the purpose of design for which the blueprint serves as a plan guiding the actions that eventually result in products)

The left column (the line style for the arrows in the diagram, W.J.) is a proposed notation (syntactic level). One can use color coding or shape-based coding. It does not directly matter (although the signs we use also shape our interpretations). The right column spells out the semantics of the relational model. If read carefully, the description's embedded quality can be noticed. Indeed, the succession of causes is nested. Here we have an iteration process, and for all practical purposes, we'd better realize that each design activity is iterative by nature.

However, the pragmatic dimension (integrating syntax and semantics [Nadin, 10] is expressed in the relational model per se:

C Commission (*Auftrag*) including self-commission (design initiated by designers)
R Resources, including environment and the state of knowledge of design and associated skills; capital is also included
S Members of society, including designers and persons involved in design-oriented activities
V Value created (satisfying needs, generating needs), including profit of any kind: financial, moral, political, cultural, etc.
A Acknowledgment: how well the design fares, how much interest it stirs, how relevant it is in respect to itself and to any other human activity

C → R *Investment* (efficient cause for the design commission or initiative)
C → D *Investment* (efficient cause for marketing, selling the design or for making it available to society in some form)
S → C *Initiative* (efficient cause, leading to the commissioning process and its attached reasons)
S → R *Human resources* (efficient cause)
S → D *Specialized human resources* (efficient causes)
S → V *Turning design into value: marketing, design, criticism, design education, etc.* (efficient cause)
S → A *Acknowledgment of design* (material cause)
A → S *Feedback* (returns value to members of society) (efficient cause)
V → S *Rewards* (material cause)
D → V *Purpose of design* (final cause)
R → D *Prototyping, production* (efficient cause)
R → D *Integrating resources in design* (material cause)

R → D *Plans* (formal cause)
D → C *Plans triggering new plans* (formal cause)
D →A *Design acknowledgment* (as design) (efficient cause)
V → C *Reinvestment in new commissions* (material cause)
A → D *Return of design experience* (efficient cause)

The relational systems model is but another theory of design in which the presence of the sign is implicit. The physicality of design and its living aspect are united, since the causes relate materials, actions, representation, and purpose. The purpose—a future state—defines each state of the unfolding design process. This is why pro-active and reactive elements can be seen in their unity. Branding, the obsession of designers today, is only an example of what it means to work in anticipation while embodying the design in the physicality of the medium (intermedia branding as the next goal).

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Biographical note

The invitation to contribute to this Reader/Anthology makes several points. One is especially interesting and reflects my fundamental position: Tell me who you are (biographic notes, i.e., sequence of self-constitution over time), and the ensuing interaction among authors will not only result in productive exchange of ideas, but also in understanding how each of us arrived at the position we happen to articulate. This is how a meta-level of the argumentation will emerge. My self-constitutive experiences are part of my persona: studies in engineering and computer science, in the humanities (especially logic and aesthetics), in cognition and design; work in engineering (electronics, electrical, programming), in design (graphic, product, and interface design), in education. My theory of design became the program in Computational Design (designing for a future that integrates the digital). And within that program, my work resulted in graduates (bachelor and master degrees) with a very high success rate (as entrepreneurs, in start-up companies, as employees at solid companies). A number of professionals obtained their doctoral degree under my guidance and are working in higher education or in research. Their work has been published. My own design work focused on new concepts: multimedia tools (for instance, the Docent and MetaDocent, Web-based tools (primarily for knowledge dissemination), interface design, ubiquitous computing, and virtual reality. A large number of my projects have received awards. At this moment, my work is focused on anticipation, which I see as a second Cartesian revolution. Design and its anticipatory aspects are documented in an interactive presentation (video, CD-ROM, DVD) to eventually be utilized as a reference address on the Web for the world community.