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Introduction

A primary gratification of editing a journal that embraces as broad a field of research as *Design Issues* does, is discovering common themes that are rooted in different research strategies, whether stemming from history, theory, criticism, or empirical investigation. Since the journal began in 1984, the editors have been committed to bringing different kinds of research and arguments into relation with precisely the expectation that related concerns and issues would surface.

This issue of the journal provides an excellent example of that process. Among the themes that have emerged in this issue's articles are the changing role of the designer, the growing complexity of design, the need to incorporate the contributions of users in the design process, and the question of how the representation of a design situation conditions the designer's response to it even when the representation is at odds with how things actually are.

Massimo Negrotti establishes a framework for the issue with his careful discussion of our need to understand the meaning of "artificiality" when we make objects. This is particularly important in fields like bioengineering and artificial intelligence where methodological confusion may arise when the designer seeks to produce the counterpart of something natural such as a bodily organ or the human brain. Negrotti provides a clear vocabulary to clarify the relation between the natural and the artificial. The natural object is an *exemplar* which the designer apprehends according to different *observation levels* that range from the electrochemical to the physiological, aesthetic, or even spiritual. What is important is that the designer understand the *essential performance* of the natural object which will be produced in its artificial counterpart. By establishing a clear distinction between natural and artificial objects, Negrotti shows us that the designer's choice of observation levels is essential in creating an artificial object that can perform like a natural one. This puts a strong emphasis on the designer's ability to "construct" the design situation as opposed to perceiving the problem of replicating nature as given.

Malcom Miles, in his critique of urban design strategies that do not sufficiently incorporate a city dweller's lived experience, shows how easy it is for planners to ignore this experience, simply by the way they construct their design problems. He writes about the power and control inherent in developing design policies on the basis of maps and abstract representations of urban space and argues for the importance of dialogue with people who live in the places where planning occurs. To support his position, he selects and discusses four articles on planning theory that embody both exclusive and inclusive strategies of planning.

Miles's emphasis on the relation between planning methodology and the ability to "see" a situation echoes Negrotti's discussion of observation levels in relation to producing artificial objects. What is essential in both instances is the way that the designer views the design situation. For Miles, the issue is modernist reason, which obscures the messiness and complexity of lived experience, while for Negrotti it is that the designer's observation of nature will determine the way artificial objects are conceived in relation to it.

Where Negrotti sees the designer's relation of the artificial to the natural as a problem of individual perception, Wolfgang Jonas addresses the problem of how designing can be theorized within a social system. He draws heavily on philosopher Niklas Luhmann's concept of *autopoesis,* which claims that human beings are autonomous organisms who apprehend the world through observation. This governs their cybernetic exchange with the system. Jonas's espousal of social constructivism has some correspondence to Negrotti's theory of observation levels as well as Miles's argument that planning techniques are also constructed, although this construction is not always foregrounded by those involved.

Each of the three history articles in this issue focuses on an individual designer. Brought into relation with the articles on theory, they are very much enriched. Michael Large's article on Canadian designer Paul Arthur relates closely to Miles's critique of urban planning theory. Arthur spent much of his career working on problems of wayfinding. He moved from an initial fascination with the principles of Swiss typography to a much broader concern with making public signage comprehensible. This brought him to the understanding that it was essential to incorporate a great deal of information about the user into the planning process. Through case studies, Large shows us how he did this.

Gerd Fleischmann's article on a poster by Max Bill is a study of a single object. Fleischmann, a graphic designer and design educator, was involved with organizing the Bill archive and found hundreds of sketches for the poster he writes about, which publicized *Concrete Art,* a 1944 exhibition at the Basle Kunsthalle. Bill believed strongly in creating visual metaphors of order to counteract the chaos of the world. While this can work for an artist who is responsible first to himself or herself, it leads to the type of planning theory that Miles finds unworkable. Bill's faith in geometric metaphors can also be contrasted with Paul Arthur's desire to move beyond Swiss graphics in order to incorporate user perceptions. Fleischmann's article carefully details Bill's creative process and helps us to understand how the artist translated his desire for clarity into a formal object.

Lastly, Fujita Haruhiko article on Notomi Kaijiro fills in a missing piece of design history by describing the career of this little known design educator. Kaijiro was an official in Japan's exhibit bureau at the 1873 World Exhibition in Vienna, where he was

exposed to Western technology. Upon his return, he had the idea to adopt modern technology to reinforce, rather than replace, traditional crafts in Japan. In 1887 he established his first school of crafts and design and had an extensive career as an educator. This account of Notomi Kaijiro shows us how much more we need to learn about design in Japan and its relation to the country's industrialization process. While it is more difficult to find themes in Kaijiro's life that connect to the theory articles in this issue, his struggle with the relation between craft and the machine is a forerunner of the kinds of issues that we face today as we strive to better understand our engagement with the artificial. Even such an indirect connection makes the relation between history and theory worthwhile. It supports the value of history for the understanding of theory and enriches the meaning of history when it is informed by an awareness of contemporary concerns.

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Designing the Artificial: An Interdisciplinary Study

Massimo Negrotti

Introduction: Beyond Common Sense

Even in a scientific lexicon, some terms suffer from a sort of meaning inertness which seems to disappear only in actual use. Take, for instance, the adjective *artificial*: for almost everybody, it seems to designate something designed and produced by man, or anything that is not natural. In this way, "artificial" is a simple substitute for "technological," since all not-natural things, obviously, are made by means of some more or less refined human technology.

Scholars including Herbert Simon[1], Jacques Monod[2], and others have taken this position, neglecting the teleological difference between a cathode tube and an artificial heart. Actually, the *perspectiva artificialis* which Leonbattista Alberti and Piero della Francesca had in mind in the Renaissance was something quite different from this inertial meaning. In fact, everybody today also, understands the expression "artificial kidney," while nobody would attach any meaning to the expression "artificial telephone."

The reflexion on technology has not yet come to a scientific theorization and, on the basis of illuministic or romantic attitudes, it confines itself to an analysis which deals with technological objects as something which man constructs, after Archimedes, as "secondary and pleasant applications" of the so-called pure sciences, such as mathematics or geometry.

But, as a matter of fact, since the dawn of civilization, man shows a great, twofold constructive ambition: one, the Prometheus syndrome, aims at *inventing* objects and machines able to dominate the nature grasping its laws and adapting itself to them; the other, in turn, the Icarus syndrome, aims at reproducing natural objects or processes through alternate strategies,[3] as compared to those nature follows. While the former may be called *conventional technology*, the latter should be called the *technology of the artificial*. From the wings of Icarus, attached by naive glue, to current techniques for replacing human organs, or to reproduce the capacities of the mind or the properties of life through ancient or recent automata, there emerges clearly a *continuum* worthy to be seriously considered as a man's specific turn, which today's and future technologies will greatly enhance.

1 H.A. Simon, *The Sciences of the Artificial* (Cambridge, MA: MIT Press, 1969), tr. it. *Le scienze dell'artificiale* (Milano: ISEDI, 1970) 18–9.

2 J. Monod, *Il caso e la necessità* (Milano: Est Mondadori, 1972), 18.

3 R. Rosen, "Bionics Revisited" in H. Haken, A. Karlqvist and U. Svedin, eds., *The Machine as Metaphor and Tool* (Berlin and Heidelberg: Springer Verlag, 1993), 94–5.

A formula for defining the artificial may involve three logical points:

1. *A necessary condition:* the object or the process must be built by man;
2. *A sufficient condition:* the object or the process must be inspired by a natural one; and
3. *A methodological constraint:* the object or the process must be realized by means of materials and procedures different from those nature adopts.

Thanks to his extremely well-developed brain, man is an animal that not only adapts itself to the natural world, but tries to *know* it, to *control* it, and even to *reproduce* it. Furthermore, from a cultural point of view, many of us think that the ability to reproduce natural objects or processes exceeds our capability of knowing.[4] The rationale behind this is: if one is able to make an effective artificial organ, he cannot lack some deep knowledge of the natural organ. Nevertheless, what really happens very often is a different affair. As the history of artificial devices openly indicates, the reproduction of natural objects, or processes, frequently is an attempt to cope with nature "cost what it may." In other terms, under the pressure of some kind of urgency—curiosity or whatever—man has designed a wide range of devices, most often neglecting any accurate knowledge of the correspondent natural object. It is enough to think of artificial hair, teeth, arms, flavors, flowers (often and meaningfully defined as "feigned"), or even processes very far from each other, such as rain or intelligence, and taste or gravity.

On the other hand, what is it meant by an "accurate knowledge" of some natural object or process? This is a key point if one wants to understand the artificial and, on a different plane, science itself.

Logic of the Artificial

In whatever field one chooses, in order to consider artificial objects or processes (bioengineering, substitutes for natural elements or substances, artificial intelligence, robotics, artificial life, remakings, etc.), we may say that man cannot but reproduce something—which we shall name the *exemplar* —he has experienced at some *observation level.*

He then attributes to the *exemplar* some peculiar structural or dynamical property, that is to say its *essential performance.* Both the selection of an *exemplar* and the attribution of an *essential performance* strongly depend upon the available knowledge (not necessarily the scientific one) and the selected *observation level.* In turn, the selection of an *observation level* depends upon certain attitudes which range from pure personal belief to established scientific paradigms.[5]

In considering a biological system, a tree for instance, as an *exemplar* to reproduce, it is clear that the selection of a mechanical

4 R. Cordeschi, *La scoperta dell'artificiale* (Milano: Dunod, 1998).

5 C. Emmeche, S. Køppe, and F. Stjernfelt, "Emergence: Towards an Ontology of Levels," *Journal for General Philosophy of Science* 28 (1997): 83–119.

observation level leads to some possible *essential performances* which are very different from the ones coming from the selection of electrochemical, physiological or, perhaps, aesthetical, symbolical, or even religious *observation levels.*

To sum up this point, if the current scientific community maintains that the *essential performance* of the kidney is that of filtering the blood according to certain modalities, it will decree the success of a reproduction attempt if it will consist of a machine able to generate that filtering function. On the other extreme—but in the same logic—if people think that the devil exists and has some features, then its reproduction in painting will be accepted—as it was in the Middle Ages for the one proposed by Coppo di Marcovaldo in the Florence Baptistery—if the painting exhibits those features.

Thus, one can answer our question ("What does an 'accurate knowledge' of some natural object or process mean?") first of all, only by indicating different *observation levels* in different units of time, and then by taking into account the more or less objective and shared models of that object or process as "seen" from the *observation level* he has selected.

The selecting role of the *observation levels* is very clear even in the seemingly simple activity of selecting an *exemplar*. Actually, in this case, man "decides" to bring something into the foreground, leaving the rest in the background. This is an observational strategy, consistent with our nature, which very often works fine. But it also is an intrinsically arbitrary strategy which, having to deal with the reproduction of natural objects, reveals all its critical aspects. While scientists may separate objects and processes for heuristic reasons—giving rise to ultra-specialized disciplines on the basis of more and more specialized *observation levels*—artificialists have to introduce separations for practical and concrete reasons, since they have to build up something, and not only to study it.

But which rules govern the selection of an *exemplar* from the perceptive background? As we know, the "ways of seeing" are, to some measure, imposed or prevented by the culture we live in. But there also is a more objective problem before us, namely, that of the boundaries that separate the *exemplar* from the background.

Speaking of an artificial heart, we all refer to a well-known and recognizable *exemplar*, which is, at least apparently, well distinguishable from all that is not a heart. Obviously, to an engineer, the question is much more complex: which organic parts, vessels, muscles, subsystems, define the "boundaries" of the heart?

Besides our awarness of heart valves, today there are devices which assume as *exemplar* the left ventricle (the so-called *left ventricular assist systems*) and which should collaborate with the natural heart of the patient, and others which reproduce both ventricles. Only recently, the total artificial heart, able to completely replace the natural heart, has been considered an achievable target, but many

problems remain, and many of them may be conceived as problems concerning the fixing of boundaries.

As another example, if we want to reproduce a pond, how should we establish its boundaries? On a topological level, should we include in the pond even the geological structure of its bottom and of its sides? As far as the flora and fauna of the natural pond are concerned, which degree of likelihood should we reach, for instance, along the range that includes, on the one extreme, ducks and fishes and, on the other, microbiological creatures? It is quite clear that different answers to these questions will give rise to different models and concrete achievements, depending upon the essential performance we have in mind.

In the field of artificial intelligence, this is a well-known and very often debated problem: how may we fix the boundaries of human intelligence with respect to the other functions of mind, such as memory or intuition, and fantasy or curiosity?

In the extreme, we could consider the case of the *exemplars* drawn from the animal field, e.g., a *holothuria* ("cucumber of the sea") that lives symbiotically with the little fish *Fierasfer acus:* how could we separate these two entities, first of all in representational terms, and then in terms of design and of reproduction?

It seems clear enough to us, that the task of outlining an *exemplar* is a somewhat arbitrary operation by which one isolates an object or a process from a wider context, which includes it, or from an environment which hosts it.

Because of its philosophical and scientific tradition, Western civilization was highly capable of carrying out the analysis of the natural world, and gained great advantages from this operation. But analysis (significantly, the word derives from ancient Greek "to break down") surely is much more useful for scientific than for artificialistic purposes. Actually, while the knowledge we may get through analysis is always to be considered as a potentially valid one—at least in descriptive terms and, sometimes, even in predictive ones—the concrete reproduction of an *exemplar* which, in nature, behaves specifically could require the cooperation of many of its constituent parts. In turn, this will require more *observation levels*, and the analysis, with its usual isolation strategies, may not succeed in rendering observable all of the levels required.

The choice of an *exemplar* is a sort of literal "radication" of some region of nature, and this can happen, as we saw, both in terms of its concrete isolation in space, and of modeling its structure.

Science and Artificialism

Here, science and artificialism exhibit some discrepancy and some analogy. In fact, while science proceeds analytically, step by step, but without any hope of getting a definite knowledge at all possible levels, designers of an artificial device (let us call them "artificial-

ists") have to construct something real. Therefore, they set up "pieces of reality" *as if* they would know all that is necessary for "replicating" the *exemplar*.

Nevertheless, what cannot be wholly known, cannot be wholly reproduced. Just as it is conceptually impossible for scientists to synthesize a natural object through a bottom-up strategy, which could put together all of the possible observation levels, artificialists cannot expect their devices to possess all of the possible performances exhibited by natural *exemplars*, just because they proceed through a multiple-selection process: *observation level*, *exemplar,* and *essential performance*. On the other hand, while a scientist can write a book with chapters that deal separately with the mechanical, electrochemical, and physiological aspects of a tree, an artificialist who wants to make an artificial tree cannot build four or five artificial trees and put them together in one and the same device. Perhaps he could do so, but, he thus would build a gadget or a toy, rather than a "replica" of the tree. The main reason is that the relationships among different *observation levels* would require new *observation levels*, in a sort of hopeless *petitio principii.*

Replicating something is an autopoietical enterprise reserved to nature (or to man in very special and unnatural cases, e.g., when he reproduces man-made objects like in mass production or in cloning pure informational systems), while making the artificial means to build something on the basis of some (more or less) refined model of the *exemplar* and of its *essential performances*, assuming some clear-cut "profile" or *observation level*. This is a matter of analytical strategy—which has no rational alternatives—which prevents science from capturing the synthetic "core" of the whole system and, therefore, prevents artificialists from reproducing it.

In fact, what we name the *essential performance* of a natural *exemplar* always is "essential" with reference to some specific *observation level*, and not in ontological terms.

The selected *essential performance* can be very complex, and it even can include several sub-performances, but these must allow a manageable model because, otherwise, the problem of coordinating two or more *observation levels* would arise.

Since this is a rather general problem, empirical evidence can be drawn from several, different fields. John Young, a biologist involved in the sixties in understanding some aspects of the sensorial functions of the *Nautilus*, wrote:

> Another fascinating problem is the relationship between visual and tactile learning. […] Since the two systems overlap in the vertical lobe, maybe there is some kind of coordination between them. However, it has been demonstrated that the objects detected by sight are not recognized by touch.[6]

6 J.Z. Young, *A Model of the Brain* (Oxford: Oxford University Press, 1964), tr. it., *Un modello del cervello* (Torino: Einaudi, 1974), 278.

The attempt to reproduce in a bionic system the coordination between tactile and visual learning will imply the discovery of the whatever stuff it is based on, and, thus, a selection and even the creation of a third *observation level*. On the other hand, if we know the basis of the coordination performance, we have to make tactile and visual performances able to work according to its rules. This could introduce some additional problems which we did not face when we only had to reproduce the two performances as stand-alone functions.

If these additional problems can be solved, then the resulting artificial system will work well at the *observation level* described by the coordination performance if, and only if, its working is locally determined. That is to say if, and only if, the subsystem is a rather locally self-sufficient one which does not involve a linkage of any other subsystem with the coordination performance, and this is, of course, a very rare case. The basis on which the coordination works—as a truly new *essential performance*—could impose a complete redesigning of the two performances, visual and tactile learnings, in accordance to the needs of other systemic levels that govern the coordination as such.

The Artificial at Work: Inheritance and Transfiguration

Artificialist deals with concrete materials—not only with concepts—which involve material complexity. Whatever material has to be conceived as a reality observable from an illimitate number of *observation levels*, and, therefore, nobody can claim that he or she knows them completely. Scientists and artificialists share the same human basic rational limits, and this means that both, when considering some material, select some observation level. Thus, artificialists will select the *observation level* most coherent with their reproduction goal.

At the start, the materials and the technologies which usually are adopted for an artificialistic enterprise are taken from current conventional technologies, exactly as they are available in their own area. We may refer to the enthusiasm of Jacques Vaucanson, who was involved, in the eighteenth century, in a project to reproduce the digestion process of a duck, when he heard of the new rubber materials coming from India. Also today's researchers in the field of the artificial are, of course, always looking for conventional materials suitable for their enterprise. For instance, "The life-saving heart surgery, often relies on a polymer originally developed for women's fashions or a plastic meant for insulating electrical wires."[7] Thus, the search for application-specific improvements of the materials which have been originally taken from other applications, soon becomes a central concern in meeting the increasing pursuit of *essential performances*.

What should be clear is that the adoption of materials for replacing parts of a natural *exemplar*, or for getting some natural

7 The Whitaker Foundation, *Annual Report: Tissue Engineering,* Internet Website (http://fairway.ecn.purdue.edu/bme/whitaker/95_annual_report/tissue95.html) (1995).

essential performances from the artificial device, may generate unforeseable situations. The reason is that, very often, only one feature of the selected conventional material will overlap the properties of its correspondent material in the natural *exemplar.* But, as a principle, all of the features—known and unknown—of the material adopted will be unavoidably *inherited.* As a consequence, they will interact in an unpredictable way both with other parts of the artificial system, and with the hosting context (body, environment, landscape, etc.).

Surely, the most spectacular instance of this phenomenon is the bio-incompatibility which leads to the so-called "rejection" of allogenic substances or elements in biological organisms.

Nevertheless, it is a matter of a much more general tendency, which characterizes whatever artificial device or process when it is concretely realized and put at work in whatever environment. Every artificial device, object, or process, (be it an artificial muscle or a flower, an intelligent software program or a robot, grass or rocks, or whatever else) works fine only within a rather narrow spectrum of internal and external configurations: the ones matching the situation in which it was designed and constructed. In other terms, the artificial can exhibit an acceptable approximation of the natural *essential performance* it wants to reproduce only if the original *observation level* is respected, and if no relevant side effects due to unpredicted material interactions, arise. If we move even a little from that spectrum, then we get unpredictable behaviors or "sudden events" from the artificial, not belonging to the spectrum of performances normally exhibited by the natural *exemplar*.

To sum up, in an artificial device, the *transfiguration* of the natural *essential performance* may depend on four main reasons:

1. The "eradication" of the exemplar and, therefore, of its *essential performance* from the whole natural system, thanks to the unavoidable selection of a single *observation level*.
2. The interplay among the features inherited from the materials used in building the parts or components of the artificial device.
3. The interactions between these features and the host environment, and its features and requirements.
4. The growing amount of conventional technology which, as a rule, is needed to improve the essential performance, or simply to control and minimize the side effects.

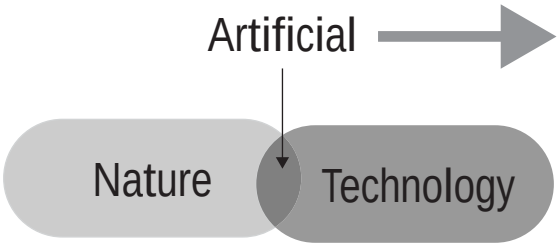
Thus, the unavoidable and paradoxical destiny of the artificial is that, starting from nature, it develops towards conventional technology (see figure 1) while trying to preserve an *essential performance* which may be impoverished or, sometimes, even improved, but always is transfigured in comparison with the natural one. A growing amount of conventional technology, means that the more an artificial device develops, the more its *essential performance* tends to represent a smaller proportion of the total amount of the perfor-

mances exhibited, actually or potentially, by the device. By the way, this explains why artificialists often give up their original projects and start a new ones suggested just by the "novelties" coming from their development.

Our discussion is not only academic: it deals with well-known real problems in bioengineering, where, in order to avoid transfigurations, i.e., troubles coming from the interplay of different *observation levels*: "Until recently, most research in the field [of cell transplantation] has focused on minimizing biological fluid and tissue interactions with biomaterials in an effort to prevent fibrous encapsulation from foreign-body reaction or clotting in blood that has contact with artificial devices. In short, most biomaterials research has focused on making the material *invisible* to the body."[8]

The artificial results from the overlapping of nature with conventional technology. The arrow pointing to the right suggests that the artificial, in its concrete achievements, cannot but develop towards conventional technology, and this fact pulls it further and further away from nature.

Figure 1



On the other hand, the tacit ideal of artificialists to get, even in the distant future, a "replication" of the *exemplar* is prevented not only from a logical viewpoint—if something is replicated, then it is not artificial—but also, as we said, from the impossibility to take into account all of the observation levels of the reality. Once again, a bioengineer clarifies the situation saying that, "If we want to engineer a material that has the characteristics of soft composite biomaterials, we have to understand the interactions at all scales, from the molecules up to the cells, and up to the macroscopic properties of tissues."[9]

It should be added that, in this field, the most advanced research trend is now on active biomaterials and, therefore, on devices which begin to be named as bioartificial: those materials which, in other words, are able to interact in a controlled way with some specific aspects of the body, rather than remaining intentionally separated from it. This means that, if the items we have discussed have some likelihood, they will enter the scene very soon because it is very difficult to imagine a biocompatibility at all the possible *observation levels*. Really, this would be the image of a replica rather than of some artificial device.

8 A.G. Mikos, R. Bizios, K.K. Wu, and M.J. Yaszemski, *Cell Transplantation,* The Rice Institute of Biosciences and Bioengineering, Internet Web site (http://www.bioc.rice.edu/Institute/area6.html) (1996).

9 W. Hoffman, "Forging New Bonds" in *Inventing Tomorrow* (Minnesota: University of Minnesota Institute of Technology, Spring, 1995).

The Intrinsic Fiction Component of the Artificial

The "invisibility" of the artificial is a very general constraint. The artificial has always to be "defended" from what comes from the neglected *observation levels*, that is to say from all the possible *observation levels* of the environment apart from the one which was assumed for the reproduction enterprise.

This is why "realistic" landscapes built for contemporary zoos have to be carefully maintained, in order to avoid degenerations due to the interactions among their components and with the hosting environment. This also is true for the Japanese *domes*, the well-known and big remakings of European or American landscapes, where people can spend their time in virtual holidays, or for the famous Paul Getty's Roman villa (the *Villa dei Papiri* of Ercolano, buried by an eruption of Vesuvio) near the Pacific Ocean.

Surely, these problems were well-known in the past. For instance by the Venetian doge Caprese who, in the twelfth century, asked the architect Nero Faggioli (founder of the *Scuola di Lattuga* from which some great masters including Filippo Brunelleschi and Lorenzo Ghiberti came) to build an artificial landscape with a mountain, a garden, a zoo, and even a stream moved by a pump which flowed down from the mountain.

But the same occurs in very different projects, such as artificial intelligence or robotics, where the *essential performances* can be obtained only within "paces of interactions" very carefully delimited by formal boundaries, concrete walls, and other controlling procedures which make artificial intelligence "purified" from all psychological and physical features which constitute it in humans.

In principle, an artificial device needs a sort of artificial environment, or, when this is impossible, it has to be "encapsulated" in such a way that, as said by twentieth century artificialism pioneer Willem Kolff concerning the artificial heart, it can be perceived by the environment only in its main function, that is to say in its *essential performance*. Said differently, an artificial heart has to "cheat" the organism.[10]

10 Personal interview with W. Kolff, reported in M. Negrotti, *The Theory of the Artificial* (Exeter: Intellect Books, 1999). See also M. Negrotti, "From the Artificial to the Art: A Short Introduction to a Theory and Its Applications," *Leonardo* 32: 3 (1999): 183–9.

Figure 2
Eighteen century automata.

Thus, we discover that even fiction and illusion play a central role in the growing history of the artificial.

Artificial cavities, or nests, for some animal species; artificial flavors or turves; flight simulators or artificial bodies for testing safety devices for cars, teaching or surgical techniques; artificial fertilizers, or gravity, and many other devices, are objects or processes which, like artificial organs, have to be "accepted" by their environments—users included—and this is possible only by some "illusory" strategy which is not, of course, a pure fiction game. Rather, artificialists try to force the environment or the hosting organism to orient themselves only towards the same *observation level* taken in the design and in the building up of the artificial device.

When this strategy is possible, the artificial realizes the *essential performances* which, in the natural world, are generated in the global interplay of the reality levels. When this strategy is impossible, the artificial realizes *essential performances* which are, so to say, at the disposal of and open to the environment. In both cases, the artificial generates *essential performances* which transfigure the natural performances it has to reproduce.

The degree of transfiguration, both in terms of quantity and quality dimensions, strongly depends upon the disposition of the natural *exemplar* to be eradicated from its context without any significant loss of its *essential performance*. In turn, all this depends upon the amount of relationships which, in nature, make possible the *essential performance*, and, even more, upon the quantity of *observation levels* involved by these relationships.

This explains why two different artificial devices referring to two subsystems of a whole system, like the human body, each working acceptably on their own, cannot easily be made to work together, when they reproduce two different *exemplars*, according to two *essential performances*.

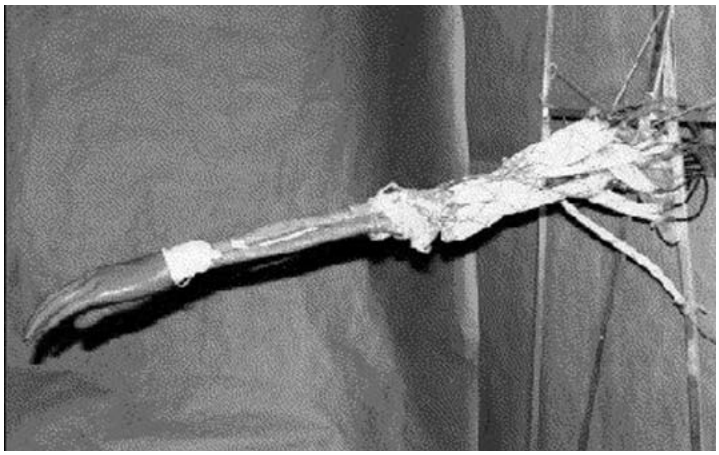


Figure 3
Artificial Arm.
(Biorobotics Laboratory at the University of Washington.)

As a rule of thumb, while this remains an open question, one has to think that the more the two natural *exemplars* and *essential performances* are functionally close to each other, the greater the difficulty, and vice versa. On the other hand, the knowledge of the "functional distance"—and of the *observation levels* involved by it—between two or more subsystems of a natural system is not always available, and this poses the greatest challenge to the work of artificialists. Therefore, the work of the artificialists, in every area, is truly an exploratory one.

Many researchers, for instance, appear to be persuaded by strictly analytical strategies. On the contrary, others seem to follow the idea that, in many cases, the problems of the materials is secondary, because the real problem in reproducing natural *exemplars* or, rather, natural *essential performances* is to find the right organizational plan. This was a central point in the study of artificial intelligence in the eighties, and in artificial life in the following decade,[11] both founded on the doctrines of the so-called *emergence*, a term coined by G. H. Lewes in 1875. According to this doctrine, in many real systems, the high level properties cannot be explained by the properties of lower levels.[12] In this approach, the main goal was the search for the "right organizational plan," neglecting the fact that a concrete artificial object or process, in contrast with pure informational systems, must adopt real materials and fit real environments.

More generally, these problems strongly emerge when we consider the possibility of combining and putting to work, in one and the same organism, two or more artificial devices. In this case, the inheritance of the materials adopted will explode exponentially, giving rise to a much more complex network of unpredictable interactions (on this point, see Negrotti, 1999).

11 C.G. Langton, C. Taylor, J. D. Farmer, and S. Rasmussen, eds., *Artificial Life II*, Volume X of *SFI Studies in the Sciences of Complexity* (Redwood City, CA: Addison-Wesley, 1992), xiii–xviii.

12 C.L. Morgan, *Emergent evolution* (London: Williams and Norgate, 1923). See also F.E. Yates, ed., *Self-Organizing Systems: The Emergence of Order* (New York: Plenum Press, 1987), idem.

Figure 4 (below)
The search for a kind of essentiality which could be shared by people. (Matthew Brand, MIT Media Lab.)

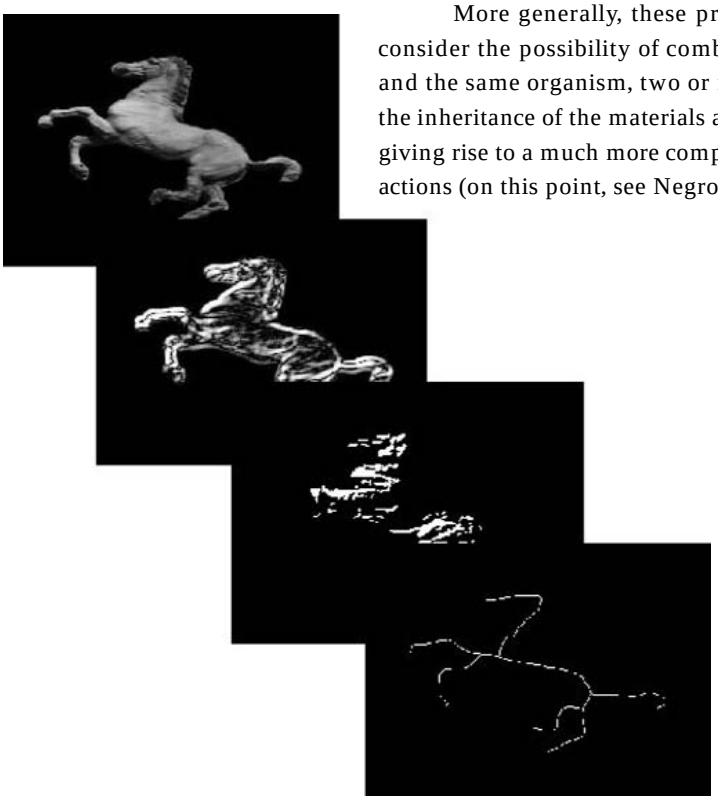


Figure 5 (above)
Artificial eyes: improvement of aesthetic performance. The "feigned" eye moves along with the natural one, thanks to a special substance which allows muscles to adhere to the rear of the artificial eye. (Bio-Vascular, Inc. Seen in "Movements on-line,"
Internet Site: http://www.ioi.com/index/html)

Conclusions

However, as a final general rule, one can say that "something will always happen": no artificial device will work *only* according to its designer's intention. In other words, the reality of the artificial is not less rich in levels than any other real object. This means that, in the end, every artificial object or process will behave according to its complex interplay of levels, and not only according to its design. This is, of course, a rather general rule that could also apply to conventional technology objects or processes. But, when the target is the reproduction of some natural *exemplar* and of its *essential performance*, the transfiguration—i.e., performance degenerations, sudden events, and side effects—cannot but assume a special meaning, not always dangerous and not always promising, but always "new" as compared to what nature exhibits.

These kinds of intuitions have started to appear in several fields of the technology of the artificial. For instance, in his 1994 doctoral dissertation, T. W. Hall at the University of Michigan highlights the limits and the "transfigurations" of artificial gravity (needed for the space journeys) as compared to the natural ones. He maintains that, beyond the machine which generates gravity, the environment in which natural gravity works and human beings live also should be studied and designed. We should, in other words, design the artificial environment surrounding the artificial objects. Hall concludes:

> The goal of environmental design in artificial gravity is not to fool people into thinking they're on Earth but, rather, to help them orient themselves to the realities of their rotating environment.[13]

In this sense, the realm of the artificial truly consists in a "third" reality, that lies between nature and conventional technology. It

13 T.W. Hall, "The Architecture of Artificial-Gravity Environments for Long-Duration Space Habitation." (Doctoral dissertation, University of Michigan, 1994).

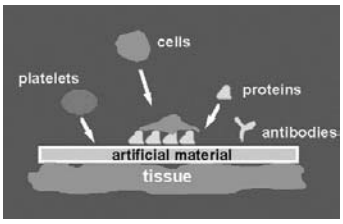


Figure 6 (above)
Mixing artificial and natural structures.

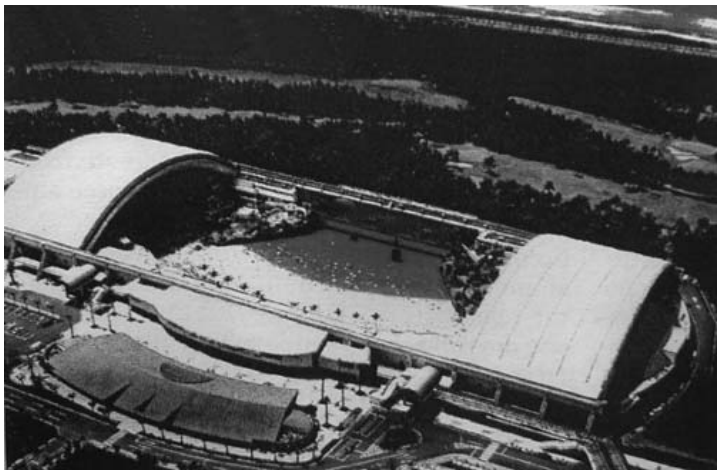


Figure 7 (right)
Japanese architectural remakings of landscape for leisure.

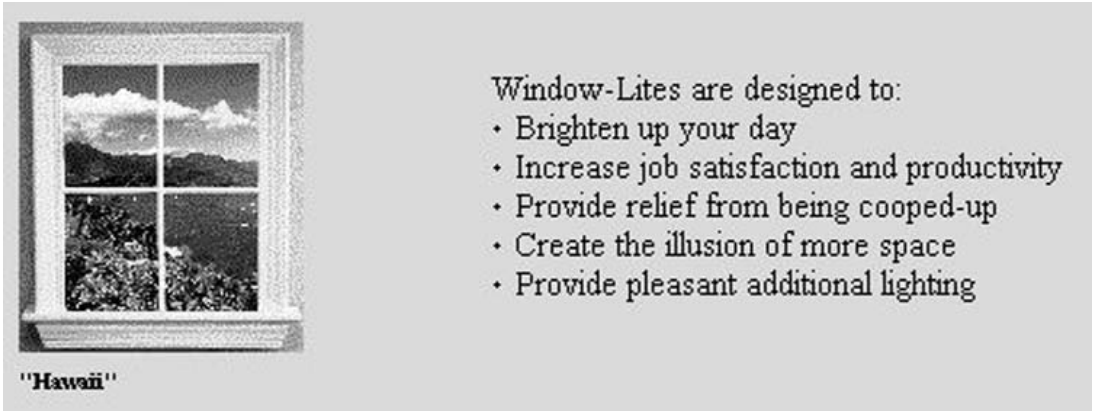


Figure 8
Two dimensional artificial landscapes. (Advertising for the American Brio-Brite company.)

cannot but "swing" between these two realities, since it can overlap neither the former nor the latter unless it loses its peculiarity. It is a matter of a new reality, coming from very far in the history of human civilization, which is destined to grow a great deal in the near future. We cannot face it in terms of pure common sense understanding or with a fragmented, nonunitary, conceptual frame.

Notomi Kaijiro: An Industrial Art Pioneer and the First Design Educator of Modern Japan

Fujita Haruhiko

Figure I
Notomi Kaijiro, immediately before the 1862 Envoy to Shanghai (from Notomi Sensei Dozo Kensetsu in ed., *Notomi Sensei Dozo Kensetsu Kinen-cho,* 1934).

I. Early Industrial Art and Design Education in *Meiji* Japan

It was around 1900 when design started to be taught at a few higher educational institutions in Tokyo and Kyoto. These government schools began to produce a number of design pioneers, who were influenced by the British Arts and Crafts, French Art Nouveau, and Austrian Secession movements and, from the mid-1920s on, the German Bauhaus. However, Japan's history of design education goes all the way back to 1887, when Notomi Kaijiro (1844–1918) established a municipal technical school in Kanazawa, Ishikawa Prefecture *(Ken),* the *Kanazawa Kogyo Gakko,* which soon became a prefectural school, the *Ishikawa Ken Kogyo Gakko.*[1]

The school was followed by the *Toyama Ken Kogei Gakko* (Takaoka, 1894) and the *Kagawa Ken Kogei Gakko* (Takamatsu, 1898), both established by Notomi, and the *Saga Kenritsu Arita Kogyo Gakko* (Arita, 1903), which became independent from the *Saga Kenritsu Saga Kogyo Gakko* when Notomi concurrently directed these two schools in Saga Prefecture. This was the final place in which Notomi dedicated himself to education in industrial art and design in *Meiji* Japan.

II. The 1862 Envoy to Shanghai

Notomi was a *samurai* and retainer of Nabeshima of the Hizen Saga domain (Saga Prefecture, after the establishment of the prefectural system in 1871), which was entrusted with the defense of Nagasaki, then the sole international port where Chinese, Korean, and Dutch merchants alone had been allowed to trade during the period of national seclusion (1639–1853).

In 1862, Notomi was sent by the Hizen Saga domain in a shogunate ship to Shanghai (figure 1). With him was young Takasugi Shinsaku, Godai Saisuke (later Godai Tomoatsu), and Nakamuta Kuranosuke on board among other *samurai* from different regions. In Shanghai, they heard the guns of the Taiping Rebellion, and realized the reality of China,[2] which also had adopted a national isolation policy, but afterwards was reduced to semi-colonial status after the end of the Opium Wars against Britain. From this experience in Shanghai, they became convinced that Japan must strengthen itself to avoid a similar fate and, in

1 Today, "*kogyo*" is the Japanese equivalent of "industry" or "technology"; and *"kogei"* means "craft." In the *Meiji* era, however, there was no very clear distinction between "*kogyo*" and "*kogei.*" In this paper, we therefore use Romanized Japanese rather than English translations for the names of schools, to keep their original Japanese names and meaning as they were.

2 K. Notomi, "Shanghai Zakki" ("Miscellaneous notes in Shanghai") in the Toho Gakujyutsu Kyokai, ed., *Bunkyu Ni-nen Shanhai Nikki* (Tokyo: Zenkoku Shobo, 1946), 3–37. See especially 6–14.

Takasugi's case at least, came to the opinion that the weakened Tokugawa shogunate (1603–1867), which was still the Emperor in Kyoto and all domains of Japan under subjection, must be overthrown by force.

This envoy to Shanghai is much less known in the design history of Japan than another 1862 envoy to Europe led by Takeuchi Shimotsukenokami, a shogun's retainer, who was, together with his entourage, depicted in an issue of the *Illustrated London News* when they visited the International Exhibition of 1862.

III. The *Meiji* Restoration and Notomi's Early Career

After coming back from Shanghai, Takasugi, together with his comrades, made a night attack on the British legation then under construction in Shinagawa of Edo (now Tokyo). This was two days after Takeuchi's return from Europe. Takasugi of the Choshu domain (now Yamaguchi Prefecture) was becoming a central figure in the movement to overthrow the shogunate.

Godai also was opposed to Britain as a retainer of Shimazu of Satsuma (now Kagoshima Prefecture), which, together with Choshu, was one of the most powerful domains. He once was taken prisoner when Satsuma fought against Britain in 1863. After having observed the power of the British fleet, however, Godai and some of his comrades changed their attitude toward Britain and Europe in general. Leading a number of students sent abroad by the domain, Godai went on a tour of Europe in 1865, and imported European arms, ships, spinning machines, and the like. The *Meiji* Restoration of 1868, mainly led by the Satsuma and Choshu domains and announced the formal return of political power from the shogunate to the emperor, became possible partly through the introduction of Western technology by the Satsuma, Choshu, and Hizen Saga domains. After the *Meiji* restoration, Godai became a business magnate.[3]

Nakamuta, who laid foundations for the Navy of *Meiji* Japan, became the director of the Naval Staff College and afterwards held the first post of the Chief of the Naval Staff before he suddenly stepped down from office at the outbreak of the Sino-Japanese War in 1894. The actual facts of the case have not been completely revealed.[4] But, it is conceivably possible that Nakamuta, who had witnessed the tragedy of Shanghai and known not only the weaknesses but also the latent power of China, as well as the common fate of East Asia, did not support a war with China. A better explanation for his stepping down is to be found in the so-called domain or clan government, in which men from the former Satsuma and Choshu domains held a large majority, and tried to control not only the political elite but the military leaders as well. Nakamuta was a fellow ex-*samurai* with Notomi from the Hizen Saga domain, which had become even more advanced in Western science and technology, but politically backward with respect to the Satsuma and Choshu domains.

3 Nihon Keiei-shi Kenkyujo ed., *Godai Tomoatsu Denki Shiryo,* 4 vols. (Tokyo: Tokyo Keizai Shinposha, 1971); and M. Miyamoto, *Godai Tomoatsu Den* (Tokyo: Yuhikaku, 1931).

4 T. Nakamura, *Nakamuta Kuranosuke Den* (Tokyo: Ozorasha, 1995). Reprinted edition of the same title privately published in Tokyo in 1919.

Unlike these fellow loyalists of the Restoration period, Notomi did not render any distinguished military service. Being physically weak, he often was sick in bed even in Shanghai. Although one of the reasons why he was chosen for the 1862 envoy was, perhaps, that he was good at sketching, he drew little in Shanghai because of his illness. After returning from Shanghai, he lead a quiet life in his domain to nurse his delicate health during the Restoration days. He was, in a sense, a *samurai* not with a big sword but with a small paintbrush. However, he also was a typical *samurai* who tried to utilize his paintbrush not for himself but for the campaign to "Increase Production and Promote Industry,"[5] to which the ex-*samurai* class contributed its major efforts in the *Meiji* era (1868–1912).

After the *Meiji* Restoration, Notomi again went over to Shanghai as a trade adviser of the Saga Domain Company carrying samples of sundry goods and seaweed which were among the main export items of Japan during this period. Although successful, he realized that the export of processed goods would be more profitable than that of raw materials, a basic principle of international trade.[6] Notomi thought that the export of industrial art objects in which Japan traditionally excelled over many other countries, was of prime importance for the country and, in 1871, went to Yokohama to master Western painting and to study the essentials of international trade. This was the year in which the Emperor's court finally dismissed its *daimyo* governors[7] and consolidated their domains into new prefectures. From this year on, Notomi worked, both nominally and virtually, for his country instead of for his former domain.

IV. The 1873 Vienna and 1876 Philadelphia Expositions

In 1873, Notomi was a technical official at Japan's exhibition bureau for the Vienna World Exposition, *Weltausstellung 1873 Wien*. Many other technical and administrative officials of the bureau also were from Saga Prefecture. Their president was Okuma Shigenobu (1838–1922), and vice-president was Sano Tsunetami (1822–1902). Both of them were ex-*samurai* of the former Hizen Saga domain. This was another example of clan solidarity, but a rather peaceful one. It was a byproduct of the Iwakura Mission to the United States and Europe (1871–73), which mainly aimed at the revision of the so-called Unequal Treaties between Japan and the Western powers.[8] The Iwakura Mission included numbers of leading figures in politics, and many of them were from the former Satsuma and Choshu domains. Because they were out of the country, the Japanese delegation of the Vienna World Exposition was composed mainly of men from Hizen Saga.

Seventy-seven Japanese men accompanying Gottfried Wagner (1831–1892) went over to Vienna to participate in the World Exposition of 1873 (figure 2). The Japanese shrine and garden con-

5 The *Shokusan-kogyo*, ("Increase Production and Promote Industry") was a major policy of the Japanese government in the early *Meiji* era in order to realize the ideal of the *Fukoku-kyohei* ("Rich country and strong military").

6 S. Hata, "Kogei Kyoiku no Senkusha, Notomi Kaijiro Sensei" in *Nihon-Shikko* (March, 1964): 3–9.

7 After the *Meiji* restoration, *daimyo* (regional rulers) were temporarily appointed governors of their former domains by the court.

8 The *Meiji* government sought to revise and replace the so-called "Unequal Treaties" concluded with the Western powers during the 1850s and 60s.

Figure 2 (left)
Japanese delegation to 1873 Vienna World Exposition. Photo taken in Vienna, January 1874 (From O. Umeda ed., *Waguneru Tsuikai-shu,* 1938). Notomi appears on the right side in front of a column.

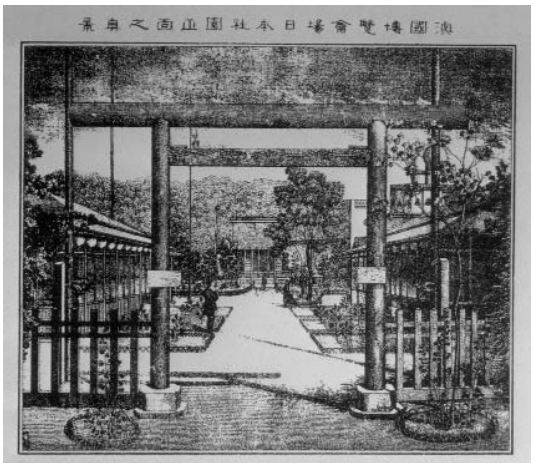


Figure 3 (right)
Japanese shrine and garden constructed in Vienna for the 1873 World Exposition (From Y. Tanaka and S. Hirayama eds., *Okoku-Hakurankai Sando-Kiyo,* 1897).

structed for the World Exposition (figure 3) possibly was suggested or even designed by Notomi, whose father was a leading *Shinto* priest. Wagner, who came to Japan in 1868, was a technical consultant and teacher from Germany. He helped local authorities improve the kilns in Arita. It was the beginning of his connection with the Hizen Saga domain. After the Vienna World Exposition, he played an even more important role in the campaign to "Increase Production and Promote Industry." His idea was to adopt modern Western technology to reinforce rather than replace the traditional crafts of Japan. After great success in Vienna, where Japanese crafts gained public favor, the Japanese government began to regard them as important merchandise.

Notomi also acted as an exhibition jury to select excellent works exhibited at the exposition in Vienna.[9] After the World Exposition, some members of the Japanese delegation, including Notomi, stayed on and studied in various European cities. Notomi visited several potteries in Europe. A mass-production method using plaster molds was one of the most important things he learned in Europe. On his return, he taught this method to students from pottery-producing centers of Japan at the exhibition bureau in Tokyo. This undertaking later was handed over to the *Kangyo-ryo,* an office for industrial development at the Ministry of Home Affairs.[10]

Two years after returning, Notomi was made an administrative official at Japan's exhibition bureau for the Philadelphia Centennial Exposition of 1876. He proposed the production of design sketches for craft objects to be exhibited at the exposition. The bureau hired artists to draw the sketches, which then were distributed among skilled craftsmen all over the country for production. In Philadelphia, Notomi again acted as an exhibition jury.[11]

V. From Tokyo to Kanazawa

Inconsistent policy by the *Meiji* government was an obstacle which Notomi had to break through. In January 1877, Notomi's teaching at

9 Y. Tanaka and S. Hirayama, eds., *Okoku-Hakurankai Sando-Kiyo* (Record of Participation in the Vienna Exhibition) (Tokyo: Moriyama, 1897), Jyo-hen (Vol. 1), 43.

10 Ibid., Ge-hen (Vol. 3), 107–108.

11 Ibid., Ge-hen (Vol. 3), 108.

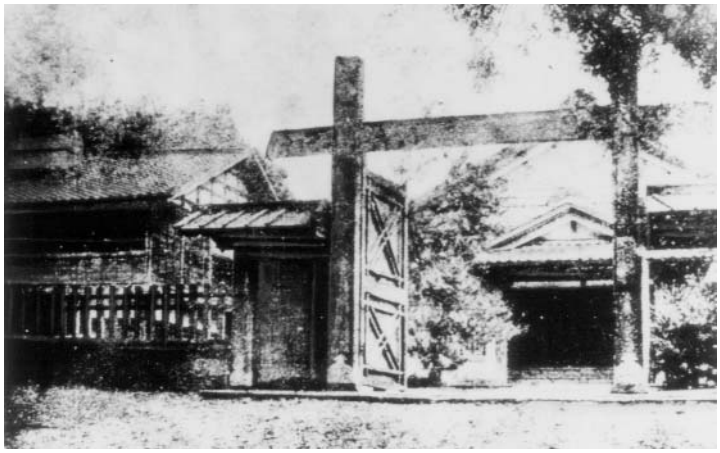


Figure 4
The *Kanazawa Kogyo Gakko* (renamed *Ishikawa Ken Kogyo Gecko* in April 1889, *Ishikawa Kenritsu Kogyo Gakko* in May 1901), Kanazawa, in the late 1880s. (Courtesy of the *Ishikawa Kenritsu Kogyo Koto Gakko* and K. Hamagishi, Kanazawa).

the Ministry of Home Affairs again was handed over to the Ministry of Industry, which gave priority to government enterprise over private business, and which finally abolished the teaching post in June 1877.

Notomi then resigned and, with another industrial-art pioneer, Shioda Makoto (1837–1917), established a private pottery, the *Edogawa Seito-sho,* for teaching and making pottery in Koishikawa, Tokyo. They made pottery utilizing the European mass-production system. They also established a soap works, a lacquer laboratory, and a cast-copper laboratory at the *Edogawa Seito-sho.* The pottery was a success as a place for experiments and education, but a failure as a business, and finally closed in 1882.

After the closing of the *Edogawa Seito-sho,* Notomi acted as a circular technical advisor in Ishikawa Prefecture giving guidance to the ceramic, copper, and lacquer industries. Besides technical guidance, he also helped to establish the first modern trade guild in Japan. All of the services he rendered in the trade and industry of the prefecture led to the establishment of Notomi's first school, the *Kanazawa Kogyo Gakko* in 1887.[12]

VI *Kanazawa Kogyo Gakko,* 1887— *(Ishikawa Ken Kogyo Gakko,* 1889)

The *Kanazawa Kogyo Gakko* was the first public technical school outside of the *Tokyo Shokko Gakko,* which had been founded as a government school in 1881, but was renamed *Tokyo Kogyo Gakko* in 1890. Therefore, it was the first "*kogyo gakko*" of Japan, and was something of an art school as well (figure 4). At that time, there was no very clear distinction between schools for higher technical education and those for secondary one. Boys and girls between thirteen and twenty-five years of age were admitted to the regular departments and divisions of the *Kanazawa Kogyo Gakko,* and men and women as old as thirty could be its semi-regular students.[13]

The *Kanazawa Kogyo Gakko* consisted of three departments, namely, the departments of Drawing, Art Crafts, and Common

12 Ibid., Ge-hen (Vol. 3), 110–113.

13 K. Takahori, et. al., *Kenko Hyakunen-shi* (Kanazawa: Ishikawa Kenritsu Kogyo Koto Gakko, 1987), 17–18.

Table 1
Comparative tables of curricula of Notomi's technical schools.

c. 1888
***Kanazawa (later Ishikawa Ken) Kogyo Gakko,* Study Subjects (except speciality)**

	Department		
	Drawing	**Art Crafts**	**Common Crafts**
Subject / **Divisions**	Japanese Historical, Botanical, Animal, Landscape, Figure Paintings Division	Wax Modelling, Pottery Painting, Embroidery, Wooden-Stone- Ivory- Sculpture, Dye Painting Division	Dyeing, Sewing, Pottery Making, Marine Products, Lacquer, Cast Copper Division
Reading	■	■	■
Writing	■	■	■
Arithmetic		■	■
Physics		■	■
Chemistry		■	■
Economics		■	■
Bookkeeping		■	■
Drawing		■	■
Geometry	■	■	■
Special Lectures	■	■	■
Prose and Poetry	■	■	
Archaeology	■	■	
Application to Products	■		
Zoology and Botany	■		
Painting Reproduction	■		
Drawing from Nature	■		
Calligraphy	■		
Perspectives	■		
Experiments		■	■
Mechanics			■
Analyses			■

1894
***Toyama Ken Kogei Gakko,* Study Subjects (except speciality)**

Subject / **Divisions**	Wooden Sculpture	Metal Sculpture	Copper casting	Lacquer
Writing	■	■	■	■
Mathematics	■	■	■	■
Physics	■	■	■	■
Chemistry		■	■	■
Industrial Economics	■	■	■	■
Industrial Bookkeeping	■	■	■	■
Drawing	■	■	■	■
Mechanical Drawing	■	■	■	■
Design	■	■	■	■
Applied Drawing	■	■	■	■

1898
***Kagawa Ken Kogei Gakko,* Study Subjects (except speciality)**

	Department					
	Woodwork			Metalwork		
Subject / **Divisions**	Wooden Sculpture	Lacquering	Mechanical Woodwork	Metal Sculpture	Casring	Mechanical Metalwork
Writing						
Mathematics						
Physics						
Chemistry						
Industrial Economics						
Industrial Bookkeeping						
Freehand Drawing						
Mechanical Drawing						
Design						
Applied Aesthetics						

Offered in 1898

Not offered in 1898

1900
***Kagawa Ken Kogei Gakko,* Study Subjects (except speciality)**

	Department					
	Woodwork		Metalwork		Lacquer	
Subject	Wooden Sculpture	Mechanical Woodwork	Metal Sculpture	Mechanical metalwork	Gold Lacquer	Mechanical Lacquer
Reading						
Writing						
Mathematics						
Physics						
Chemistry						
Industrial Economics						
Industrial Bookkeeping						
Drawing						
Mechanical Drawing						
Design						
Applied Aesthetics						
Moral Lessons						
Military Drill						

Figure 5
Notomi Kaijiro, director of the *Ishikawa Ken Kogyo Gakko,* around 1890. (Courtesy of the *Ishikawa Kenritsu Kogyo Koto Gakko* and Y. Ito, Kanazawa).

Crafts. To judge from its curriculum (figure 9), the Drawing Department was a kind of design department. The Art Crafts Department concentrated on crafts. The Common Crafts Department was a department of industry and technology, rather than that of crafts. However, what they called Common Crafts was neither mechanical engineering nor chemical engineering. The Common Crafts Department consisted of divisions of dyeing, copper casting, marine products, sewing, lacquering, and pottery making. Therefore, compared with the Art Crafts Department, which consisted of divisions of wax sculpture, drawing for dyeing, pottery painting, wood-stone-ivory sculpture, and embroidery, the Common Crafts department dealt with crafts for the common man. *"Futsu" of "Futsu-kogei-bu,"* the Japanese name of the Common Crafts Department, means "common," "ordinary," "average," or "everyday." For example, both lacquered and marine products were not only a Japanese specialty, but also what Japanese people, average as well as above average, used and consumed every day. The word and concept of *"futsu"* was important in the history of design education in modern Japan.

We can understand the Department of Drawing as a kind of design department, judging from its position in the school. However, five units of the department were for "Japanese History Painting," "Botanical Painting," "Animal Painting," "Landscape Painting," and "Figure Painting." Therefore, it was more of a department of painting mostly applied to product surfaces.

A characteristic subject of study was "Prose and Poetry." Appreciation of the beauty of nature in the four seasons and the classics, Japanese as well as Chinese, were considered essential for future designers and art craftsmen.[14] Students of the Common Crafts department did not take this subject and "Archaeology." Instead, they took "Experiments," "Mechanics," and "Analyses."

The *Kanazawa Kogyo Gakko,* a municipal school, became prefectural as a result of Notomi's efforts, and was renamed *Ishikawa Ken Kogyo Gakko* in 1889. For all his success, Notomi's health rapidly declined. He suffered from pleurisy, and fell into a critical condition the following year (figure 5). To make matters worse, he was entangled in political strife. It was the year when the *Meiji* Constitution finally was promulgated.

The *Jiyuto* (Liberal Party), Japan's first national political party, and the *Rikken Kaishinto* (Constitutional Reform Party) of Okuma Shigenobu gained a majority in the first session of the Imperial Diet against the government ruled by the Satsuma and Choshu clans. However, the Cabinet was still organized by the latter, and the two political camps were pitted against each other all over the country. It was around this time when Notomi from the former Hizen Saga domain, was degraded from being director to head instructor of the school. Following this, he was further degraded to teacher, and finally to part-time instructor. It was probably the hardest time for him as an educator.

14 In *Meiji Japan,* talent for poetry and art, including calligraphy or penmanship, was considered essential for respectable people, and many men had their own artist's name, that is, a poet's name or pen name. For instance, Notomi Kaijiro also was known as Notomi Kaido, and Kuroki Yasuo, who took Notomi's chair as his successor in Takamatsu, was much better known as Kuroki Kindo.

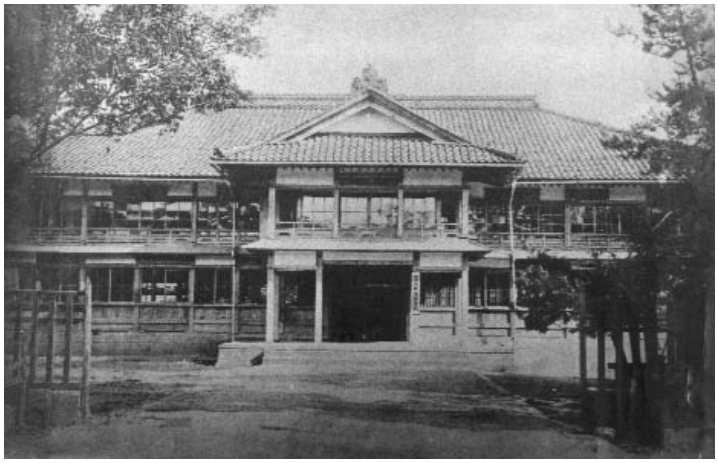


Figure 6
The *Toyama Ken Kogei Gakko* (renamed *Toyama Kenritsu Kogei Gakko* in October 1901), Takaoka, in the 1890s. (Courtesy of the *Toyama Kenritsu Takaoka Kogei Koto Gakko* and K. Joho, Takaoka).

Figure 7
Carved and lacquered tray, *Tai-bon (Mukai-dai),* designed by Notomi in 1894–97. (Courtesy of the *Toyama Kenritsu Takaoka Kogei Koto Gakko* and K. Joho, Takaoka).

VII. *Toyama Ken Kogei Gakko,* Takaoka, 1894–

Asked by Tokuhisa Tsunenori (1843–1910), Governor of Toyama Prefecture, Notomi subsequently established the *Toyama Ken Kogei Gakko* in Takaoka in 1894 (figure 6). Takaoka was a center for traditional crafts such as cast-copper products and lacquer ware.

In Takaoka, Notomi did not adopt the ambitious but rather complicated department-division system of his former school for the *Toyama Ken Kogei Gakko.* The new school simply consisted of divisions of Wooden Sculpture, Metal Sculpture, Copper Casting, and Lacquer. A division of design, the Drawing Department in Kanazawa's case, was, at first, not established there. This does not mean that Notomi abandoned design education in Takaoka. As can be observed in the curriculum of Takaoka's four divisions, design subjects were included in each division (table 1). Possibly owing to his experience in Kanazawa, Notomi seems to have realized that design should be taught in every division, and that all future craftsmen should learn design at their schools.

Although Notomi was still in poor health and working in a director's office with a bed on which he could lay himself down at any time, his administrative work was successful in Takaoka. He also tried to use his influence in the interest of Takaoka crafts with his own design experiments. A large carved and lacquered tray, called "*Tai-bon*" or "*Mukai-dai*" (a pair of red snappers) is a rare existing work designed by Notomi (figure 7).

In Tokyo, one of his fellow countrymen and the past president of Japan's 1873 Vienna Exposition bureau, Okuma, took office as Prime Minister in 1898. It is said that Notomi was suggested by Okuma to administrate the first and only official art school in Japan, *Tokyo Bijyutsu Gakko,* which was then in turmoil, but he declined the offer not only because he wanted to teach future industrial artists rather than painters or sculptors, but also because he wished to avoid any suspicion of clan-government favoritism.[15] Instead, Notomi moved to Takamatsu in Shikoku, the smallest of Japan's four main islands, to establish another technical school there.

15 S. Hata in *Nihon-Shikko* (March 1964): 8–9.

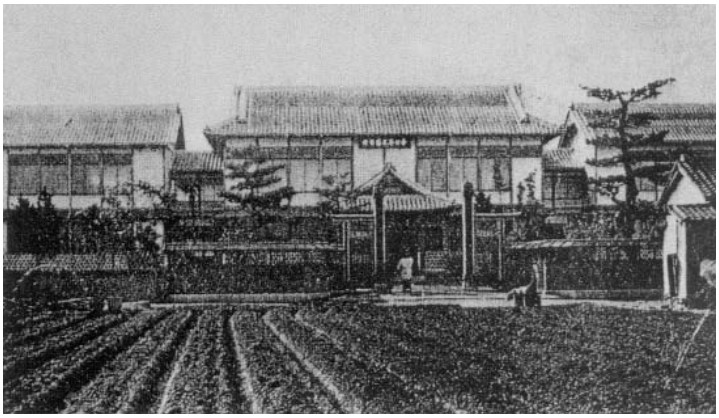


Figure 8
The *Kagawa Ken Kogei Gakko* (renamed *Kagawa Kenritsu Kogei Gakko* in May 1901), Takamatsu, in the 1900s. (Courtesy of the *Kagawa Kenritsu Takamatsu Kogei Koto Gakko*).

VIII. *Kagawa Ken Kogei Gakko,* Takamatsu, 1898—
Again, it was Tokuhisa who asked Notomi to come to Takamatsu to establish the *Kagawa Ken Kogei Gakko.* Tokuhisa had been transferred to the Governorship of Kagawa Prefecture in 1896. He was Notomi's fellow countryman and called *"Kangyo-chiji"* (the Governor who encouraged industry). These two fellows from the former Hizen Saga domain worked together and promoted the development of local industry.

Founded in 1898, teaching at the Takamatsu school began in a temporary building. Its new building, completed in 1900, was supervised by Notomi, and possibly designed by him as well (figure 8). Its symmetrical form was considered *"Byodo-in"* in style after the Phoenix Hall, *Ho-o-do* of the *Byodo-in* of Uji. It might also have reflected that of another Phoenix Hall, the *Ho-o-den* built in Chicago as a Japanese pavilion for the world's *Colombian Exposition of 1893.*

The school started with four educational divisions, namely Wooden Sculpture, Mechanical Woodwork, Lacquering, and Metal Sculpture.[16] The Mechanical Woodwork division was for woodworking by machine, as can be read in the school regulations reported by a local newspaper: "Today's industry of this country is practiced mainly by hand without the help of machinery. As industry develops and wages rise, however, it is natural and a matter of course to use machines in industry. Therefore, we teach how to use machines to produce various things and call the teaching unit for it Mechanical Woodwork division." [17]

The word "mechanical" is significant for the design history of modern Japan, because here an important concept was reflected in the name of that teaching unit itself. The original Japanese word Notomi used for it was *"yoki."* [18] Between 1898 and 1900, Casting and Mechanical Metalwork divisions were added to the school, which was further reorganized in 1900 into a very symmetrical department-division system (table 1). Notomi's idea of industrial art and design education seems to have been reflected in full in this curriculum. The school was renamed *Kagawa Kenritsu Kogei Gakko* in 1901.[19]

16 It might have started with five divisions. Historical records vary in details.

17 *The Kagawa Shinpo,* February 20, 1898. Quoted in Hyakushunen-kinenshi Hensan Iinkai, *Takamatsu-kogei Hyakunen-shi, Motozue* (Takamatsu: Kagawa Kenritsu Takamatsu Kogei Koto Gakko, 1998), 48.

18 " Yo" of *"yoki"* is the Japanese equivalent of "use"; and *"ki"* means "apparatus," "instrument," or "machine."

19 Other noticeable subjects added to the curriculum around 1900 were "Moral Lessons" and "Military Drill." Physical exercises became important in the age of nationalism. The modern Olympic Games, started in Athens in 1896, also reinforced this tendency.

IX. *Kagawa Kenritsu Kogei Gakko* visited by Frank Lloyd Wright

A young American architect visited the *Kagawa Kenritsu Kogei Gakko* in Takamatsu in 1905. He called the school "Takamatzu Industrial Arts." [20] It was Frank Lloyd Wright (1867–1959) on his first visit to Japan. An undated manuscript kept in the Frank Lloyd Wright Archives of Taliesin West shows us his sensitive observation of this school, sympathetic understanding of the culture and history of Japan, as well as critical attitude toward the Westernization of this country.

Wright, who had caused a theoretical revolution in the Arts and Crafts movement in the United States by his famous speech "The Art and Craft of the Machine" of 1901, was not in favor of the use of machinery in Japan in the manuscript. One of the reasons why he was against the introduction of machines into Japan was already shown in his 1901 speech:

> The machine has emancipated these beauties of nature in wood; made it possible to wipe out the mass of meaningless torture to which wood has been subjected since the world began, for it has been universally abused and maltreated by all peoples but the Japanese.[21]

Before Takamatsu, Wright perhaps had visited Kyoto, judging from the above-mentioned manuscript: "As to the director of the foreignized Kyoto school said to me, with an apologetic smile, 'We must now be quick, Old Japanese method become too slow, we can no longer afford, European method cheaper, I think?'" [22] Wright's response to this opinion is shown in his comment on the school's collection: "The 'collection' of this school consists of the worst of French, German and Italian Renaissance, rows of foreign horrors." [23] The collection seems to have consisted mainly of European turn-of-the-century items rather than real Renaissance ones, and the school must have been the *Kyoto Koto Kogei Gakko,* which had been founded in 1901 as the third *"koto kogyo gakko* (higher technical school)" of Japanese government, but actually was called *"koto kogei gakko,"* because it was a more art-oriented technical school.

At the *Kagawa Kenritsu Kogei Gakko* in Takamatsu, Wright found a "small but true Japanese" collection instead.[24] He also found that, under its director's leadership, they still inculcated "Pure Japanese." [25] The director at that time was Kuroki Yasuo (1866–1924), an authority on the Chinese classics. He succeeded Notomi, who had left for Saga in 1901 after establishing the foundation of the school. Kuroki's father was a priest and an eminent leader of the *Shinto* religion of the Takamatsu domain (later Kagawa Prefecture). Notomi and Kuroki thus had something in common in their backgrounds. Unlike Notomi, Kuroki did not paint, but he was a master calligrapher as well.

"Pure Japanese" teaching at the school probably was what Kuroki inherited from Notomi. For instance, drawing sketchbooks

20 Undated manuscript, Frank Lloyd Wright Archives, Taliesin West, 11. Professor Tanigawa Masami kindly showed me a copy of this manuscript sent from the Frank Lloyd Wright Archives. Margo Stipe of the Archives dated it around 1905–6. Hereafter we refer to it as F.L. Wright, 1905/6.

21 Frank Lloyd Wright, "The Art and Craft of the Machine," (1901) in Edgar Kaufmann and Ben Raeburn, eds., *Frank Lloyd Wright: Writings and Buildings* (Cleveland and New York: The World Publishing Company, 1960), 66.

22 F.L. Wright, 1905/6, 8.

23 Ibid., 8.

24 Ibid., 10.

25 Ibid., 11.

Figure 9
Drawing for a metal flower-vase, a graduation design, by Kobayashi Sadashichi, 1901. (Courtesy of the *Kagawa Kenritsu Takamatsu Kogei Koto Gakko* and I. Yamamoto, Takamatsu).

of Kobayashi Sadashichi,[26] one of the first graduates of the school, are full of flowers, birds, fishes, insects, and the like, drawn with a hair-pencil in Japanese style (figure 9). Although Notomi introduced various Western things and ideas, he was conservative in terms of drawing methods and design aesthetics. F. L. Wright, one of the most progressive architects of the time, also was conservative in this respect. He wrote:

> There seems to be but one hope for the artistic future of the Empire. It lies with the conservative party in Japan,…".[27]

When young Kuroki entered Tokyo University in 1885, an American scholar, Ernest Fenollosa (1853–1908), who had contributed to the reassessment of traditional Japanese art and brought its appreciation to the West, was teaching philosophy and logic there. After teaching at a few schools in Tokyo, Kuroki came back to Kagawa Prefecture and taught at its normal school before being appointed Director of the *Kagawa Kenritsu Kogei Gakko.* Among the frequent visitors to Kuroki's house in Takamatsu was Nogi Maresuke (1849–1912), then the divisional commander and lieutenant general, and a later symbol of loyalty and sacrifice after his self-immolation with his wife in the evening of the funeral of the Emperor *Meiji.*[28]

Wright visited Takamatsu probably to see Kuroki and his school. He might have had an interest in its school building as well, but did not mention it at all in his manuscript: "The Director, Kuroki, was proud of the fact that the arts have never been separated from the crafts in Japan, and suggested that it might be a good subject for thought on the part of his arch enemy, the Western art school. And can we say that a truly great art is possible when the arts and crafts are not united?" [29]

It was not simply a Japanese idea, but also Wright's own opinion as well as something we may find in William Morris or even in the 1919 manifesto of the German Bauhaus. It was Notomi,

26 Now kept at the Kagawa Kenritsu Takamatsu Kogei Koto Gakko.

27 F.L. Wright, 1905/6, 9.

28 General Nogi visited Kuroki once a month to learn Chinese poetry and calligraphy. This friendship was unshaken until the ritual suicide of Nogi and his wife on the evening of the funeral of the Emperor *Meiji* on September 13, 1912.

29 F.L. Wright, 1905/6, 17.

Figure 10
Ornamental wooden tray or "*Marugaku-Hakusai-no-zu.*" (Courtesy of the *Kagawa Kenritsu Takamatsu Kogei Koto Gakko*) .

however, who laid the foundation for it, as has been shown, by not separating design courses from other craft courses, but by uniting them into one in his school curriculum.

> Wright's close observation continues:
> In this wonderful little school, an all around training includes painting, lacquer, and carving. Their results are astonishing. In none of these things is the process of manufacture allowed to be lost in the finished result. It is made an artistic and interesting circumstance in the result; as in a small wooden saucer where the strokes of the carving tool in cutting away the wood had been given a rhythm, which so serves as a finished decoration that the mere record of trimming off superfluous wood at the back of the saucer is an artistic feature, the only one attempted in the result.[30]

What Wright observed possibly was a course in the Mechanical Woodwork division rather than that of Wooden Sculpture. Although they had announced at the opening of the school in 1898 that "various processes are carried out by using machine" in the former division, what they actually used in their early days were manual-turning apparatus, because "steam-operated big machines, which might be used in large cities, are not necessary yet in local areas." [31] Wright wrote, "I was glad to know that such integrity existed, fighting though it is for its existence against fearful odds, and I was ashamed to realize that we of the West in the arts stand for its fatal enemy." [32]

Unfortunately, there is scarcely any record of the early years of the school which include the Mechanical Woodwork division left in Takamatsu. Almost all school records and artworks, not to mention its buildings, were destroyed in the fire of 1926. The new buildings of 1928 were again burnt to the ground in 1945. Takamatsu was severely bombed at the end of World War II, and most of it was consumed by fire. The above-mentioned sketchbooks were kept in a house outside of Takamatsu City, and are rare survivors from its early days. An undated circular wooden board entitled "*Marugaku-Hakusai-no-zu*" may possibly be a rare work of art reminiscent of its Mechanical Woodwork division (figure 10). It is a work by Mori Shodo (1887–1967), who had studied at the division and graduated from the school in 1905, when Wright visited Takamatsu.

X. A Change of Direction: Art and Design Education Around 1900

Wright, who partisanly observed the fight against the "fatal enemy," however, was not optimistic about the arts and crafts of Japan at all: "Whoever has noted the change that has come over the Japanese arts and crafts in the past four years, notably the difference between their exhibit at the Columbian and the St. Louis expositions, has witnessed the beginning of the end." [33] The difference between

30 Ibid., 15–16.

31 The *Kagawa Shinpo,* February 20, 1898, in Kagawa Kenrirsu Kogei Koto Gakko, *Takamatsu Kogei Hyakunen-shi: Ishizue* (Takamatsu: Kagawa Kenritsu Kogei Koto Gakko, 1998), 48.

32 F.L. Wright, 16.

33 Ibid., 1905/6, 8.

Japan's exhibit at the *World's Columbian* (Chicago, 1893) and the *Louisiana Purchase* (St. Louis, 1904) expositions must have been clear for such Americans as Wright who had become interested in Japanese art and architecture in Chicago. Japan's westernized exhibit distinctly went on increasing in number after the *Columbian Exposition*.[34]

The change started in 1896, when Western Painting and Design divisions were newly established, and the former Painting division was renamed the Japanese Painting division at the *Tokyo Bijyutsu Gakko,* where the only "pure Japanese" arts and crafts had been taught since its opening in 1889. It was a restart of westernization in art education in Japan, and Okakura Kakuzo (1863–1913) who had, together with Fenollosa promoted Japanese art resigned as director of the school in 1898.[35] This was the year in which Notomi was suggested by Okuma to be the administrator of the school.

Design education also was started at the *Tokyo Kogyo Gakko* (later Tokyo Koto Kogyo Gakko), first at its affiliated teachers' training school in 1897, and at a regular division called *"Kogyo-zuan-ka"* of the principal school in 1899. It was started to supply design teachers then in growing demand to local technical schools. *"Kogyo-zuan-ka"* which literally means "Industrial Design Division" aimed at *"futsu"* (common) products rather than *"bijyutsu"* (fine arts) works. Its naming was as significant as those of Kanazawa's *"futsu-kogei"* (common crafts) and Takamatsu's *"yoki-mokko* (mechanical woodwork)" or *"yoki-kinko"* (mechanical metalwork) in design history. Notomi did not participate in the planning of design education at the *Tokyo Kogyo Gakko,* but his ideas undoubtedly took the initiative in the education of industrial art and design in this country.

It was also in 1897 when Notomi's school in Takaoka was planning its own design division. As we saw before, it had consisted of divisions of Wooden Sculpture, Metal Sculpture, Copper Casting, and Lacquer; and a design course had been incorporated into the curriculum of each division. Its Design and Painting division was created in 1899 after Notomi's departure for Takamatsu. It is not clear if he supported the establishment of the new division, judging from the fact that he did not create a design division at his next school in Takamatsu.

While Notomi's schools in local cities remained prefectural and for secondary education, the two government technical schools in Tokyo and Osaka evolved into institutions of higher education, and the third government technical school in Kyoto was, as was mentioned before, established as the first *"koto kogei gakko."* Notomi's schools were, more or less against his own will, partly becoming preparatory schools for these higher schools and particularly for the *Tokyo Bijyutsu Gakko.*

34 For example, while there had been only three pieces of "Paintings in Oil" (Western) against forty-seven pieces of "Paintings" (Japanese or Chinese) at the 1893 exposition, there were twenty-eight of the former against sixty-four of the latter at the 1904 exposition .

35 In Japan, Western painting and sculpture had been taught by Italian teachers at the *Kobu Bijyutsu Gakko,* an affiliated art school of the *Kobu Daigakko,* Imperial College of Technology, between 1876 and 1883.

Figure 11
The *Saga Kenritsu Saga Kogyo Gakko Arita Bunko* (former *Saga Ken Kogyo Gakko Arita Bunko* before June 1901, renamed *Saga Kenritsu Arita Kogyo Gakko* in April 1903), May 1902. (Courtesy of E. Hirokawa, Arita).

Figure 12
Notomi Kaijiro, after retirement, at the age of sixty-nine (Courtesy of A. Kanaiwa, Arita).

XI. Last Years: Saga, Arita, and Tokyo

When Wright was in Japan in 1905, Notomi was in the final phase of his teaching and administrative career in the education of industrial art and design in Saga Prefecture. He was fighting his last fight in his native land. Since his arrival at the *Saga Ken Kogyo Gakko* (soon renamed *Saga Kenritsu Saga Kogyo Gakko*) in April 1901, Director Notomi had been very active inside and outside of the school. He remodeled its curriculum, made its branch school in Arita independent as the *Saga Kenritsu Arita Kogyo Gakko* (figure 11), and promoted the development of craft education for women as the advisor of a newly-founded private girls' school in Saga City. However, Saga's prefectural assembly, then in political entanglements, was not for him. It was ruled by a majority which made a political issue of everything including Notomi's school.

This political strife continued for years. Notomi, whose views differed from those of the majority, resigned as director of the *Saga Kenritsu Saga Kogyo Gakko* on April 1, 1905. He kept his teaching post at the *Saga Kenritsu Arita Kogyo Gakko* for a while, but retired from the school for reasons of health and age on April 10 of the same year, at the age of sixty-two. He left his native land for Tokyo before long and never returned (figure 12).[36] Wright left Yokohama for Vancouver on April 28 , 1905.[37] Notomi continued his design activities in Tokyo. He established a design office in Tokyo with his fellow artists, inventing various things, producing many paintings in the Chinese and Japanese traditions. He died at the age of seventy-five in 1918, on the eve of the beginning of modern design education in Europe.

36 S. Ide, *Notomi Kaijiro Ryakuden* (Nishinihon Shinbunsha, 1976), 66–70.

37 M. Tanigawa, "On photos Wright supposedly took on his first visit to Japan in 1905," *Nihondaigaku Kogakubu Kiyo Kogaku-hen Bunrui*A, 37 (1996): 117–33. Wright and his patron client, Mr. and Mrs. Willits, sailed from Vancouver on February 21, and arrived at Yokohama on March 7, 1905.

Picking Up Stones: Design Research and Urban Settlement

Malcolm Miles

Introduction

What is the relationship of design research to the methodology of urban design? This paper analyses the methodologies of city planning and design, and their assumptions about power and value and the place of urban dwellers; it introduces the critical framework of French cultural theorist Henri Lefebvre[1] and refers to a Cartesian subjectivity taken as definitive of modernity. Secondly, four cases of design research—two concerning the UK, Williamson[2] and Robbins,[3] one from the Netherlands, ter Heide and Wijnbelt,[4] and one from the USA, Loukaitou-Sideris[5]—are examined. The paper asks whether research replicates or challenges assumptions derived from the conventional methodologies of disciplines such as urban planning and architectural design. Thirdly, alternative models of urban settlement are noted and alternative possibilities sketched.

It is helpful to investigate this today because a majority of the human inhabitants of the earth will soon dwell in large urban concentrations, many in the "informal settlements" which surround the cities of the southern hemisphere,[6] and because the history of the Western (white, modern) city exhibits an increasing dysfunctionality; its replication throughout the world is a form of economic colonialism. Although the literature of urbanism has equivalents of war stories for a masculine sensibility, [7] the violence on which they are based is neither a fantasy nor an anomaly in the post-war history of urban development, as demonstrated by Marshall Berman's [8] account of road building in New York in the 1950s. This institutionalized brutality is more than the marginalization of publics by enclaved urban development. It begins in a methodology which splits dwellers' experiences of urban living from the conceptualization of "the city" in the minds and graphic representations of planners, architects, and designers—which allows a disparity between representation and reality.

While the representation may be Utopian, the experience can be chaotic. Berman writes of Robert Moses, who as City and Parks Commissioner redefined New York as a network of fast roads, that he "seemed to glory in the devastation" [9] but that he "genuinely loved New York." [10] This contradiction requires explanation. Do the methodologies of urban planning and architectural design facilitate it?

1 Henri Lefebvre, *The Production Of Space* (Oxford: Blackwell, 1991).

2 C. Williamson, "Urban Design in Central Milton Keynes: 25 Years on from the Masterplan," *Urban Design International* 1:4 (December, 1996): 335–356.

3 E. Robbins, "Thinking Space/Seeing Space: Thamesmead Revisited," *Urban Design International* 1:3 (September 1996): 283–91.

4 H. ter Heide and D. Wijnbelt, "To Know and to Make: The Link Between Research and Urban Design," *Journal of Urban Design* 1:1 (February, 1996): 75–90.

5 A. Loukatia-Sideris, "Cracks in the City: Addressing the Constraints and Potentials of Urban Design," *Journal of Urban Design* 1:1 (February, 1996): 91–102.

6 E. Wilson, *The Sphinx in the City* (Berkeley: University of California Press, 1991), 128; and T. Angotti, *Metropolis 2000* (London: Routledge, 1993), 28; A. Goldberg, "The Birds Have Nested: Design Direction for Informal Settlements," *Urban Design International* 1:1 (March, 1996): 3–15. Also J. Beall, *A City for All* (London: Zed Books, 1997), 39.

7 M. Davis, *City of Quartz* (London: Verso, 1990); L. Woods, "Everyday War" in P. Lang, ed., *Mortal City* (New York: Princeton Architectural Press, 1995), 46–53.

8 M. Berman, *All That Is Solid Melts Into Air* (London: Verso, 1983).

9 Ibid., 293.

10 Ibid., 307.

The Dominant Methodology—Drawing a Line

Architects design the facades of buildings by drawing lines on sheets of paper, just as planners design cities by drawing lines on maps. At the simplest level, these acts both use the medium of an abstract space. That medium (and its graphic articulation) is retained whatever complexity is added by reference to various kinds of information. But the act of drawing a line also is a metaphor and stands for a reduction of the world to its representation. As representation, the world can be controlled absolutely, a figment of imagination the reality of which is in the mental life of its conceiver. Reductive representation is radically different from expressions of urban experience or the appropriation by dwellers of urban spaces. It is through representation in an abstract medium that the Cartesian division of subject—the "I" of the designer—and object—that which is designed in space—is enabled. This separation is produced in a disintegrated subjectivity, and replicated as urban fragmentation. It is not so surprising, then, that Moses could conceptualize New York as a network of freeways and seem oblivious to the destructive impact of his plans on some urban publics.

Moses and New York

Moses, in his old age, was driven up and down Long Island in his limousine, fantasizing a hundred-mile ocean drive, or a bridge to join Long Island with Rhode Island. Berman grants Moses historical stature in his ability to persuade people "that he was the vehicle of impersonal world-historical forces, the moving spirit of modernity,…" [11] and sees in him a grandeur which stands for the heroic but hollow aspect of modernity. Yet he likens him or his works—it is not quite clear—to Moloch, the destructive force of the modernist city in Allen Ginsberg's poem "Howl." Berman argues that resistance to Moloch requires a "modernist vocabulary of opposition" through which to show "that this was not the only possible modern world" [12] and recalls his own participation in protest against some of the urban development for which Moses was responsible.

Earlier, Berman cites edifices such as the Brooklyn Bridge, the Statue of Liberty, and the Rockefeller Center as symbolic expressions of modernity. Each, it could be argued, states a kind of freedom. The same progressive spirit informs Moses' work; except that Moses had a dynamic model of the future featuring fast-moving automobiles, and that he inscribed his schemes on an extant urban fabric. Moses, who was able to read the federal agenda and bring into New York's development vast federal funds, had a singular approach to this: "When you operate in an over built metropolis, you have to hack your way with a meat ax." When asked if there might be human problems, he responded: "There's very little hardship in the thing. There's a little discomfort and even that is exaggerated." Berman remembers seeing his neighborhood destroyed for ten years from 1953 by the making of the South Bronx Express-

11 Ibid., 294.

12 Ibid., 313.

way, and his particular grief at the destruction in its path of one of the loveliest art deco apartment buildings on Grand Concourse. He writes of the dismay of Jews that a fellow-Jew could do this to them, of disillusionment when the government which made the New Deal failed to stop the blasting through of a road which displaced 60,000 working- and lower-middle-class Jews, Italians, Irish, and African Americans from their homes. Further destruction followed the expressway's completion, when the noise and dirt generated by the road caused the desolation of adjoining spaces and a second outflow of population. The commercial fabric of the area was destroyed as office blocks were demolished, the market burnt down, and business outlets isolated from their customers went broke.

What emerges from Berman's text is a contrast between grand schemes and the experiences of those who found themselves in the way. The former deal in broad gestures, the latter in specific memories. But this is a historically specific kind of urban development in which the American dream is translated as the freedom to build for money and the freedom to drive; it involves the binding together of the city and its environs as a unified entity. Residual landscape and residual settlement are welded into a new, Utopian vision of a clean city which, no doubt, looked terrific in plans. Those who rejected it were invited to leave.

Moses acknowledged the planned city of the Enlightenment and Haussmann's approach to urban design. The inevitability he claimed for the production of a city symbolic of middle-class desires for purity is still claimed by developers, though today schemes are more likely to be driven by private than public sector interests, as in the gentrification of SoHo.[13] Mayor Koch, in the 1980s, updated Moses' call for the disaffected to leave, stating, "If you can't afford to live here, move out."[14]

The perfectionism of Moses' plans is evident from the beginning of his career in the 1920s and can be seen in his project for Jones Beach Park. Berman notes the clean sweep of the landscape design, punctuated only by a water tower at its center and two art deco bathhouses, and asks what a Jones Beach of the mind would be like in its "Apollonian clarity."[15] That clarity, which is the Utopian aspect of modernist design, privileges the visual over other kinds of sensation. Similarly, the bridges and expressways "created a series of spectacular new visual approaches to the city, displaying the grandeur of Manhattan from many new angles."[16] Geographer Doreen Massey links a privileging of the visual to a kind of masculinity which involves mastery and detachment.[17] Perhaps this helps to explain the contradiction between Moses' love of New York and his relegation of specific publics to irrelevance.

The approach to urban development exemplified by Moses' work depends on the medium of visual representation according to certain rules, such as those of linear perspective, which, in themselves, unify the design. The conventional urban plan assumes a

13 S. Zukin, *Loft Living: Culture and Capital in Urban Change* (New Brunswick, NJ: Rutgers University Press, 1989).

14 M. Rosler, "Fragments of a Metropolitan Viewpoint" in *If You Lived Here,* B. Wallis, ed. (Seattle: Bay Press, 1991), 15–44.

15 Berman, *All That Is Solid Melts Into Air*, 297.

16 Ibid., 301.

17 D. Massey, *Space, Place and Gender* (Cambridge, UK: Polity, 1994), 223–4.

viewpoint above the city, that is, in the site of God's eye in traditional iconology, the position of omniscience and omnipotence. Some popular images of cities, such as the tourist postcard, take a distant viewpoint, producing a seemingly coherent, even characteristic, skyline. Seeing the city from afar or above, as Michel de Certeau experiences from the top of the World Trade Center in Manhattan, turns it into an abstraction "immobilized before the eyes." [18] In the remoteness of the view, the exclusion of sounds, smells, and tactile qualities, is a distancing which allows a perception of unity; the same distancing, at a conceptual level, enables the suppression of individual experiences of dwelling and the recognition of their diversity as conditions of city development.

Spatial Practices—Lefebvre and Descartes

The God's eye viewpoint of the city plan is, then, a metaphor for a position of power, and is in its utilization by urban planners a position of real power to conceptualize the city and implement their concept through civic institutions, a process in which the dominance of professionals over non-professional "users" is affirmed through the opacity of the planning process, the exclusivity of technical language, and the unavailability of information to those who might object. Urban dysfunctionality follows from this separation of concept and everyday life, and, in an increasingly institutionalized society, from the replication of this model even when it has evidently failed. Jürgen Habermas argues that bureaucratization increases the autonomy of professional experts,[19] and Ivan Illich holds that the redress for failure is a reapplication of the failed approach, so that "the cure for bad management is more management" and that the failure of research to produce solutions leads to "more costly interdisciplinary research." [20] This raises the question: does design research escalate the problems caused by design?

In order to answer this, it is necessary to formulate a critique of conventional practices in planning and design. Lefebvre offers a theoretical framework through which to do this, and links dominant spatial practices to Cartesian dualism. This affinity is extended in Wolfgang Welsch's comments on modernity and Claudia Brodsky Lacour's critique of Descartes's use of architectural metaphors.[21]

Lefebvre weaves his arabesque-like text around two complementary kinds of spatial practice. The implication is that much can be known of a society's values and structures of power by interpretation of how it orders and attaches meaning to space, particularly built space. Spatial practices under capitalism also include the relationship of local to global, the everyday to the symbolic, and the visible to the metaphorically invisible, so that: "Operating-procedures attributable to the action of a power which in fact has its own location in space appear to result from a simple logic of space." [22] This leads to benefit for some and exclusion for others, and often to a naturalization of negative impacts, enabled through what Lefebvre

18 de Certeau. *The Practice of Everyday Life* (Berkeley: University of California Press, 1984), 91.

19 J. Habermas *The Structural Transformation of the Public Sphere* (Cambridge, MA: MIT Press, 1991), 233.

20 Ivan Illich, *Tools for Conviviality* (London: Marion Boyars, 1990), 8–9.

21 C.B. Lacour, *Lines of Thought* (Durham, NC: Duke University Press, 1996).

22 Lefebvre, *The Production Of Space*, 289.

terms the violence intrinsic to abstraction which "manifests itself from the moment any action introduces the rational into the real, from the outside, by means of tools which strike, slice and cut." Whilst Lefebvre writes theoretically, accounts of gentrification linked to the symbolic economy of New York—by artist Martha Rosler,[23] art historian Rosalyn Deutsche[24] and sociologist Sharon Zukin[25]—might serve here as cases.

Lefebvre distinguishes two forms of spatial practices, the "representations of space," or conceived space, and the "representational spaces" of living.[26] Representations of space are conceptualized, as used by planners and social engineers; they constitute the dominant space in any society or mode of production, and tend towards verbal and intellectual signs. Representational spaces, on the other hand, are experienced through memory and association; they are the spaces given meaning by habitation, and are the dominated spaces "which imagination seeks to change and appropriate," and tend towards nonverbal expression. Representational spaces overlay physical spaces, and lend them a certain feeling. Lefebvre does not see the two kinds of spatial practice as in opposition, and points out that, when a new economic order in Tuscany in the thirteenth century produced a new spatial ordering through linear perspective, a device soon translated into art and architectural practice, townspeople and villagers did not abandon "the traditional emotional and religious manner" of experiencing space—"by means of an interplay between good and evil forces at war throughout the world" as in spaces of special import such as the body, the house, and the graveyard.[27] But modern, capitalist society does set the two kinds of space in competitive opposition. The spaces of memory, appropriation, and desire of urban dwellers are devalued. The institutions of capitalist society enforce this hegemony, and professional expertise relegates those who have expertise of dwelling, that is of representational spaces, to the margin.

Lefebvre sees architecture as depending on visual representation, an abstraction which is implicitly if passively violent. He writes of the architect that he is, within the spatial practice of modernity, ensconced "in his own space…bound to graphic elements—to sheets of paper, plans, elevations, sections, perspective views of facades, modules…" which, as a medium for objectification, supposes a "fixed observer, an immobile perceptual field, a stable visual world." The architect sees this conceived space as "true."[28] From this viewpoint, "users" are marginalized even in language, associated, as Lefebvre points out, with the realm of things, of utility, and exchange. Yet the use of space by dwellers is not confined to its utility, and includes its permeation with meaning. Lefebvre writes: "…the space of the everyday activities of users is a concrete one, which is to say, subjective. As a space of 'subjects' rather than of calculations, as a representational space, it has an origin, and that origin is childhood, with its hardships, its achievements, and its lacks."

23 Rosler, "Fragments of a Metropolitan Viewpoint."

24 R. Deutsche, "Alternative Space" in Wallis, B., ed., *If You Lived Here* (Seattle: Bay Press, 1991), 45–66.

25 S. Zukin, *Loft Living,* and *The Cultures of Cities* (Oxford: Blackwell, 1995).

26 Lefebvre, *The Production Of Space*, 38–39.

27 Ibid., 79.

28 Ibid., 361–2.

But, it could also be argued, the spatial practice of childhood is play, which entails an imaginative appropriation of things so that a table, for instance, upturned becomes a boat, and a chair a castle. For grownups, this symbolic appropriation is transferred to images, such as when a still life of apples becomes a memory of the breast,[29] as cited by Fuller.[30] Fantasy is no less involved in the conceptualization of a city as a series of spaces for the display of power, or a system of zones for specific uses, but the force which directs these acts is no longer playful. If, as Freud argues, civilization depends on a subsuming of individual desires in the collective, it does not necessarily follow that the collective desire should be redefined as that of the dominant class of planners or entrepreneurs, nor that urban design should be a means of producing disciplined publics. Play, after all, has an element of spontaneity.

Lefebvre is dismissive of Freud, saying he falls too easily into mechanistic thinking and that his distinctions between Eros and Thanatos, and between pleasure and reality (or productivity), lose their dialectical character.[31] He draws on the history of Western philosophy, and posits a relationship between the dominance of representations of space and the rational subjectivity of Cartesian dualism. The rational practice of the sixteenth century is "usually associated with Cartesian philosophy," though differing "in the way a social practice does differ from an ideology." [32] Earlier in his argument, Lefebvre states that the space of modernity, which can be taken as that of representations of space, "has an analogical affinity" with the space of Cartesian philosophy. He adds that "unfortunately it is also the space of blank sheets of paper." [33] This is a space articulated by lines and mathematical laws, in which everything can be calculated. It is inert, a site in which people and things "take up their abode," a model of "conceiving things in their extension as the 'object' of thought." [34] Cartesianism separates the subjectivity in which representations of space are conceived, that of the philosopher in a study, or the planner and architect in their professional office or studio, from the objectivity thereby assigned to whatever occupies space.

This objectivity is more or less the same applied to inventions in a plan or a drawing of a facade, and is a key element in urban dysfunctionality. Dwellers, re-coded as "users" become objectified. Value is then reattached to the plan produced in a privileged subjectivity. For many planners and architects of modernity, such as Moses, the conceptualization of the city is (as if) real while the urban fabric, in which spaces are given meaning through the lives of dwellers, is (as if) unreal. The ground of the city plan or the architect's drawing is, then, a space constructed without value. At the same time, outside the still air of the studio, the spaces of the street are filled with the contending values of people who live in and pass through them.

29 C. Bell, "Dr. Freud on Art," *The Dial* (April, 1925): 282.

30 P. Fuller, *Art & Psychoanalysis* (London: Writers and Readers, 1980), 157-8.

31 Lefebvre, *The Production Of Space*,177.

32 Ibid., 277.

33 Ibid., 200.

34 Ibid., 297.

Modernity—the Drawing of a Line

Several writers see Descartes as the founder of modernity. Lacour writes of "a commonplace in histories of Western philosophy and culture that the *Discours de la Méthode* marks the beginning of modern thought."[35] Stephen Toulmin states that the "chief girder in this framework of modernity…was the Cartesian dichotomy"[36]; and Welsch that "modern architecture is actually Cartesianism in built form."[37] Descartes uses the metaphor of architecture to articulate his idea of a world of mathematical certainty. His philosophy "draws a line" under the past as under the impressions of the senses and knowledge gained from either travel or book-learning. Only mathematics and geometry exist in the purity of an internally-regulated system. He states, in a passage of the *Discourse* which begins with a reminiscence of his sitting in a stove-heated room:

> Thus one sees that buildings which a single architect has undertaken and completed are usually more beautiful and better ordered than those which several architects have attempted to rework…Thus these ancient cities, which having been only large villages, became great cities with the passage of time, are normally so poorly proportioned, compared with the well-ordered towns and public squares that an engineer traces on a vacant plain according to his free imaginings.[38]

The image of the engineer (or architect) drawing freely is a metaphor for the process of thinking, just as the space of the stove-heated room might act as a metaphor for the enclosure which enables and, in turn, characterizes Cartesian subjectivity. In that enclosed space, free imagining in the form, for example, of a logical discourse, is possible without reference to sense impressions or the actualities they denote. Lacour writes:

> The act of architectural drawing that Descartes describes is the outlining of a form that was not one before. That form would combine reason…with imaginative freedom…It is not only new to the world, but intervenes in a space where nothing was, on a surface…where nothing else is.[39]

In the twentieth century, technology and the alliance of capital with planning regulation allow the fantasy of a "new city" to be realized, though generally as an enclave within the old city. An example is Canary Wharf, where histories of work and sociation generated by the industries of the London docks were obliterated. A tower designed by Cesar Pelli now rises above a site reduced to a blank space on a map—Utopia in the abolition of history.

The Utopian vision of shining towers, affirmed by symbolic urban economies through which development is lent the universality assigned to cultural values, involves a total transformation of the world according to new principles, as exemplified by Le Corbusier's proposal for the demolition of the centers of old cities.[40] Welsch

35 Lacour, *Lines of Thought*, 18.

36 S. Toulmin, *Cosmopolis* (Chicago: University of Chicago Press, 1990), 108.

37 W. Welsch, *Undoing Aesthetics* (London: Sage, 1997), 109.

38 Lacour, *Lines of Thought*, 33.

39 Ibid., 37.

40 Le Corbusier, *The City of Tomorrow and Its Planning* (New York: Dover, 1929 and 1987), 96.

argues that, for Descartes, the new city stands for the new science, and that to merely improve things from the past makes no sense: "One had to begin from the start according to one's own order and create everything anew."[41] Descartes argues that the course of human history, as a process towards civilization, consists of faltering steps which are insignificant compared to the "ordinances made by God alone," and prefers the "simple reasonings which a man of good sense can make naturally concerning things that present themselves" above the accumulated works of the natural sciences, as cited by Lacour.[42] Allied to such reasonings, and by implication the perfection of God's ordering of the universe, are the inscribed fancies of the engineer who draws "regular places" on a blank ground. Lacour summarizes:

> The proportional "places régulieres" drawn by an architect acting in complete autonomy are the manifestations of a rapid, mental continuity discontinuous with autobiographical or any human history. They are forms produced on an empty plain whose use is uninhibited by the remains of years and millennia that are historical memory.[43]

So, regularly proportioned forms, in drawings or extended into plasticity, have a reality of their own. Architecture and town planning are thus fields of autonomy like modernist art.

Design Research—Affirmation or Criticality?

Does design research affirm or interrogate the methodology of design which depends on a Cartesian abstraction of space? Four research papers published in 1996, two from each of two recently established journals for urban design—*The Journal of Urban Design* and *Urban Design International*—are taken as cases through which to consider this. The four articles concern, respectively, urban design in the Netherlands, the master plan for Milton Keynes in the UK, an evaluation of Thamesmead in the UK, and "cracks" in the urban landscape of Los Angeles. The papers represent the range of studies offered in these journals. Both journals are international in scope.

Dutch Urban Design

Henk ter Heide and Danny Wijnbelt at the University of Utrecht ask whether there is any difference between the design approaches of architects and engineers. They see a contest between these professions in the emergence of Dutch urban design in the early twentieth century, with architects interpreting town and country planning as art, and engineers calling for an empirical approach. Both parties are, they claim, influenced by the work of Geddes, Abercrombie and Unwin in England, and Sitte and Baumeister in Germany. Given the post-war development of Dutch town planning as a multidisciplinary field, in which engineers are largely supplanted by geographers, sociologists, economists, and demographers, and later by

41 Welsch, *Undoing Aesthetics* .

42 Lacour, *Lines of Thought*, 90.

43 Ibid., 92.

policy analysts, giving planning a mix of objectives and methods, the study compares the practices of "planologists" (people trained in a social science of spatial ordering) and designers (including graduates from the urban design courses of technical universities).

The following research questions were formulated and investigated through the literature of design methodology and socio-environmental research, and through interviews:

1 To what extent are the supply and demand for knowledge in spatial planning attuned to each other?
2 Is knowledge exchange between researchers and designers hindered by specific obstacles?
3 Can methods be devised to improve attunement of supply and demand for knowledge and to clear away communication obstacles? [44]

The results of the literature survey and interviews were then taken to workshop discussions with professional designers, managers, and researchers.

Ter Heide and Wijnbelt found that the kinds of knowledge used in spatial planning included mainly data (water sources, population figures, etc.), but also social contexts and current policy. Urban designers were more analytical than architects. Among the sources of knowledge mentioned by designers were experience and intuition. But knowledge provided by social researchers was not often used, and the intuition of designers was seen as in competition with knowledge obtained from research.[45] Following from this, they see a role for sociological research in planning and design, noting that Geddes was a cofounder of the British Sociological Society, and that early twentieth-century planning in the United States was influenced by the Chicago sociologists.

Ter Heide and Wijnbelt take the Bijlmermeer high-rise development of the 1960s, which provided overflow housing to the southeast area of Amsterdam, as a case of the negative consequences of ignoring perception-based research. While they see Bijlmermeer as an extreme case where some of the blocks are now being demolished, and grant that other high-rise developments did not have the same degree of failure, they attribute the problem to the isolation of the tightly-knit design team from the realities of users:

> …it is often knowledge regarding the manner in which residents and users of space perceive their surroundings which designers tend to pass by. This would also be understandable, as perception of space is precisely what designers consider themselves preeminently experts on.[46]

They suggest that the gap might be filled by behavioral research, market research, and perception research including psychological

44 ter Heide and Wijnbett, "To Know and to Make," 76.
45 Ibid., 83.
46 Ibid., 79.

studies. They also cite the activity patterns used by geographers, and the lifestyle theory of Pierre Bourdieu,[47] which compares economic (consumption-related) and cultural (knowledge-related) expressions of status. Ter Heide and Wijnbelt see surveys as the means to indicate a community's "prevalence of economic and of cultural lifestyles."[48] Although studies have been carried out and published in these fields, it seems designers tend to avoid them for fear of being restricted in scope, or because they mistrust them.

This paper also looks at how knowledge is transferred within a design team. A difficulty is the mutual lack of understanding between professionals with a social science background and those with a technical or design orientation. To social researchers, design methodology is enigmatic—perhaps reflecting the element of intuition. Social researchers see the ability of designers to integrate different kinds of knowledge as minimal, while most designers see themselves in such a role, which is that of powerbroker. Other mismatches are the favored style of communication—written or graphic—and perceptions of the importance of this issue. Finally, a short paragraph mentions perception research involving residents of Beverwijk, who were offered alternative designs for a local park.

This study seems helpful in comparing the perceptions, including of each other's roles, of two professional groups to indicate different methodologies, and in foregrounding the variety of research fields which can inform urban design. This clarifies the graphic and intuitive aspects of how architects and designers interpret a brief. Both attributes fit with Lefebvre's characterization of the architect, and while "intuition" often is seen as creativity it may also be a term for the kind of subjectivity possible in a Cartesian space of enclosure. This illuminates the mistrust felt by designers for the findings of social research—which is akin to the kinds of knowledge dismissed by Descartes in favor of the pure order of mathematics and geometry. So, does the article resist the Cartesian basis of design? Not really. It exhibits three difficulties: the initial set of questions defines "knowledge" as something exchanged between professionals; the interviews and workshops involved only professionals. Dwellers are relegated to a subordinate, objectified position—the only study noted in which they are involved is covered in one paragraph at the end of the article; that study concerns only a passive role for dwellers, asked to select one of two plans already prepared by professionals.

While the call for an increased use of social research and perception research might lead to a greater understanding of the needs of dwellers, it does not offer an alternative design methodology through which to achieve it. Neither does the reference to the Chicago School support such an aim. The writings of Chicago sociologists Robert Park and Ernest Burgess were progressive for their time, but are as much part of a reductionist attitude to the city as any text from urban planning or architecture. Indeed, according to

47 P. Bourdieu, *Distinction* (London: Routledge, 1984).

48 ter Heide and Wijnbett, "To Know and to Make," 88.

geographer David Sibley, Burgess's representation of the city "attained the status of a universal statement" so that alternative readings, from the perspective of different urban publics, were disregarded "because the idea of a multiplicity of equally valid worldviews was alien to [a] universalizing, scientific perspective on the world."[49] Similarly, the reference to activity patterns, although approaching the lives of dwellers and demonstrating gender differences, remains a reduction to diagrammatic representation. At no point do ter Heide and Wijnbelt seek a direct interaction with urban dwellers through personal narratives of their experiences, nor do they criticize the maintenance by professionals of a boundary to their expertise, outside of which dwellers fall. In the end, the study affirms the hegemony of professional knowledges and abstract representations, while calling for the use of a wider range of these.

Milton Keynes

Architect Christopher Williamson looks at Milton Keynes twenty-five years after its master plan was published and presented to a public inquiry. He begins, running ahead of his research, by describing the town as "a thriving, successful city," claiming that Milton Keynes has "great appeal and attraction to the majority of inhabitants" and is, therefore, a good case for a study of the value of the kind of urban space planning of which the master plan is an example.[50] He roots the concept of the new town in prewar British town and country planning, and mentions the provision of a "green belt" around London from 1935, and Abercrombie's proposal in his Greater London Plan of 1944 for ten satellite towns close to London and ten further afield. But while these were seen as expansions of extant settlements, Milton Keynes has a "center" which is simply the highest point on a ridge running through a hitherto mainly rural site.

Williamson mentions the work of Jane Jacobs and Leon Krier, who advocate a higher density of urban living than is found in Milton Keynes; and suggests that the master plan provided for a more diverse zoning around a central pedestrian mall than that implemented by the architects. He quotes various sections of the master plan, such as:

> It should, for instance, be possible to drive into the center along planted boulevards fronted by office and other uses, and then to pull off and park in a tree-planted square fronted by shops with covered pedestrian arcades leading directly to the bus stops…[51]

Instead, Milton Keynes, today, has, as Williamson acknowledges, a grid road system dividing large, single-use blocks with little movement between zones. The potential for pedestrian use and the informal mixing of publics is further diminished by the fact that many of the roads are two-lane highways with adjacent parking, so that

49 D. Sibley, *Geographies of Exclusion* (London: Routledge, 1995), 127.

50 Williamson, "Urban Design in Central Milton Keynes," 335.

51 Milton Keynes Development Corporation, *The Plan for Milton Keynes,* Vol. 2 (Bletchley: UK, MKDC, 1970), 319 and 1308, and Williamson, 336.

buildings are around eighty meters apart (compared to the typical twenty meters in a provincial city street). Williamson writes that this allows each building to be freestanding and is "a successful interpretation of the way we now prefer to live," [52] although he suggests the situation may change when the cost of private transportation increases. It is motor transportation which governed the interpretation of the masterplan, following predictions of increasing car use to the end of the twentieth century.

The grid is the defining motif of the plan of Central Milton Keynes, taken by Williamson as "a clue to why the city center appears uneventful and lacking in visual interest." [53] He briefly compares it with Cerda's grid for the extension of Barcelona, which has a smaller scale and is relieved by diagonals, with the Roman city of Timgad in Algeria, where the grid changes scale near the central forum, and Grenade-sur-Garonne, France, where the medieval grid varies according to the diagonal of the block preceding it. In Milton Keynes, however, the grid is rigidly applied in the central area, and plot- rather than building-based. In its center is a shopping mall based on the north American model, accepted by the planners in part to avoid its later appearance out of town. Williamson quotes Reyner Banham on the Burbank Mall in Los Angeles as a positive comparison. He also notes the encroachment of privatized space on the public realm, and that the mall is locked at night. While citing an article by Ray Thomas which says, "There is no graffiti and no trouble and who wants to window-shop in the middle of the night anyway?" [54] Williamson introduces surveys which show that people do want access to the shopping center outside of shopping hours, and that it impedes the routes of commuters to bus stops; women and elderly people are anxious at being forced to walk around the building at night,[55] which he describes in detail.[56] The diminution of the public realm is further exacerbated by a lack of open space, and Williamson wonders where residents would go to protest against council taxes—outside the town hall are only the regulation parking spaces.

Williamson conducted an informal survey by face-to-face questionnaire with twenty shoppers on a Saturday afternoon. He writes: "It was soon apparent that the nature of the face-to-face interviews was not a good format" and that responses were "ill-considered" and seldom went beyond a simple "yes" or "no." He continues: "People were too busy and focused on the shopping task in hand to concentrate on a fairly taxing series of questions." [57] Two-hundred revised questionnaires were delivered to flats and houses during August and September 1995. One-hundred and eleven replies were received. One hundred and fifty additional questionnaires were sent to architects and planners in Milton Keynes and London, eliciting eighty-four replies. A higher proportion of professionals than residents (eighty-five percent compared to fifty-two percent) thought the center should have a feeling of excitement,

52 Williamson, "Urban Design in Central Milton Keynes," 340.

53 Ibid., 342.

54 R. Thomas, "Milton Keynes: City of the Future?" *Built Environment* 9:3,4 (1983), and Williamson, 346.

55 C. Ward, *New Town, Home Town* (London: Calouste Gulbenkian Foundation, 1993), 99.

56 Williamson, "Urban Design in Central Milton Keynes," 346.

57 Ibid., 351.

although both groups agreed that the shopping center had no such "buzz." A high proportion of both groups thought other cities had facilities lacking in Milton Keynes. To a question on the lack of public space in the traditional form of a town square, thirty percent of residents and fifty-seven percent of the professionals thought this a problem. Contrary to other findings quoted by Williamson, his own survey found only forty-four percent of the residents regretted the closure of the shopping center at night.

Concluding his study, Williamson argues for greater pedestrianization, offering his own plan for this, and sees the new town's weaknesses as a dearth of landmarks, uniformity of scale, monotony of design, lack of civic focus, domination by a traffic system, and a too-rigid zoning of uses [58]—not quite a picture of a "thriving, successful city"! But Williamson is no more helpful than ter Heide and Wijnbelt in addressing the underlying questions of urban design methodology. He gives close attention to what happens, but not much to why it happens. His surveys abandon face-to-face contact for the more distant medium of a questionnaire delivered to a mix of residents and professionals. His conclusion sounds like a prescription for a job for which he could himself tender. What is missing from it is any direct involvement of residents in determining how the master plan can be adapted for changing use, and behind that any questioning of the assumptions on which it was based. Williamson, like ter Heide and Wijnbelt, retains a premium on professional rather than dweller expertise and, although he spent time at the site and attempted to meet local people, this is not followed through into any new methodology which would translate the results of a more sustained form of such contact into design.

While the above two studies are typical of a conventional approach, other studies are more radical. Edward Robbins, based at Harvard, questions the standard professional view of high-rise developments such as Thamesmead in southeast London; and Anastasia Loukaitou-Sideris, from the University of California at Los Angeles, examines the interstices, or "cracks" in the urban texture of Los Angeles. Robbins cites both theoretical and empirical sources, including Michel Foucault's proposition that:

> We live inside a set of relations that delineates sites which are irreducible to one another and absolutely not superimposable on one another." [59] This also is cited by Robbins.[60]

Loukaitou-Sideris uses sources mainly from the literature of planning, but questions conventional solutions which homogenize the urban environment.

Thamesmead

Robbins argues that sites of habitation "delineate and reveal" the complexities of relations and practices "through which we construct our world." He defines site in social rather than physical or carto-

58 Ibid., 555.

59 M. Foucault, "Of Other Spaces" in *Diacritics* 16 (1986): 23.

60 Robbins, "Thinking Space/Seeing Space: Thamesmead Revisited," 283.

graphic terms, and is critical of other studies [61] which prioritize form over social dynamics. His intention is to see how housing policy is embodied in spatial design and how the production of urban space is, in itself, a way of making policy. The vehicle for this is Thamesmead, a social housing development of the late 1960s and early 1970s, built by the Greater London Council, and typical of the kind of high-rise development no longer undertaken. Robbins argues that it is important to revisit such schemes (literally) to see how good intentions, such as the provision of "better" housing for the inhabitants of areas of deprivation, may mask less acceptable ideological premises.

Robbins begins by reflecting on the kind of inner city neighborhoods from which the people rehoused at Thamesmead came. He notes the conventional (pessimistic) characterization by dilapidation, overcrowding, high density, bad plumbing and heating, noise, pollution, and irrational plan. Yet, he points out, another (romantic) view of the same place might focus on the liveliness of street life, the supportive social fabric, and the accommodation of a diversity of uses within an informal sense of place. He writes that the public spaces of such neighborhoods "could become living rooms where people socialized" because "their homes are neither large nor nice enough to entertain indoors," and that, in these spaces, children grew up and adults shared joys and sorrows. He concludes that, whatever else might be said, such localities "are alive, spontaneous, even chaotic if not necessarily disorganized or disorderly." [62]

People from such areas were moved to Thamesmead during a period of social reconstruction, when large sums (£150 million between 1965 and 1969) were spent by the GLC on social housing. Robbins sees the development as a case of large-scale state intervention in the urban environment, and as evidence of an attitude to the poor. A group of towers on the edge of the site—marshland surrounding an old arsenal, a four-mile stretch of Thames shoreline—act as wind- and noise-breakers for low-rise housing; the whole is articulated as a set of residential sections joined by an undulating spine. Regulations on the use of marshland determined that all habitation should be above ground level, leading the designers to provide garages and stores at the base of each block—a practice since abandoned due to the dereliction and lack of safety in such spaces.[63] Pedestrian traffic is separated from car traffic by walkways. The provision of low-rise housing responded to the beginnings of critical attitudes to high-rise blocks. This indicates a degree of social responsibility, affirmed by the plan to mix housing with amenities in the forms of schools, play and leisure areas, cycling paths, shops, and community centers. The scheme constituted a complete environment. It was intended that the provision of a marina and yacht basin would attract middle class residents. Robbins summarizes:

61 P. Rowe, *Modernity and Housing* (Cambridge, MA: MIT Press, 1993); M. Glendinning, and S. Muthesius, *Tower Block: Modern Public Housing in England, Wales and Northern Ireland* (New Haven, CT: Yale University Press, 1994).

62 Robbins, "Thinking Space/Seeing Space: Thamesmead Revisited," 285-6.

63 A. Coleman, *Utopia on Trial* (London: Hilary Shipman, 1985), 43.

> For the GLC policy-makers and designers, Thamesmead offered the latest in housing form and social possibility. They were providing a clean, well-ordered, safe, functionally delineated and segregated, and well-defined space into which people would come and build meaningful and happy lives.[64]

As such, it counteracted conventional notions of working-class neighborhoods as "slums." But in doing so, it offered a world of ordering rather than order.

A specific functionality was assigned to each part of the site, in contrast to the mixed spatial utilization of inner city areas. Spontaneous social organization is replaced by social engineering which allows no space for unplanned use. Despite the good intentions of planners and designers who, Robbins suggests, would mostly have seen themselves as socialists, Thamesmead has come to stand for urban dystopia, used in the filming of *Clockwork Orange.* Robbins explains the discrepancy by looking at the assumptions underpinning the plan for Thamesmead; for instance that the physical environment, hence design, conditions behavior; and that an ordered environment produces orderly behavior. He also sees the segregation of functions as evidence of a "deeply felt anti-urbanism," and distrust of people's ability to order their own lives in the street.[65] He refers to Charles Dickens and William Morris as proponents of a regression to the countryside as an answer to inner city problems, and argues that "a critique of the lifestyles found in a space unwittingly became a critique of the space itself." Hence the poor were not given any opportunity at Thamesmead to recreate the spatial interactions of their previous habitat, despite the consequence that this also prevented a rebuilding of the social interactions which took place in those spaces. So the spaces of "middle-class familialism and individualism" replace those of "working-class solidarity and sociality," and, as Robbins writes, "the operative word is images." [66] Robbins means that the delineation of space in plans and designs masked an unstated ideology, and led to an imposition of an ordering environment on those regarded as unable to order their own lives. In other words, Thamesmead is an exercise in disempowerment, a case of design supposed to influence the behavior of a public, and not of a public influencing the design of their environment.

A study of residents' complaints about the development foregrounded many practical difficulties: poor heating, leaks, noise, a lack of jobs in the vicinity, a lack of play and recreation space, the distance from their previous homes (and friends), and the siting of a slurry pipe in the middle of the development—all signs of a development for those with little choice and unlikely to be found in middle-class areas, which would also have better views. Robbins comments that the residents were "being told through the design" that "their class needed to be moved out of its old environment but

64 Robbins, "Thinking Space/Seeing Space: Thamesmead Revisited," 287.

65 Ibid., 289.

66 Ibid., 290.

they should not forget their class through the design of the new environment." If the designers saw obstinacy in complaints about a lack of play space, then they overlooked the fact that they had provided it separated from living space and, in the process, prevented any reformation of the previous social pattern of dwelling, playing, and socializing in proximity. Robbins concludes by pointing to the irony of the situation: Thamesmead fails not because its designers were hegemonic, but because they espoused progressive ideological positions, yet translated them in terms of spatial rather than social form. This turned good intentions into a desocializing environment.

The study is helpful in drawing attention to the conflict of intention with unstated ideology, and a failure of methodology deriving from a disintegration of design and reality. The same critique could be applied to Bijlmermeer or Milton Keynes. Although Robbins does not embark on a philosophical discourse, the frameworks provided by Lefebvre, Welsch, and Lacour could be called on to extend his critique. The disintegration of design and reality is precisely the product of a Cartesian subjectivity. Robbins, then, challenges the basis of modern design. The implication of his study is the development of a new methodology, which not only includes the expertise of dwellers on the social construction of place, but also empowers them to use this knowledge to influence the design of their environment.

Cracks in Los Angeles

A challenging approach is taken towards the responsibilities of urban designers by Loukaitou-Sideris. Her study concerns the sudden discontinuities and small wastelands—"cracks"—found in most cities, although her experience is of Los Angeles. Cracks include built interventions which disrupt pedestrian flows, neglected parks and play areas, fenced off public housing, intrusions of railway lines and waterfronts, the deadness of outer-town malls in the evening, and the car-dominated vacant spaces between city centers and suburbs—in general, the in-between places which can be seen either as waste or as sites awaiting realization.

Loukaitou-Sideris takes the grid plan as the main factor determining the North American city. This emphasizes street frontages and intersections rather than social spaces within built areas, and reflects the division of land into equal-sized plots in contrast to the organic growth of older (European) cities:

> American cites are products of abrupt human actions on the natural landscape. Most American cities were laid out purposefully and quickly to house settlers. Others were drawn on paper almost overnight and then superimposed on the landscape by profit-minded speculators.[67]

67 Loukaitou-Sideris, "Cracks in the City," 93.

In some cases, several settlements combine to form a modern metropolis, with the result that the original grids do not fit neatly together, but create "breaks" which tend to separate neighborhoods. The grid also is capable, as a geometric form, of indefinite extension. This sense of an idealized, endless horizon is affirmed by the automobile, to meet the needs of which other, newer networks of freeways are cut into the existing grid, creating more breaks. Los Angeles is seen as typical of such a development.

Within such cities, residents live "near their own kind" from fears of violence and sexual relations which transgress categories of class or race.[68] Zoning regulations and the efforts of speculators enforce further single-use and single-class segregation, so that distinctive localities seen as interesting by tourists, like Chinatown and Little Italy, are culturally alien to residents of other neighborhoods. Loukaitou-Sideris sees wealth as the most defining factor of a neighborhood, attributable to the dominance of the private sector in urban development: "The design praxis is shaped by…the power of capital."[69] Another outcome of this dominance is the dereliction of downtown areas redeveloped for commercial use—central business districts (it could be pointed out, translating the Burgess ring model from concept to actuality) in place of town squares and main streets.

What do urban designers do in such a context? Loukaitou-Sideris argues that their social role tends to be left aside when developers offer profitable contracts, and that many are "content" to undertake the design of socially undesirable projects such as "signature urban plazas, theme parks, and invented streets."[70] Her response is to set out an agenda for development using urban cracks as spaces for mending rather than neglect. This agenda requires design to be seen as a process which can empower people to change their environment. But how, it could be asked, is this to be done? Is the power really transferred, or does it stay with the (professional or institutional) empowerer?

She sets out six possibilities: respecting the "substantive" client—the people who live, socialize, or work in the space designed—rather than the nominal client who pays the designer; the use of forms related to social context, rather than the generalized forms favored by developers and modernist architects, and which can be imposed on more or less any site but will be experienced differently in different sites; design to facilitate rather than obstruct social mixing, and mixed-use zoning; design for flexibility to enable future changes of use; the creation of places rather than relegation of open space to a set of margins between signature buildings; and the development of genuinely new models of design rather than replication of versions of early (white) American or European types of streetscape.

Loukaitou-Sideris concludes by characterizing the conventional role of the urban designer as artist and purveyor of technical

68 K. Lynch, *A Theory of Good City Form* (Cambridge, MA: MIT Press, 1981), 266, as quoted by Loukaitou-Sideris, 95.

69 Ibid., 97.

70 Ibid., 97–98.

expertise. She argues that this is an artificial separation of the aesthetic / technical from the social / political. A "meaningful" space, in contrast to much urban modernist development, is "culturally bounded," both "informed by the past" and "determined by the present." Because the present always moves into the future, the space cannot be conceived as permanently designed. Her final paragraph states:

> Many communities need the professional, the architect, the planner, the urban designer, not to lead but to listen, not to impose plans but to search and suggest ways by which space can become better bit by bit, piece by piece. It is now, more than ever, that urban designers should get involved in civic and community action …"[71]

and her final line calls for a filling up of the cracks.

All this seems to exhibit the same radical approach as Robbins—the re-empowerment of dwellers, the importance of perceptions, and the diversity of urban experiences and publics. Like Robbins, although without putting it as such, Loukaitou-Sideris reveals a hidden ideology in urban development when she writes of the typical corporate plaza as designed for public use, but discouraging such use by the emphasis on social control in its design.[72] She also advocates design for diversity in patterns of use by people of different ages, genders, and races. But there is still a note of that moral imperative (which Robbins rejects) through which design conditions behavior:

> A whole repertoire of spaces can be reclaimed as part of the public realm by mobilizing the forces of design ... each city has myriad forms "awaiting realization": empty lots, river banks, parking lots…It is the urban designer's role to suggest new possibilities for such spaces and "inject" them with activities patterned according to the revealed preferences of users.[73]

But if "users" are aware of their preferences, can they not themselves be responsible for the injection? And, as Richard Sennett points out, writing on Battery Park City, children often prefer to play in non-play spaces.[74] Such spaces invariably are what Loukaitou-Sideris perceives as cracks, yet wishes to see filled up.

This study is helpful in setting a more dweller-centered agenda; in proposing a redefinition of urban design to enable greater social responsibility on the part of the designer; and in setting out ways in which practice might change. In part, it corresponds with developments in adjacent fields, such as the use of urban design action teams advocated by the Urban Design Group in the UK, and echoes progressive writing on planning by Forester,[75] or Sandercock and Forsyth.[76] Perhaps some aspects of Davidoff's advocacy planning[77] could be reevaluated in light of it. The study also could be linked to some writing on recent art practices, such as Kastner,[78] who coins the phrase "art as a verb" in relation to the

71 Loukaitou-Sideris, "Cracks in the City," 102.

72 Ibid., 98–99.

73 Ibid., 100.

74 R. Sennett, *The Conscience of the Eye* (New York: Norton, 1990), 193.

75 J. Forester, "Planning in the Face of Conflict" (1987) in R. LeGates, and F. Stout, *The City Reader* (London: Routledge, 1996), 433–446.

76 L. Sandercock and A. Forsyth, "A Gender Agenda: New Directions for Planning Theory" (1992) in R. LeGates and F. Stout, *The City Reader* (London: Routledge, 1996).

77 P. Davidoff, "Advocacy and Pluralism in Planning" (1965) in R. LeGates and F. Stout, *The City Reader* (London: Routledge, 1996), 421–432.

78 J. Kastner, "Art as a Verb," *Artists Newsletter* (April, 1995): 24–25.

project "Culture in Action" in Chicago in 1993.[79] But there are still pitfalls, and not all projects which have agendas similar to that put forward by Loukaitou-Sideris have empowered communities.

The work of the multidisciplinary *Power of Place* team in Los Angeles seeks to enable minority communities to gain identity by constructing monuments from people's memories of places—for instance, a new streetscape in Little Tokyo—but retains a professional hegemony.[80] Similarly, Sheila Levrant de Bretteville's work in New Haven—putting stars in the pavement on which are inscribed the names of past and present, black and white citizens—recognizes diverse urban publics but does not offer power within the web of city regulation and speculative development. What happens to the names in the pavement is that they are walked over.

Taking the four papers together, two seem to affirm a conventional exclusivity and reductionism of design; and two question assumptions and point to emerging alternative perspectives. Some design research, then, does offer a way towards revisioning the aims and methods of urban design.

An Alternative Framework for an Alternative Model

If there is a need to re-vision design methodology and redraw the parameters of design research to include the criticality of, say, Robbins, there also is a need for practical models for the production of urban settlements. And just as conventional design methodology is intertwined with the Cartesian framework of modernity, so an alternative possibility will be outside it, through its location in a nonindustrialized society or its constitution of a post-industrial social form. The Cartesian model splits subject (designer) and object (thing in space), and favors the designer over the dweller; the alternative will equate the knowledges of designers and dwellers to reintegrate the subject and object which the Cartesian paradigm divides.

Several alternative models for the production of settlement exist. These include the village of New Gourna, Egypt, designed by Hassan Fathy in the 1940s,[81] and the Open City at Ritoque near Valparaiso, Chile[82] constructed by the architecture faculty of the Jesuit University of Valparaiso from 1970. A study of informal settlements in South Africa, in contrast, shows the mapping of Western ideas of town planning onto townships to be unsuccessful, one scheme earning the name "Beirut" for its brutal design.[83] When a model fails when transposed to a new situation, attention is thrown back onto the limitations of the model.

From cases such as New Gourna and Ritoque, it is possible to work towards a reintegrating methodology. In New Gourna, the villagers revived traditional skills of building in mud brick, a practice in which the architect (or "engineer" as Fathy is sometimes termed by Egyptians) plans the site, but the design of houses takes place within traditional parameters through building. Decorative features such as lattices also are functional breeze intakes. Fathy be-

79 M.J. Jacob, M. Brenson, and E. Olson, *Culture in Action* (Seattle, WA: Bay Press, 1995).

80 D. Hayden, *The Power of Place* (Cambridge, MA: MIT Press, 1995).

81 H. Fathy, *Gourna: A Tale of Two Villages* (Cairo: Egyptian Ministry of Culture, 1969).

82 A. Pendleton-Jullian, *The Road That Is Not a Road* (Cambridge, MA: MIT Press, 1996).

83 Goldberg, "The Birds Have Nested," 49.

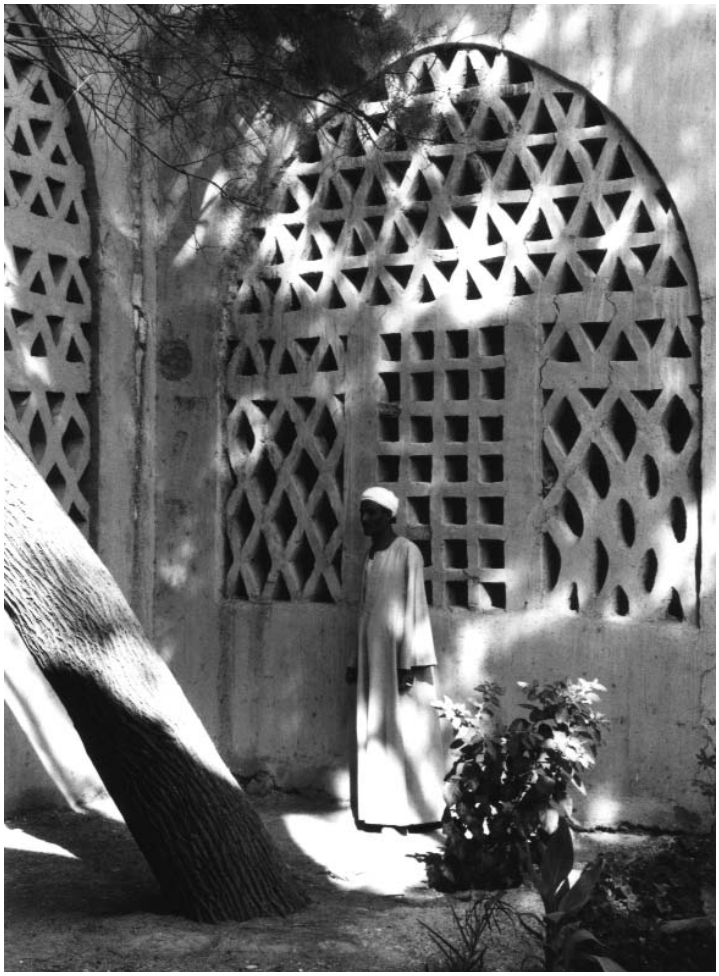


Figure 1
Hassan Fathy. Courtyard of the mosque, New Gourna, Egypt. Photo, M. Miles

gan his work by studying the social structure of village life, and planned the spaces of the village accordingly. At Ritoque, a group of professionals seeking an alternative lifestyle devised a city without a plan. Any dweller can propose a change to any building, and all decisions are taken collectively; the site for a new building is founded by a collective poetic act, and it is built in easily available, often recycled, materials using artisan skill instead of heavy machinery. In both cases, the conceptualization of the settlement is not divorced from the experience of making and living in it.

What, then, are the possibilities for a reintegrative design methodology? First, a reevaluation of the role of the designer as facilitator, so that dwellers empower themselves to become co-determiners of what kind of city is built for whom, and co-designers of its form. This can happen at a local level without upheaval—a housing association in Brighton, England, for instance, is collaborating with a designer on a scheme for self-built housing. Second, the value of dwellers' expertise on their lives needs to be given the same status as that of designers on designing and planners on planning. This mix of knowledge can be applied to solutions which take

a site as a social and psychological entity—Lefebvre's representational spaces—as well as a physical space. Thirdly, political decisions are required which grant real power, not just a privilege of consultation over alternatives already devised, to groups of dwellers; a corollary of this is the reeducation of professionals in non-specialist forms of communication. At Coin Street in London, one of the last acts of the GLC before its abolition by the Thatcher government was to implement planning controls on a site of social housing near Waterloo to prevent speculative redesignation; the tenants managed the development themselves, selecting the developer and the businesses which lease space in a mixed-use scheme. These three possibilities imply an engagement with local cultures and with cultural processes in general. This leads to a fourth possibility: the adoption of personal narratives rather than technical specifications as the point of departure for development. The *Power of Place* is one, restricted example of how such narratives can be given form. Some recent writing on urban issues by women consciously uses a first-person style to emphasize the experiential rather than distanced dimension of urban space.[84] Such narratives can inform urban planning and design as well as art, and one way to begin a process of empowerment might be to create the space for such narratives to be heard.

Conclusion

There is a proverb in Burkina Faso: "You can't pick up a stone with one finger." Another proverb, from the Shona people of Zimbabwe, says: "One finger cannot crush the bug that stings you." The speaker continued: "Being organized enables us to give each other ideas. As a group we can do what one person alone could not."[85] The Cartesian approach of modern design is like picking up a stone with one finger; it depends on an isolation in which reality is reduced to representation, the world experienced in the mental life of the observer. The cities produced are disintegrated, and this results from a methodology which some recent research begins to interrogate. Alternative possibilities begin to emerge from such interrogations, in which the spaces of experience are revalued, and the expertise of dwellers as well as designers and planners contributes to more sustainable patterns of human settlement.

84 Wilson, *The Sphinx in the City*; Massey, *Space, Place and Gender*; and P. Weyland, "Gendered Lives in Global Spaces" in A. Oncu and P. Weyland, eds., *Space, Culture and Power* (London: Zed Books, 1997), 82–97.

85 P. Pradervand, *Listening to Africa* (New York: Praeger, 1989), 82.

A Poster by Max Bill or the Love of Geometry

Gerd Fleischmann

Translated by John Cullars, Bibliographer for the Humanities, University of Illinois at Chicago.

Illustrations courtesy of Dr. Angela Thomas Schmid, haus bill, Zumikon (Zürich).

Footnotes for this article begin on page 62.

"My images and sculpture are the putting into concrete form of ideas …without my intervention, these wouldn't be clearly realized. i would like them to be objects for intellectual use whose individual qualities are directly communicated to the observer. i hope such communications will be of a clarifying and organizing nature."

Max Bill, Easter 1964[1]

Among the posthumous papers[2] of Max Bill (1908–1994), the best known of all the Swiss artists[3] of the twentieth century, is an inconspicuous gray, loose-leaf folder in a brown envelope for a 62–page illustrated brochure for the *Sozialer Wohnungs-und Siedlingsbau* [Social Dwelling and Housing Development], published by the Delegierten für Arbeitsbeschaffung [Delegate of the Work Program] and designed by Max Bill in 1944 in Zürich. On these pages, there are 478 sketches for the poster of the *Concrete Art* Exhibition[4] held from March 18 to April 16, 1944, in the Basle Kunsthalle.[5] Eight of these pages are of thin typewriter paper, size DIN A4 and partially marked on both sides; another part is similar to large transparent sheets from a roll. Then there is a row of smaller transparent sheets and labels of which the smallest measure only 34 x 102 mm. Others simply display sheet-filling designs. This bundle of sketches is unprecedented in Bill's legacy. There are far fewer sketches and designs preserved for other projects or commissions, often no more than a single plan. In connection to the total legacy, that means that Bill had not done much more with them.

Aside from military service, during which Bill was assigned to camouflage activities, he worked at that time on a book about the Swiss bridge builder Robert Maillart,[6] and on another book on settlement planning and simple building procedures that appeared in 1945 under the title of *Wiederaufbau* [Reconstruction].[7] With both books, he desired to be remembered as both an architect and an architectural authority.

The *Concrete Art* Exhibition in Basle showed "ten individual works by foreign artists drawn from Basle collections,[8] twenty selected graphic art works,[9] thirty photos of works by foreign artists [because the originals were inaccessible due to the War] [10] and ten work sets by arp, bill, bodmer, kandinsky, klee, leuppi, lohse, mondrian, taeuber-arp, vantongerloo." [11] In Halls 1 and 1a, there were cases with publications of the Allianz-Verlag,[12] which Bill himself

managed. Bill had not merely organized the exhibition, but also was its initiator; with it, he sought to publicize his own artistic position as a concrete artist as well as a curator of exhibitions and a graphic designer. For the poster, he expressly crafted a "concrete" pseudo-Greek set of characters,[13] which he later reused for individual art works, such as his 1960 exhibition at the Winterthur Museum.

The fascination of the sketches for the *Concrete Art* poster is twofold. On the one hand, they illustrate a fundamentally simple example of the design process; on the other, they display a catalogue of concrete art motifs. Max Bill never published anything on the design process—at least no publications are known. The sketches also were not intended for publication. Bill presumably would be reluctant to agree to their discussion here today, since they reveal something about his methods.[14] He was so interested in promoting goal-oriented thought and business[15] that he actively sought a commission that was close to his preferences. Thus, six months after finishing the design for the *Concrete Art* poster, he bid on a logo for Book Supply Services in Zürich[16] with eight different, interchangeable geometric figures ranging from a pentagram to a tree model with symmetrical root and branch areas, which he already had used in part for other projects. The firm wrote in its rejection letter, "…We've come to the conclusion that your printer's mark is not right for us since it does not in the least communicate anything about what our firm is working on…." [17]

Vis-à-vis the effort to submit a "suitable" design to a potential client as a provider of a service, Bill's work on the *Concrete Art* poster seemed to be stimulated by his desire to find an effective form and thus a positive "trademark" for this artistic discipline. Dr. Georg Schmidt, the former director of the Basle Kunsthalle, was an advocate and sponsor of concrete art as Max Bill represented it when he was entrusted with the exhibition for the organization. "People tend to reproach concrete art for being unconcerned with the problems of the day. It is striking that it has not dramatized these problems. Instead, it devises an activating counter-model." Georg Schmidt sides with the avant-garde: "Whoever has experienced intellectual impulses has 'very strong standards' concerning the reality at hand," Schmidt said in his opening address for the *Concrete Art* Exhibition (the organization of which Max Bill was entrusted) in 1944 at the Basle Kunsthalle. "Concrete image—spaces as free spaces can be read as socio-culturally Utopian. The concrete art originating in Zürich has moral and political utility value that defines its aesthetic value." [18]

In his search for an effective image for *Concrete Art*, Bill tried to find a form which didn't directly cite any of the works or positions in the exhibition. That wasn't easy since Bill, being from the middle generation, was "no inventor, no creator of styles, no transformer but rather a finisher, one who draws the quintessence from a development." [19] Thus, the sketches present a microcosm of

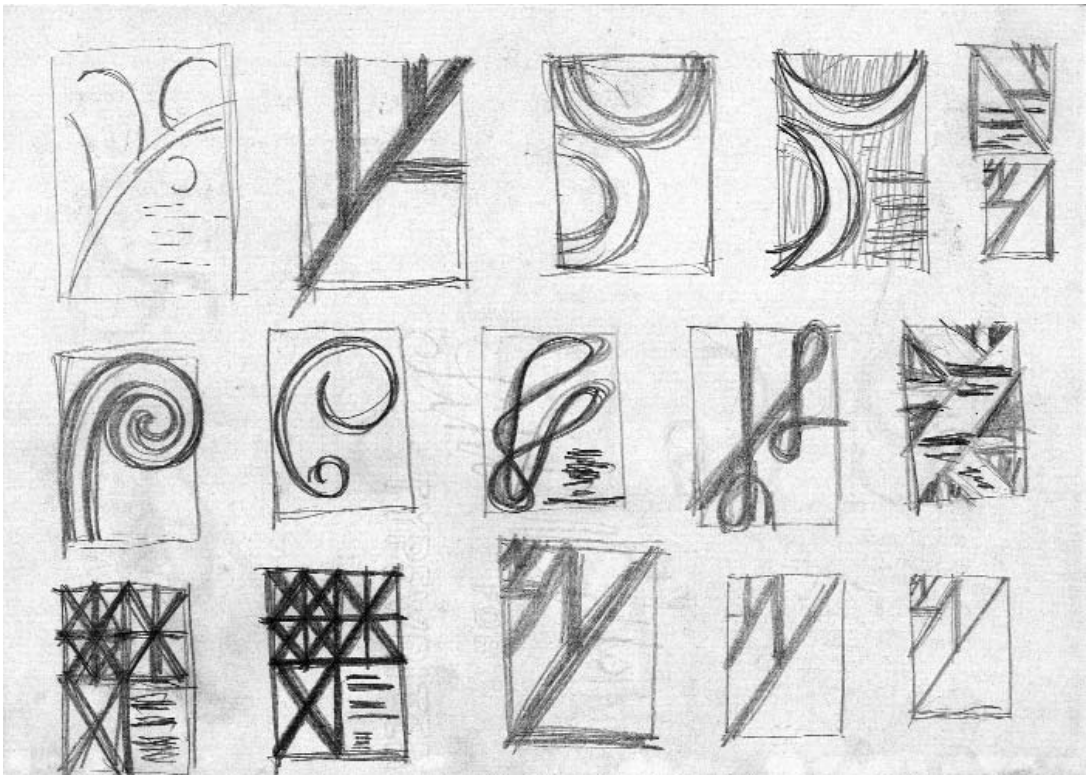


Figure 1
Drawings for the poster *konkrete kunst* (concrete art), pencil on paper, 29.7 x 21 cm. All illustrations courtesy of Dr. Angela Thomas.

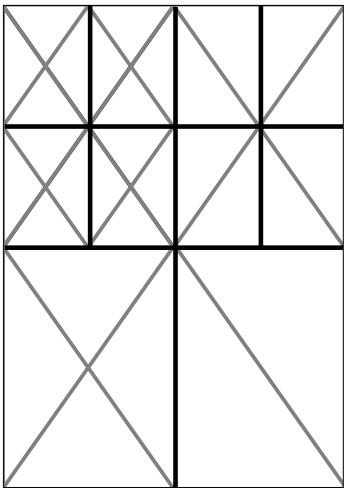


Figure 2
Construction pattern of two sketches in Figure 1, by the author.

concrete art, with many images by Max Bill and other artists in which the love of geometry and simple spatial relations shine through. An ordered microcosm replaces the confused and impossible-to-overlook chaos of the world.

That can be demonstrated by the following examples. The beginning point for Bill's ideas generally is a drawn rectangle (see figure 1). This framework will be seen and performed as space (or a stage). Nearby are vertical, horizontal, or diagonal divisions. Each of us has made them out of graph-paper at school when bored by the instruction—daydreaming and lost in reveries (see figure 2 diagram). In the commercial art business, rectangles crossed by diagonal lines in the layout always were representatives of images. Today, text and image areas are differentiated in layout programs, as previously, by diagonals. The conflict of the three elementary directions and the fascination of constant processes lead to a series of sketches that are later filled in with round elements. The divisions end when it is no longer possible to represent them in a small framework. That is, simultaneously, the limit for the poster which, because of its necessarily being seen from a distance, can require (or be granted) no greater reduction than that of the little sketch on the table.

There is a positive and negative theme in other sketches (see figure 3)—a scheme that can be observed in the art of all periods. It always has been a theme in architecture, too, as realized in masonry built by former Bauhaus instructor Josef Albers in 1949–50 in a brick

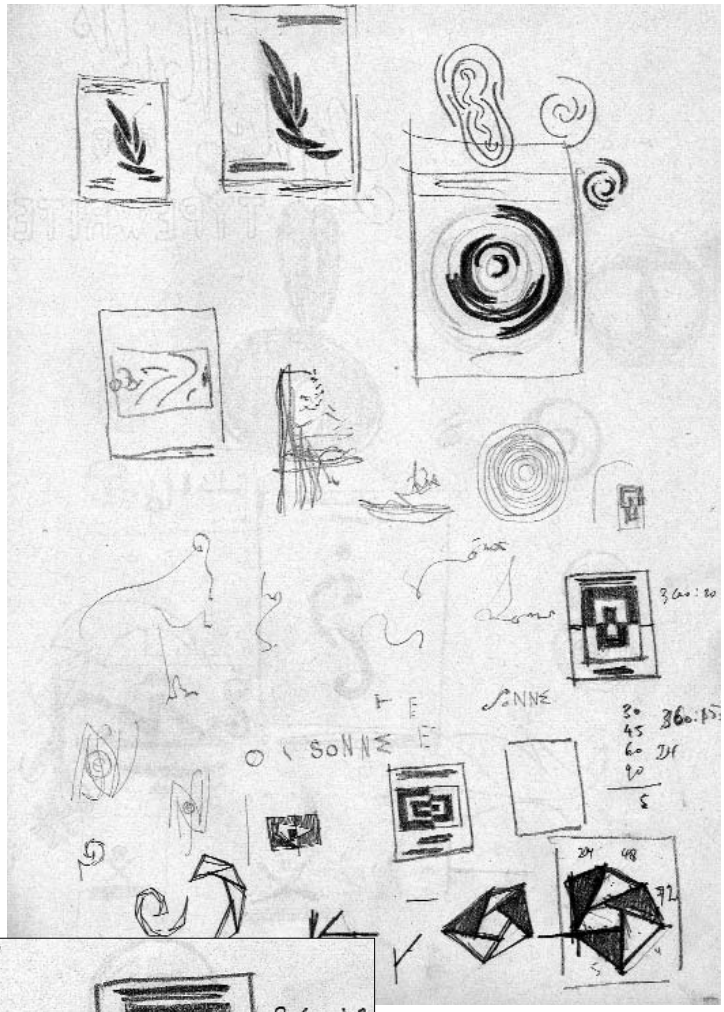


Figure 3 (below)
Detail of figure 4.

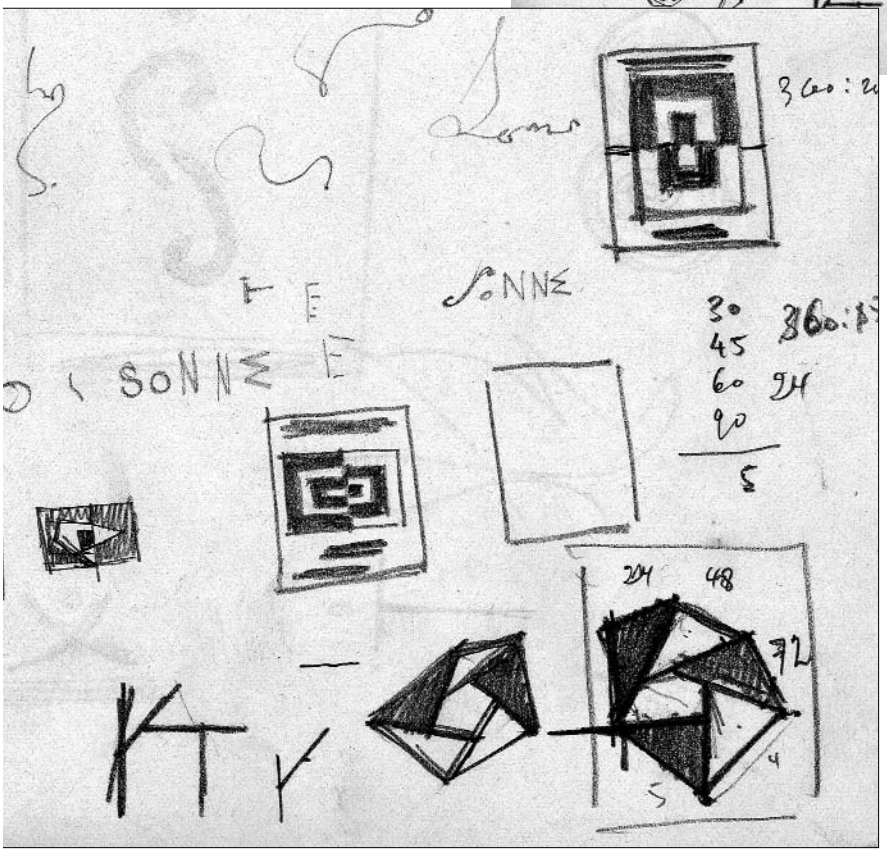
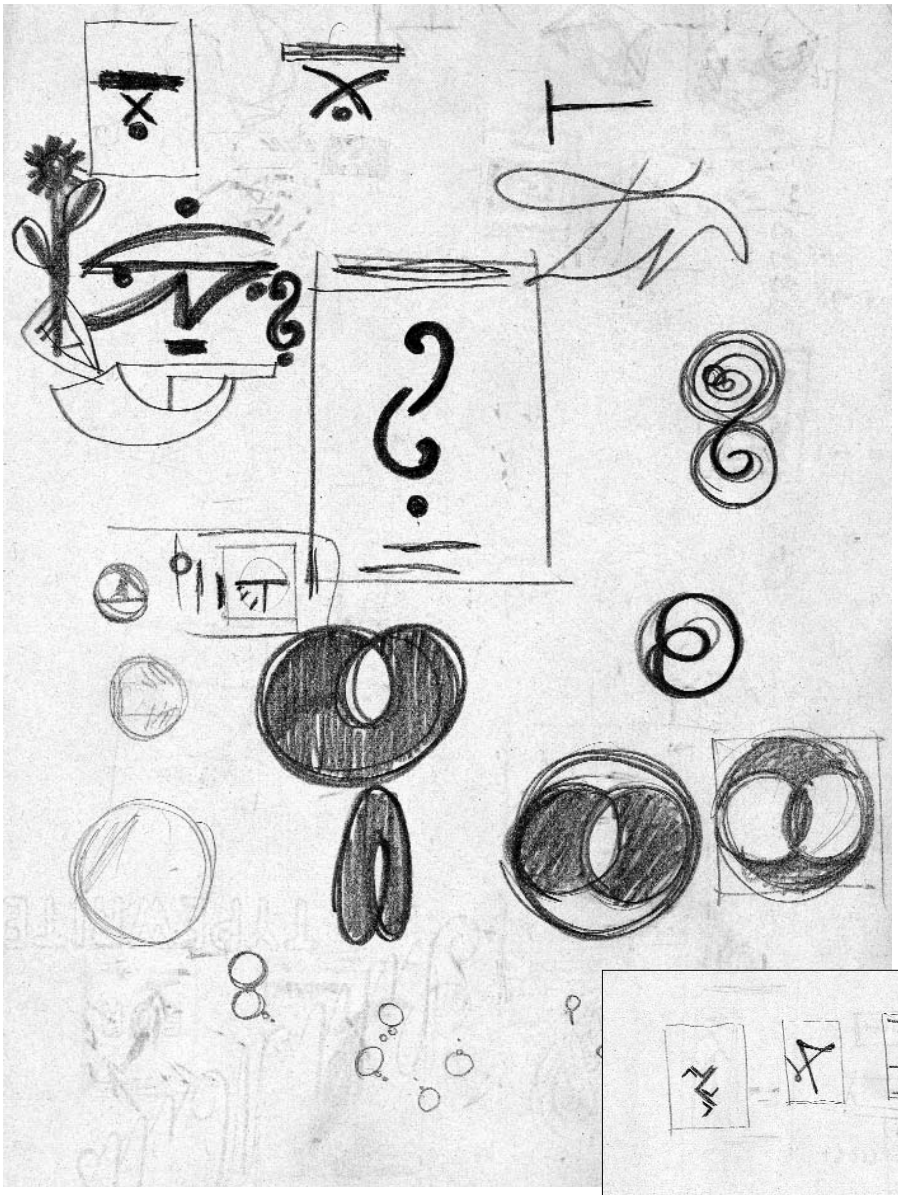


Figure 4 (above)
Drawings for the poster *konkrete kunst* (concrete art), pencil on paper, 29.7 x 21 cm.



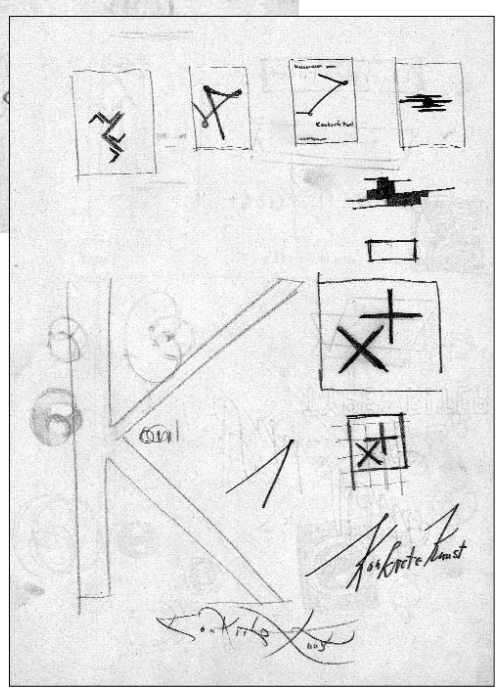
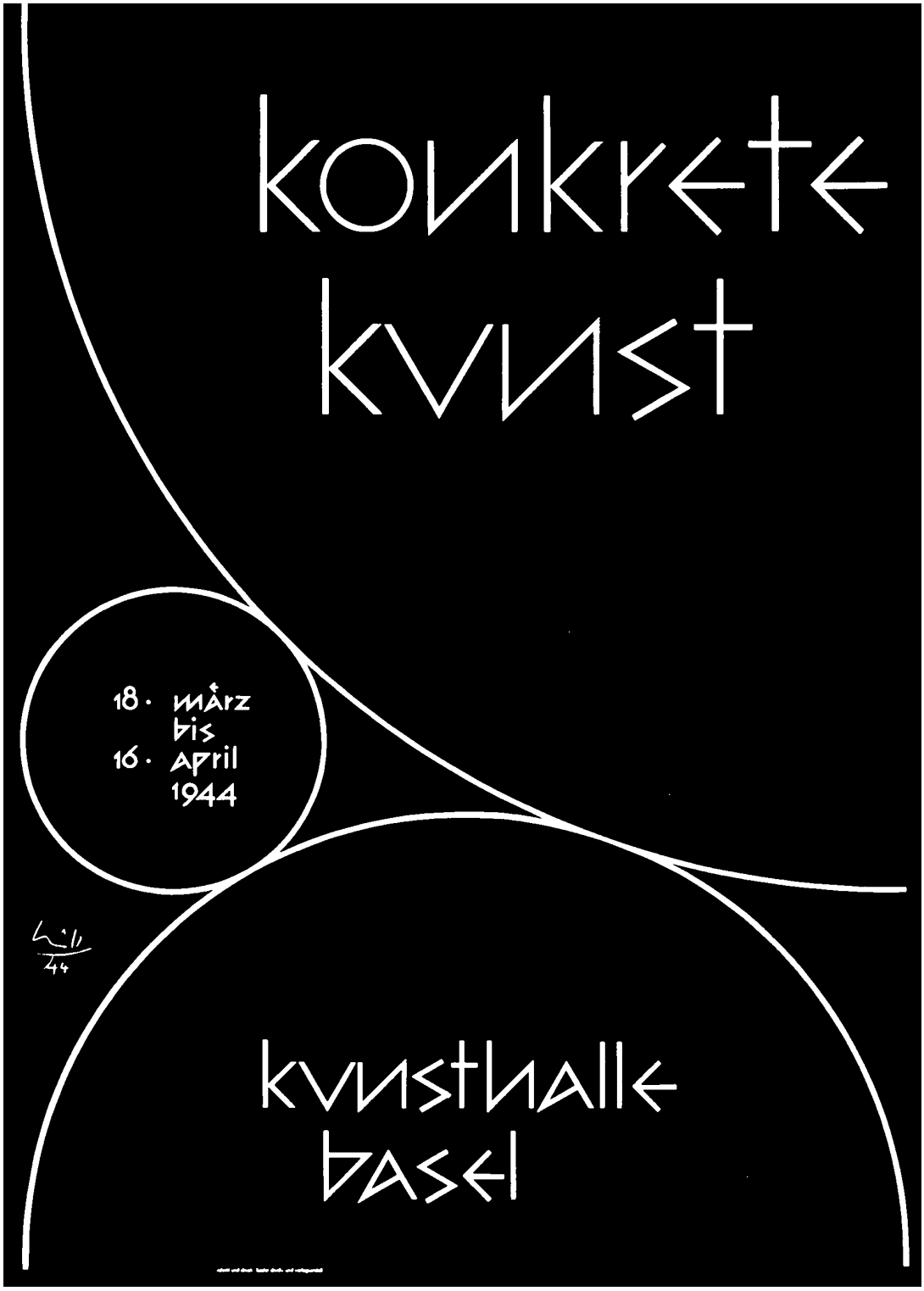


Figure 5 (above)
Drawings for the poster *konkrete kunst* (concrete art), pencil on paper, 29.7 x 21 cm.

Figure 6 (right)
Calligraphic drawings, detail fo drawings for the poster *konkrete kunst* (concrete art), pencil on paper, 29.7 x 21 cm.



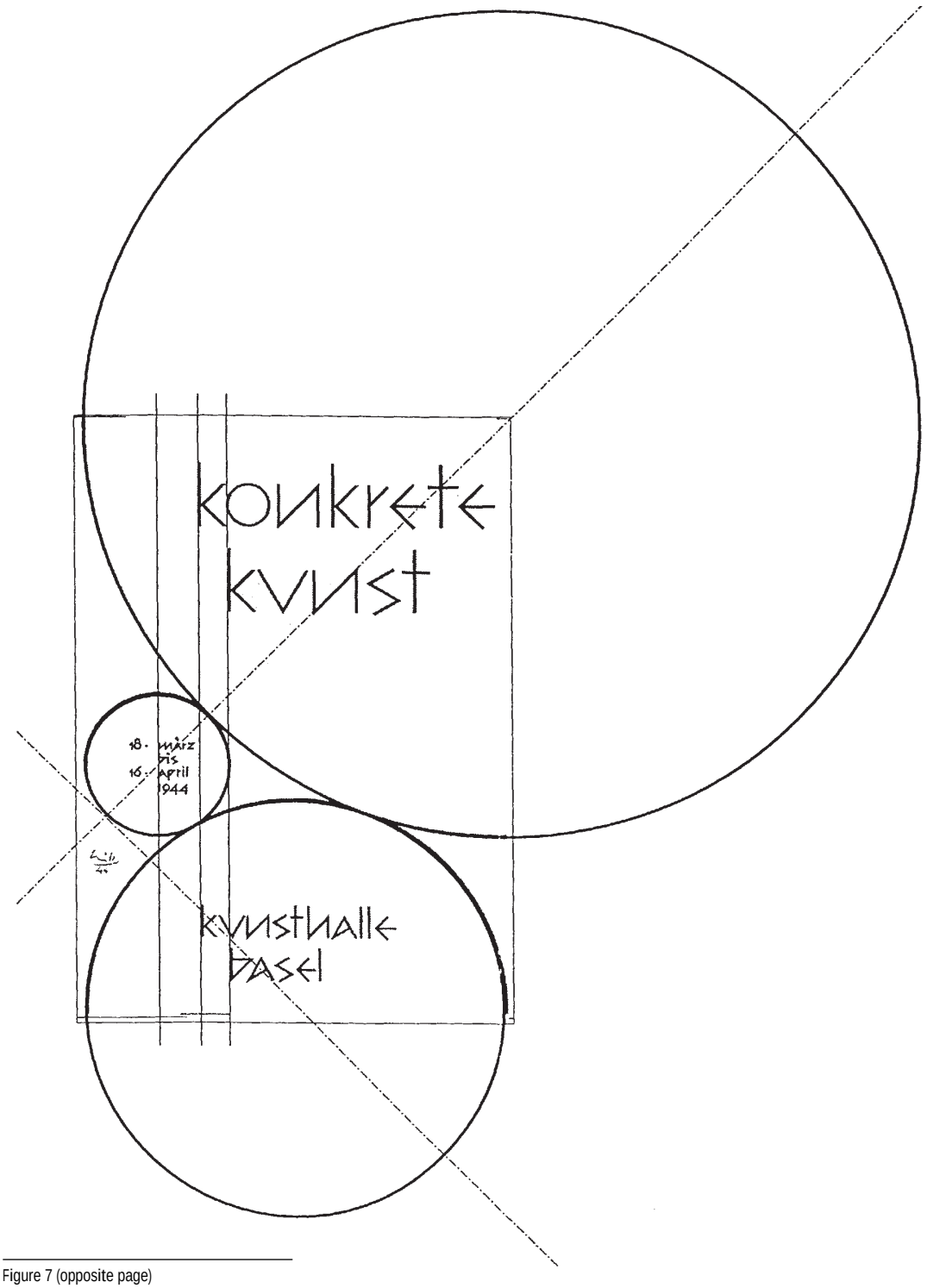


Figure 7 (opposite page)
konkrete kunst, poster, lino cut, letterpress, black on white paper, 90.5 x 128 cm.

Figure 8 (above)
Construction pattern to the poster (figure 7) by the author.

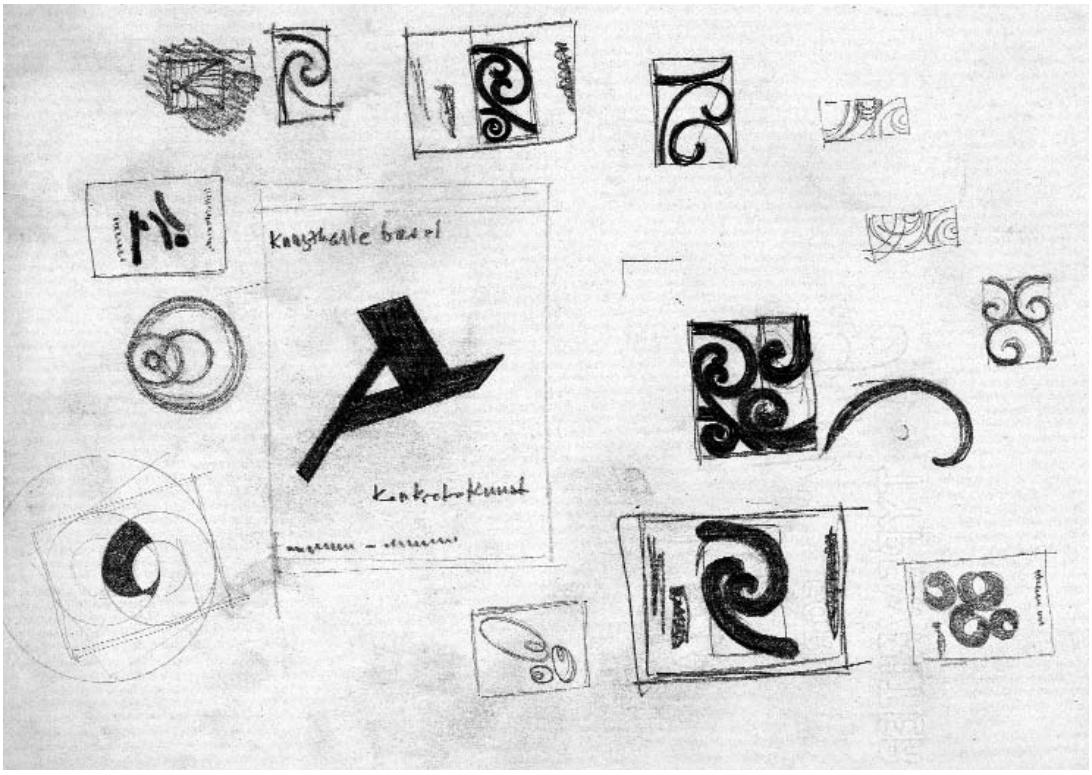


Figure 9
Drawings for the poster *konkrete kunst* (concrete art), pencil on paper, 29.7 x 21 cm.

wall in America. Deep shadowy holes, which take the weight from the wall and let it become an image, appear through gaps in the architectural background. On the one hand, this results in the multiplication of the ground mass of the image structure; on the other, the brightness and darkness dissolves the weight of the rectangular wall. Analogously, Bill arranged a series of three small sketches of right-angled U-form figures so that, ideally, a motif no longer appeared on a surface, but rather the entire surface became the image-motif. Thus, it came about that the construction is modular, as is shown by the numbers next to and beneath the sketch (figure 4).

Another, also unrealized, arrangement carries out a small line–drawing without any surrounding framework (see figure 5). It is reminiscent of drawings and images by Paul Klee from the period in which Bill studied with him at the Bauhaus, which means that it is without objective solidification, as in his 1927 *Tiere bei Vollmond* [Animals by the Full Moon]. Four cat-like beings, sketched by what appears to be a single line, form a counterpoint to the circular moon.

As well as geometric ideas, there are direct allusions to the precise initial letters “K” and “k” respectively. Bill attempted to find an effective legible form in a calligraphic example (see figure 6). The long calligraphic swings cause the two words to look more like manuscript illumination than text. In doing this, Bill makes use of the fact that, not only are the two initial letters alike, but that a “k”

also occurs in the middle of the first word and that the two words appear as triple cycles. The printed *Concrete Art* poster (figure 7, poster) shows a quadrant, a semicircle with a half diameter and a full circle, which respectively touch—or, better yet, which blend into the heavy lines. A naive visitor to the exhibition in Bielefeld[20] envisioned in the arcs of the circles machinery that didn't work. If the wheel from which a quadrant is seen turns clockwise, then the semicircle as well as the full circle turn counterclockwise, but not without grinding between the two.

The diameter of the full circle is about one-third the diameter of the semicircle. Thus, the three figures are in the proportion 1:3:6. Blocks of text are found in the circular figures, whose graduated sizes have the same proportions. The game is pursued when one examines the pattern of the lines. The intervals of the boundary lines of the bound words on the left are 2:3 (figure 8, diagram).

Max Bill, perhaps unknowingly, had moved ever closer to the edges of Pythagorean doctrines. We find columns of numbers and proportional models on many of the sketches in his posthumously discovered papers. He attempted to bring the world into completely numerical relations, and was visibly enamored of infinitesimal processes, such as the frequently encountered progressions (figure 9). As an artist, he always allowed himself the freedom of deviating from the rules that he set up at the beginning of a project to complete the anticipated course of action with a gestural form. The mathematical start of his design frequently would be corrected based on what he observed. He made that explicit in one of the key texts of the expression of concrete art:

> the mathematical way of thinking in contemporary art isn't mathematics itself; indeed, what one generally understands as exact mathematics is of little use for our purposes. this way of thinking is much more a pattern of rhythms and relations, of laws, which have individual sources in exactly the same way that mathematics, on the other hand, has its origins in the thought of path-breaking mathematicians.[21]

1 The manuscript is connected to a design for the title page on the documentation of the Swiss Regional Exhibition *Expo '64* in Lausanne, 1964, for which Max Bill was architect and coworker in Sector 3, *Líart de vivre*, and in the half-sector *Bilden und Gestalten*.

2 Max Bill's typographic and commercial art legacy is found in haus bill, the artist's former home and studio in Zumikon near Zürich. I examined, arranged, and inventoried it in a sabbatical leave during the summer semester of 1997 and brought it to public attention in an exhibition in haus bill in 1997, and in the Bielefeld Kunsthalle in 1998. A special number of the *Typografische Monatsbätter* on Max Bill, which served as the catalogue of the exhibition in Bielefeld, appeared in the series *Pioneers of Typography* in July 1997. The Niggli Verlag in Sulgen prepared a monograph entitled *max bill: typografie, reklame, buchstaltung.* The sketches that are discussed in this publication are unordered and unnumbered in a gray Schollís Turicum portfolio, with the description "poster studies for *Concrete Art* Basle 1944," with the heading *Concrete Art Poster* (see note 4). The numbering of the sketches used here isn't authentic. With the exception of occasional dates, the leaves aren't marked.

3 In the first monograph on Max Bill, his early admirer and later antagonist Tomás Maldonado designated him as "architect, painter, sculptor, graphic artist, designer, publicist, and educator." (Tomás Maldonado, *Max Bill* Buenos Aires, 1955).

4 Der Delegierte für Arbeitsbeschaffung, ed., *Sozialer Wohnungs- und Siedlungsbau. Series Frage der Arbeitsbeschaffung* 9. (Zürich: Polygraphischer Verlag, 1944). The sewn innerbook is ripped out.

5 Max Bill was a proponent of this art and had set it out programmatically in his 1936 catalogue for the exhibition, *Zeitprobleme der Schweizer Malerei und Plastik,* in the Zürich Kunsthalle: "concrete design is that design which arises from its own media and laws without having to derive from or reject its external natural appearance. optical design rests subsequently on color, form, space, light, movement. although each creative design originates through inspiration, it cannot be completed without clear and precise formulation. works that are coming into being take on concrete form through this formulation; they are realized from their pure mental existence into acts; they become objects, optical and mental commodities."

6 Max Bill, *Robert Maillart*, (Erlenbach-Zürich: Verlag für Architektu, 1949).

7 Max Bill, *Wiederaufbau: Dokumente über Zerstörungen, Planungen, Konstruktionen*, ed. Abteilung Aussenhandel der Schweizerischen Gewerbeverbandes. (Erlenbach-Zürich: Verlag für Architektur, 1945).

8 Willi Baumeister, Viking Eggeling, Jean Hélion, El Lissitzky, Kasimir Malevitch, László Moholy-Nagy, Kurt Schwitters, Theo van Doesburg, and Friedrich Vordemberge-Gildewart.

9 Hans Arp, Willi Baumeister, Max Bill, Sonia Delaunay-Terk, Hans Fischli, Otto Freundlich, Max Hinterreiter, Max Huber, Vassily Kandinsky, Leo Leuppi, El Lissitzky, Verena Löwensberg, Richard Paul Lohse, Alberto Magnelli, Ben Nicholson, Alexander Rodchenko, Vladyslaw Strzeminski, Sophie H. Taeuber-Arp, and Friedrich Vordemberge-Gildewart.

10 Josef Albers, Rudolf Bauer, Étienne Béothy, Constantine Brancusi, Alexander Calder, Jean Chauvin, Robert Delaunay, César Doméla [-Nieuwenhuis], H. Eltzbacher, John Ferren, Otto Freundlich, Nahum Gabo, A. E. Gallatin, Jean-Albert Gorin, Barbara Hepworth, Auguste Herbin, Arthur Jackson, François Kupka, Alberto Magnelli, François de Martin, Henry Moore, Georges L. K. Morris, Malow Moss, Ben Nicholson, Hans Reichel, Charles G. Shaw, Vladimir Tatlin, Léon Tutundjian, Luigi Veronesi, and Lajos Vajda.

11 Text from the cover of the catalogue *konkrete kunst* (Basle: Kunsthalle Basel, 1944), which also was designed by Max Bill (Broschure, DIN A 5: 148.5 x 210 mm).

12 Max Bill, ed., *5 constructionen + 5 compositionen* (Zürich: Allianz-Verlag, 1941); Jean Arp, *poémes sans prénoms* (Zürich: Allianz-Verlag, 1941); Max Bill, *10 original-lithos, "10 origins"* (Zürich: Allianz-Verlag, 1941); Max Bill, *x=x* (Zürich: Allianz-Verlag, 1942); Max Bill, ed., *les derniers 9 dessins de sophie taeuber–arp* (Zürich: Allianz-Verlag, 1943); and Leo Leuppi, *10 compositionen* (Zürich: Allianz-Verlag, 1943).

13 The digital font is found in postscript format under the name "architype bill" as one of six avant-garde fonts of *Volumes Architype* (London: The Foundry, ca.1995).

14 "as a man, max bill seeks to conceal himself behind a veil of reserve. and yet he is very direct and aggressive in his opinions. he barricades himself in an ever higher mountain of books, magazines, and catalogues. images and objects, which he acquires as an inexhaustible collector of art, he piles up all around him. within his self-created caves, there remains a very small place for him to write and draw, just large enough for a sheet of paper, in the middle of what he calls the "geological levels" of unfinished things. yes, years ago, he abandoned offices because all the space in them was used up, and a new office would soon look just like the old one. there in the old office he searched all over the place for books and documents, which he called mining." Margit Staber-Weinberg, "anstelle einer biografie," in *max bill—leben und sprache* writings 6, 1988, ed. stiftung für konstruktive und konkrete kunst zürich. First published as "quando pitagora dipinge" in *bolaffiarte* 27, Turin, February 1973, p. 58 ff. As a pupil of Max Bill and graduate of the hochschule für gestaltung ulm, Margit Staber-Weinberg, like Max Bill from his Bauhaus days, employed radical lowercase orthography, which had been propagated by, among others, Herbert Bayer at the Bauhaus. He placed as the footer of stationery from the bauhaus dessau: "we write everything lowercase because we can't spare the time to do otherwise." (See Gerd Fleischmann, *bauhaus: drucksachen, typografie, reklame* (Düsseldorf: Marzona, 1984, p. 117).

15 "ich habe meinen weg gewählt: der weg der kleinen schritte" in: Der Themakreis im IDZ Berlin, ed., *Design? Umwelt wird in Frage gestellt* (Berlin: Internationales Design Zentrum, 1970), 19.

16 Max Bill: 8 logo sketches for book supply services a-g, zürich 1, manuscript signed and dated 8/12/45, as sender ìmax bill-architect-limmattal st. 253, zürich. Posthumously-discovered papers, haus bill.

17 Communication from the Book Supply Services, Zürich, October 9, 1945. Posthumously-discovered papers, haus bill.

18 Thomas Jankowski, Angela, "Max Bill und seine Konzeption von Konkreter Kunst: Die Anfänge in Zürich," *Tagesanzeiger* (Saturday, January 9, 1982): 41-42. [Zürich] The last section addresses the criticism that concrete art is an art of forgetfulness and therefore, was, especially questionable in the Germany of the "economic miracle." In no other nation was Max Bill as successful as in Germany, where he was the artistic adviser to Chancellor Helmut Schmidt. His monumental Sardinian granite sculpture *Continuity*, set in place on September 7, 1986 in front of the Zentrale der Deutschen Bank in Frankfurt am Main by one of the largest moveable cranes in the world, is a later expression of this consciousness. It simultaneously mirrored the artist's yearning for immortality—and wealth. The original 500–ton block was carved from a cliff and transported to Carrara, where the sculpture was the work of many years, even after being reduced to about 180 tons due to the breaking of the stone. The finished sculpture finally weighed more than 60 tons. It was this very work that provoked the initiative *Ordensleute für den Frieden* [Religious Order for Peace], "enlarged" with liquid manure and rubbish to protest against "a merciless capitalism" in which "the rich get richer and poor ever poorer and more numerous." *Frankfurter Rundschau*, June 5, 1998).

19 Heinz Ohff, "Das Tragische verschwindet: Zur grossen Max-Bill-Ausstellung in der Akademie [der Künste, Berlin]," *Der Tagesspiegel*, no. 9297 (April 14, 1976): 4.

20 *max bill: typografie, reklame, buchgestaltung* Kunsthalle Bielefeld, Studiengalerie, March 29–May 24, 1998. Curator: Gerd Fleischmann, as part of the project "rational, konstruktiv, konkret."

21 Max Bill, "Die mathematische Denkweise in der Kunst unserer Zeit" in *Das Werk*, Vol. 3 (1949): 88 (written in 1948), as published in *Pevsner, Vantongerloo, Bill* Catalogue, (Zürich: Kunsthaus,1949).

A Scenario for Design

Wolfgang Jonas

Dedicated to V.M.

1. Introduction

This paper illustrates a functional framework (a scenario) for the design process comprised of epistemological, theoretical, and methodological aspects, and introducing the concept of scenario as a guiding idea.

A scenario is a design in itself. So the criteria for the appropriateness of the construction have no correlation to some reality "out there," but comprehensiveness, coherence of the different chunks of knowledge, and beauty of the design, as well as adaptability and flexibility. "Designing designing" [1] does not claim truth, but universality. I like to call it "neorational" in the sense that it is a rationalism that has passed post-rationalism / modernism, and has evolved into "post-post-rationalism." It strives to bridge the gap between the "two cultures" of the humanities and the sciences. The starting point is science, using such concepts as autopoiesis, self-organization, and second-order cybernetics.

The scenario can be considered as an experimental stage set for design and planning practice, and a conceptual framework for disciplinary development.

2. Situation and Disciplinary Deficits

Design is developing from a craft and trade activity to a profession and, hopefully, towards an established academic discipline.[2, 3] Krippendorff [4] examines the question, "What makes a discipline?" in detail, and describes the deficits of design, mainly concentrating on the disciplinary discourse yet to come. Owen[5] calls design a "slow learner" with regard to the establishment of a knowledge base. Jonas [6, 7] describes the structure of these "learning pathologies," arguing that frequent crises in self-concept lead to the reactive adoption of stylish ideologies ("small theories" / "theory fashions") which focus on isolated aspects of the field. They postpone the crisis for a while. Theory fashions (functionalism, product semantics, eco design, and ethical design, for example), fiercely fighting each other, suddenly appear in close proximity.

On the other hand, there are the less spectacular, longer-term activities of theory-building that undergo considerable delays before showing any effect in practice. The last big effort of this kind, trying to enable design to deal with the increasing complexity of problem situations, took place in the 1960s, and ended in the early 1970s. There was little positive immediate effect. Some results were even

1 John Christopher Jones, "designing designing" in *Essays in Design* (Chichester: John Wiley & Sons, 1984, originally, 1978).

2 Richard Buchanan, "Myth and Maturity: Toward a New Order in the Decade of Design" in *Design Issues* 6:2 (Spring 1990): 70-80.

3 Richard Buchanan, "Education and Professional Practice in Design" in *Design Issues* 14:2 (Summer 1998).

4 Klaus Krippendorff, "Redesigning Design. An Invitation to a Responsible Future" in Vihma Tahkokallio, ed., *Design—Pleasure or Responsibility?* (Helsinki: UIAH, 1994), 138–162.

5 Charles Owen, "Design research: building the knowledge base" in *Design Studies* 19:1 (January 1998): 9–20.

6 Wolfgang Jonas, *Design—System—Theorie. Überlegungen zu einem sy-stem-theoreti-schen Modell von Design-theorie* (Essen: Verlag Die Blaue Eule, 1994), 50–68.

7 Wolfgang Jonas, "Viable Structures and Generative Tools—an approach towards 'designing designing' " "Contextual Design—Design in Contexts" (European Academy of Design, Stockholm, April 23–25, 1997).

negative, driving researchers including Alexander[8] and Jones[9] to retreat from the field. Nonetheless, long-term influences have been produced.

Working on the basis of short-term theories has had the side effect of fundamental work increasingly being neglected. The disciplinary infrastructures to do this autonomously waste away or even disappear completely. Unlike medicine, another academic discipline aiming at practice, the necessity of continuous theory work is not widely acknowledged. This is a vicious circle, driving design into the poor role of an auxiliary profession of economy or marketing, not really responsible for its contributions to culture. Theory, mostly about design, is left to those reflecting disciplines as philosophy or cultural sciences, which normally do not care much about design's fitness for its crucial, everyday function of shaping our way of living. Figure 1 illustrates this "shifting-the-burden" pattern[10] in systemic language.

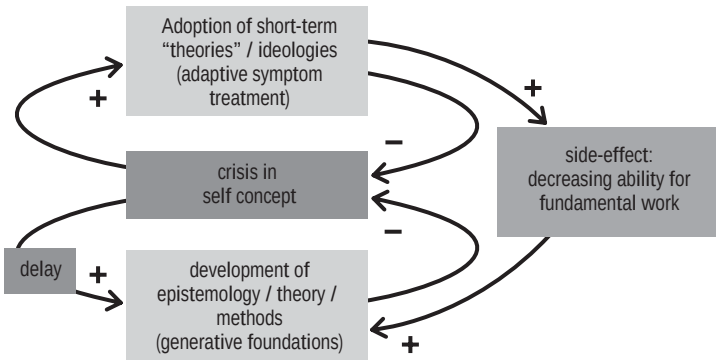


Figure 1
Creating generative foundations seems to be a necessary intervention for overcoming learning pathologies in design.

There still seems to be too little internal complexity to deal with increasing external complexity. The "critical mass" of coordinated efforts to produce reliable foundations has not yet been reached. This weakness of discourse and value system weakens design's ability to communicate with established disciplines such as economics or engineering on an equal basis. Other disciplines (including marketing) speak for design instead. Of course, there are a few individuals who are "Starck" enough to communicate according to their own rules, acting rather as a prima donna than as a partner.

3. What Is Special About Design?

The question is: How can design achieve autonomy? Design has not (yet?) reached the status of science, art, technology, and economics. Ongoing definitory attempts which revert to previously established areas include those of the Bauhaus, New Bauhaus, and Ulm schools. They might be useful, at best, as negations. Design is *not art* because it does not aim at individual expression, but instead to serve various stakeholders, even though there are all of those intuitive, creative, and individual components. Design is *not technology* because it deals

8 Christopher Alexander (interviewed by Max Jacobson), "The State of the Art in Design Methods" in *DMG Newsletter* 5:3 (1971): 3–7.

9 John Christopher Jones, "How My Thoughts About Design Methods Have Changed During the Years" in *Essays in Design* (Chichester: John Wiley & Sons, 1984, originally 1974).

10 Peter Senge, *The Fifth Discipline. The Art & Practice of the Learning Organization* (New York: Currency Doubleday, 1990).

with fuzzy, discursive criteria rather than objective criteria, even though design shares many functional objectives. Design is *not science* because it does not offer new explanatory models of reality, but changes reality more or less purposefully, and yet the experimental process of research resembles the design process. Obviously, design is something very special.

Glanville[11] uses the similarities in design and the research process to perform a complete "U-turn," arguing that design thinking should be the model for scientific research. Though very appealing, it really is not a solution since it shifts the burden of basic explanation to design, the weakest part of all. While design, in fact, is a cross-discipline and integrates various expert fields, it cannot be basic to everything else. Instead, it should be conceived as an expert discipline of a special kind: for integration, relation, and meaning. There have been numerous attempts to redefine design.

Table 1:
Two recent attempts to redefine designing

Reinterpretation Bonsiepe[12]	**Functional Definition** Jonas[13]
Design is a domain which can manifest itself in *every area of human knowledge and practice.*	
Design is oriented towards the *future.*	Design is *anticipative* (looking ahead, in different directions and time scales).
Design is related to *innovation.* The design act introduces something new into the world.	Design is *generative* (aiming at the synthesis of material or immaterial artifacts and patterns of behavior).
Design is tied to *body and space,* especially the retinal space.	
Design aims at *effective action.*	Design is *use-oriented* (taking quality of life as its criterion, without claiming to know what this is).
Design is fixed at *language* in the area of *assessments.*	Design *is illustrative* (creating wholes, contexts, narratives, aiming at agency and dissemination).
Design aims at the *interaction of user and artifact,* acting in the domain of the *interface.*	
	Design is *integrative* (neglecting disciplinary boundaries, moderating perspectives, and including its own).
	Design is *context sensitive* (being aware of and using social, cultural, technological interdependencies).

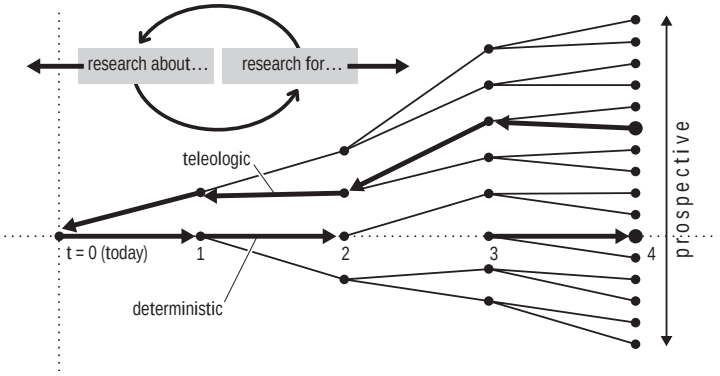
11 Ranulph Glanville, "Why Design Research?" in R. Jacques and A. Powell, *Design: Science: Method* (Guildford: Westbury House, 1980).

12 Gui Bonsiepe, *Interface. Design neu begreifen* (Mannheim: Bollmann, 1996).

13 Wolfgang Jonas, "Research for the Learning Design School," *The New Academy* (Barcelona, October 1997).

Theory-building has to consider that design, in aiming at "solutions," needs a theory for practice to deal with complex entities of different types (material, cognitive, and social) so that some kind of "systemic" concept seems inevitable. Design is future-oriented and, of course, serves people and social institutions. This is not to stress human-centered nature, there is nothing other than people to design for, with the possible exception of self-conscious machines. Yet it does emphasize that design, for the most part, is a matter of fuzzy, changing, cultural criteria as opposed to scientific criteria. There is ongoing negotiation between stakeholders of perspectives, with the goal of understanding each other's viewpoint. Design changes the world and, in turn, is changed by these changes.[14]

To derive the requirements for the framework, we should distinguish human operations by their orientation in time. They are either forward-oriented, aiming at purposeful action (called practice), or backward-oriented, aiming at reflection, interpretation, and causal reconstruction (called theory). A hypothetical abstract definition might describe design as a permanent sequence of decisions to reduce contingency at the individual, organizational, and social levels. The function of each decision is to define and, subsequently, to eliminate alternatives and absorb uncertainty in order to create novelty. In order to do this on a rational, meaningful basis, it is necessary to have feedback cycles established between theory and practice, and between the forward and the backward perspectives. This really is not new, but known as forecasting (deterministic), planning / backcasting (teleologic), scenario-building (prospective) or, more generally, learning (figure 2).



Fugure 2
Design as a bifurcation process of decision-making.

Any claim as to the priority of either the humanities or the sciences in this endeavor is counterproductive, since it tends to broaden the cultural gap.[15] We should not hesitate to include everything into a general framework which seems to be useful (from pragmatic philosophy to chaos theory).

14 Alain Findeli, "Theoretical, Methodological, and Ethical Foundations for a Renewal of Design Education and Research," *The New Academy* (Barcelona, October 1997).

15 Victor Margolin, "Design Research and Design Studies: Why We Need Both," a lecture given at the conference *"No Guru, No Method?"* (UIAH Helsinki, September 6, 1996).

This approach implicitly covers the issue of values and ethics in the Aristotelian sense as deriving from good practice, and not vice versa.[16] To focus on ethics would make design a religious project.[17]

4. Epistemological Consideration

Epistemology concerns the basic assumptions of our way to gain knowledge of the world we are living in. Normally, the epistemological basis either is taken for granted in a scientific field or more or less arbitrarily chosen, depending on the researcher's intellectual biography, as in design. Nevertheless, the choice shapes the complete building.

Design theory deals with an inherently context-dependent and temporal subject matter. Recognizing change as an essential feature should not be considered as an uncritical adaptation to contexts, but rather an essential condition of any dynamically stable theory. There are two major problems: self-reference (leading to circularity) and paradox (leading to nothing or everything). Like linguistics, psychoanalysis, and other disciplines, design research is a reflexive project. The most awkward characteristic of the subjects mentioned is that they examine themselves in their own terms. The observer is, at the same time, part of the observed field and observing from outside of it. The same is true for theory. Design theory is part of its subject; and creating a theory changes the subject.

Any comprehensive theory or model of design should be able to explain its own emergence and change.

In the classical scientific paradigm, this situation is extremely critical. The thing talked about is on one level, and the thing in terms of which it is talked about must be on another (meta) level. Gödel proved in 1931 that it is impossible to describe something both completely and consistently in its own terms. But some subjects, such as design, do and must talk about themselves in their own terms—that is, their metalevels are the same as their levels. This leads to the flaw that they have to be considered as incomplete and / or inconsistent in terms of the classical paradigm.

Is there any way out? Glanville[18] argues that self-reference is obvious even in "hard sciences" and, therefore, must be accepted as basic. The problem thus arising (see the "U-turn," above) is to redesign the whole of scientific knowledge to encompass not only the classical view (possibly modified), but also those things which currently are excluded. Are there, then, any levels at all? If self-referential (living) systems are basic, then levels cannot exist. Glanville's explanation is based on the observation of the way in which scientific knowledge actually is produced, and on remembering how it is that levels come into being:

> Science (and how often we do forget this in our oversimplifications) is a corpus of knowledge, and a corpus of knowledge requires agents to know it. It is not constituted of cold

16 Wolfgang Jonas, "Design und Ethik — brauchen wir eine Sondermoral für das Design?" 15. designwiss. Kollo–quium *Design und Ethik* (Hochschule für Kunst und Design Halle, 1995).

17 Ezio Manzini, "Prometheus of the Everyday. The Ecology of the Artificial and the Designer's Responsibility" in Buchanan and Margolin, eds., *Discovering Design* (Chicago: The University of Chicago Press, 1995), 219–243.

18 Glanville, "Why Design Research?"

> facts, but of working hypotheses. The corpus of knowledge does not, a priori, exist; it is constructed. The relationships in it have to be made through the act of relating, and they have to be expressed linguistically, and stabilized through shared interpretation in shared language.…

Glanville shows, in detail, that the sort of mechanisms that must be assumed for self-referential systems to be observable to others permit and require the making of such relationships and, thus, of levels. Without this assumption, there would be nothing left to talk about. This reinforces the concept of science as being a social endeavor. But it also provides the theoretical basis for the observer in any experiment—or the designer in any design—as being involved in a circular, feedback process in which the observer's description and the experimental arrangement's behavior interact and modify each other until they are in apparent agreement, allowing predictions to be made (inductively) without the need for any recourse to "truth."

This leads to the *autopoiesis theory* of living systems, and its further extension to mental and social systems. Maturana and Varela[19] argue that living organisms are autonomous, operationally closed, dissipative systems because they strive to maintain an identity by subordinating all changes to the maintenance of their own organization as a given set of relationships. They do so by engaging in circular operations. Thus, continuous patterns of interaction are established that are always self-referential, because a system cannot enter into interactions that are not specified in the pattern of relations that define its organization. The concept of operative closure already has been indicated by Schütz,[20] who clearly describes the unreconcilable gap between subjective meaning and alter's understanding:

> Intended meaning is essentially unapproachable, because it is constituted exclusively inside my own flow of consciousness.

For all these reasons, a constructivist approach seems to be appropriate. Luhmann[21] states:

> Constructivism is the consequence of some theoretical positions which focus on operational closure. This means that a system can only work within itself and not outside. A system can never operate in its environment…In cognitive science, this idea comes from brain research, as the brain is an operationally closed system. So, if we have to use our brains to make science, how can we get into the environment?

Luhmann's theory (see section 4) uses the concept of "observation," which is defined formally as an operation with a distinction in order

19 Humberto R. Maturana and Francisco Varela, *Der Baum der Erkenntnis. Die biologischen Wurzeln des menschlichen Erkennens* (Bern und München: Scherz, 1987).

20 Alfred Schütz, *Der sinnhafte Aufbau der sozialen Welt. Eine Einleitung in die verstehende Sozio-logie.* (Frankfurt: Suhrkamp, 1974, originally 1932), 140.

21 Ole Thyssen, "Some Basic Notions in the Systems Theory of Niklas Luhmann" and "Interview With Professor Niklas Luhmann, Oslo, April 2, 1995" in *Cybernetics & Human Knowing* 3:2 (1995): 3–22 and 23–26.

to indicate one side and not the other side of the distinction. The initial distinction is, more or less, arbitrary but influences the rest of the construction. The theory does not refer to ontology, but to the basic distinction system / environment. Any observation is based on the dualism of self-reference and external reference. Both types of reference imply each other, so that no materialism (only external reference) and no idealism (only internal reference) is possible. What is stable is not the objective world, but *eigenvalues*, functions and structures which are the product of "second-order observation." [22] A shared world is constructed and continually tested out of second-order observations.

To sum up: there is a "real world" which we cannot perceive as it "really" is. Constructivism provides a consistent and comprehensive way to account for that. Due to its foundation in autopoiesis theory, constructivism is a contribution to the naturalization of epistemology.

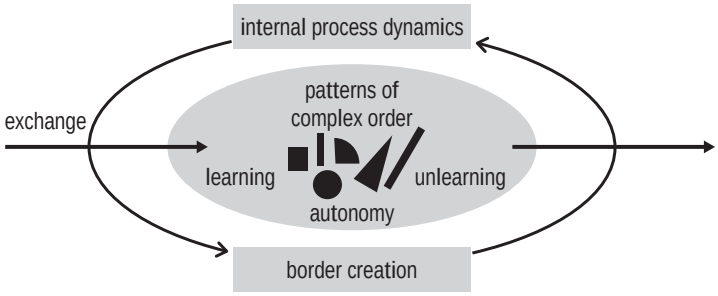


Figure 3
Dissipative systems (living, mental, and social) build internal complexity by autopoietic closure. This permits interaction with the environment, exertion of influence, evolution, and learning.

5. Systems Theory as Core and General Framework

The theory has to be comprehensive, highly abstract, and flexible in structure in order to integrate numerous subject theories on different levels of resolution. And it has to be adaptable to change, while keeping its basic character.

Every observation is a unity of a distinction and an indication.[23] Cognitive operations begin following the imperative: Make a distinction! This section started with a contingent (i.e., neither necessary nor impossible) decision to be stabilized through the coherence of the total approach: the adoption of sociological systems theory for theory-building and methodology, and the choice of the distinction system / environment as a starting point. The guiding idea is that design, if it intends to act generatively, has to become an autonomous system itself (theory). Other fields, if seen as subjects of intervention (methodology), have to be considered as autonomous systems.

5.1. Outline of Systems Theory

The reception of social systems theory in design seems to end with Parsons, whose structural functionalism, concerned with the problem of conserving existing structures, is rightly considered too rigid and static.[24] The further differentiation of systems theory is widely

22 Heinz Von Foerster, *Sicht und Einsicht: Versuche zu einer operativen Erkenntnistheorie* (Vieweg: Braunschweig, 1985) - originally *Observing Systems* (Seaside, CA, 1981)

23 George Spencer Brown, *Laws of Form* (London: George Allen & Unwin, 1968).

24 Victor Margolin, "Design Research and Design Studies: Why We Need Both."

neglected. One of its origins lies in first-order cybernetics,[25] dealing with observing an objective reality and the problem of control. Here, many designers still stop listening and turn away with horror. But there also is second-order cybernetics (developed at the Biological Computing Lab at the University of Illinois, Urbana, by von Foerster et al., and at the Palo Alto Mental Research Institute by Bateson, et al.), dealing with the problem of negotiation and argumentation, and the construction of a reality by observing observations. Whereas, first-order cybernetics deals with observed systems, considered open, and with the observer defining the system's purpose; second-order cybernetics deals with observing closed systems with the observer defining "his or her own purpose."

Luhmann's theory of social systems[26] is the most advanced model of modern society. He extends the autopoiesis concept of living systems to the description of mental and social systems since about 1980. Living systems act in the medium life, mental systems in consciousness, and social systems in communication. Both mental and social systems operate with language and meaning. Communication cannot take place without presupposing consciousness, and vice versa.

The theory asks for the function of systems. The purpose of system formation is, generally speaking, the creation of separated regions which allow the system to record and process the complexity of the world. Systems establish a difference between inside and outside, acting as a sense-making, symbolically mediated interface between delivered and processable complexity. Thus, a system defines, for itself, the boundary which allows it to create its own identity according to internally produced and processed rules, and to maintain it against an external reality.

No analysis of consciousness will ever reveal anything about communication and vice versa, just as no analysis of mental processes will reveal anything about brain processes, which are the domain of living systems. Autopoietic systems act in operative closure; mental and social systems being totally distinct. The construct of person is the structural coupling of mental and social systems, allowing both references to communication and consciousness.

Boundaries increase the level of "stabilizable improbability" (organized complexity), limiting meaning to the internally meaningful. Every kind of environment is perceived only with respect to the own difference schema. The kind of relationships possible with its environment depends on the mode of operation, which is determined by the system's internal structure. External control of autopoietic systems is impossible, except at the price of destroying their autopoietic quality and identity.

Functional subsystems are the products of ongoing differentiation. They increase their operational efficiency by using generalized media and codes (e.g., the economy operates in the medium money, science in the medium truth, politics in power, etc.). Sub-

25 Norbert Wiener, *Cybernetics or Control and Communication in the Animal and the Machine*, 1948.

26 Niklas Luhmann, *Social Systems* (Stanford: Stanford University Press, 1995)—originally *So-ziale Systeme. Grundriß einer allgemeinen Theorie* (Frankfurt: Suhrkamp, 1984).

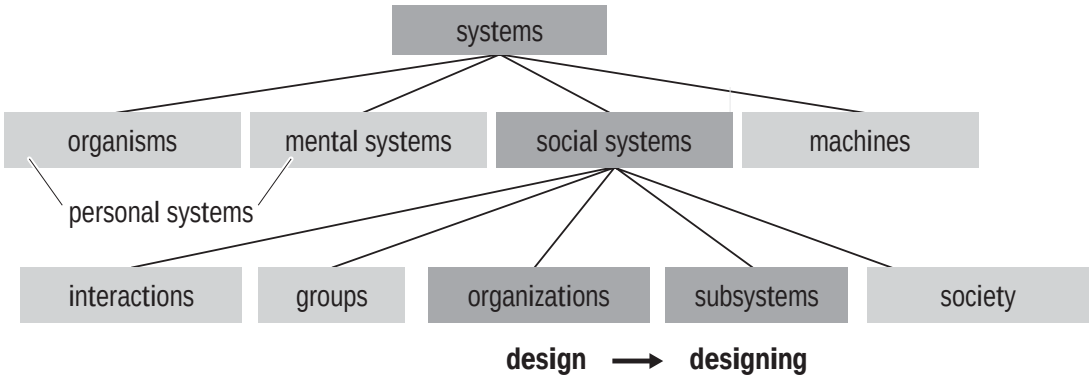


Figure 4
System classification.[27] Design can be conceived as a social system interacting with other social systems.

systems are closed and create their own domains, allowing only certain operations. Though creating a shared orientation via their codes, they are not based on consensus but, rather, stabilize around conflict. Conflicts are productive, and allow for change and learning. Thus, no vantage point exists to observe society as a whole, and it is impossible to talk about what is rational for society or what will benefit society as a whole.

Jonas[28] elaborates on the concept for design by introducing three contextual and/or historical phases—satisfaction, creation, and reflection of need—three process steps (expanding the "problem-solving" process—see section 6), five process levels (from creative to cultural processes), and four reality levels (vision, structure, patterns, and events/objects). The hypothetical social subsystem designing (on the level of science, economy, etc,—see figure 4) is introduced as a flexible, project-oriented and, thus, temporary framework that integrates engineers, designers, economists, social scientists, and futurologists, depending on the specific task at hand.

5.2 Related Paradigm Shifts

From adaptation to generation

One of the crucial questions in a theory of open systems, from evolution to organization or education, has been: How does a system adapt optimally to its environment? In a theory of closed systems, we ask: How does a closed system constitute and reconstruct itself in an overly complex, chaotic environment? Adaptation is not central, but rather the conditions of the possibility of establishing a complex order.

Meaning as a formal process concept

Meaning (*Sinn*) does not refer to a certain aspect of reality, but describes the formal order of human experience and action as a continuous process of selection, following internal criteria and based on the difference of the actual vs. the possible. The present core of actuality is unstable because it permanently needs new indications of possibilities. Meaning is a surplus of relationships to

27 Niklas Luhmann, *Social Systems*.

28 Jonas, "Viable Structures and Generative Tools—An Approach Towards 'Designing Designing,'"

further possibilities of experience and action, so that what is in the center of attention is surrounded by a horizon of assumptions and references. The "automobility" of processing meaning, which sustains itself through self-referentially enabling its own reproduction, is autopoiesis par excellence.

From aggregation to emergent qualities

Social entities constitute realms of their own, emergent orders, irreducible to the characteristics of biological and mental systems. It is the *form of processing meaning* which makes the difference: mental systems are processing meaning in the form of thoughts and imagination, whereas social systems process meaning in the form of symbolically mediated communication. Communication is necessary for their formation and continued existence. The connectivity of communication is meaning in social systems.

From people to communication

One of the irritating consequences is that social systems consist of the processing of communication, not of human beings. There is no place and no need for the individual in the theory (there are simply too many of them). Man is a very diffuse idea, depending on who is observing and how. No supersystem encompasses living, mental, and social systems. In this perspective, the "members" belong to the environment because they are never, in total, part of a system but only in some respects, with certain roles, motives, and attentions. Only a radical depersonalization of social systems enables us to understand their peculiarity and autonomy in a way that prevents them from being regarded as a mere collection of biological and psychic moments. "Intersubjectivity" does not solve this problem, because the neurobiologically founded assumption of the autopoietic quality of mental processes leads to the conclusion that every person possesses his or her own intersubjectivity.

From purpose to the function of purpose

The concept of intentional action has to be qualified in the systems context. Speaking of the "true" purpose of product development apparently is meaningless in the economic context. The point here, whether design likes it or not, is the magnitude of the flow of goods and capital. Thus, the key question is the function of purposes on whatever level. Purposes reduce the complexity inside the acting system and increase performance. They provide the neutralization of values needed to minimize irrelevant side effects; they serve for the operationalization, (i.e., the formulation of clear instructions); and they justify the means. Purpose also is a means of drawing borders, establishing identity and, thus, system formation. Purposes do not denote the "nature" of an action (there is nothing of that kind); rather, they have important auxiliary functions.

From action theory to systems theory

It therefore is necessary to transfer the concept of action from action theory to systems theory. The relationship of action and system can be broken down into various components mainly through the boundaries of action systems which, on different levels of generalization, produce different rationalities, features, and problems. *The level of individual action is sociologically irrelevant*. Even Schütz questions the seemingly clear and distinct category of action:[29]

> So it is left to the observer, be it a partner in social life or a sociologist, to fix high-handedly the start and end-point of alter's acting the meaning of which is to be explored. The objective course does not offer any criteria for the distinction of a "unified action."

From means and ends to continuance/viability

Systems theory starts from the permanent problem of system continuance. The basis of this is not single purposes or simple chains of purposes and means, but "purpose programs." They transform permanent, insoluble problems into sequences of soluble problems. At the end of this multistage reduction are concrete design problems leading to design solutions. Purpose programs formulate and formalize the conditions on which a subsystem may handle the means of the supersystem's like own purposes and, therefore, become indifferent to effects that nonetheless may be relevant in the whole system. For example: "gute form" or "quality of life," as self-defined purposes of the subsystem (design team or school), are contingent on the supersystem (firm or economy) with its purpose program of securing continuance. Changing contextual conditions (satisfaction, creation, and reflection of need) produce crises and hectic reformulations of design purposes. These conflicts are more fruitless the less autonomous the subsystem is.

Design thus should make an effort to transform its simple, sometimes naive, contingent purposes, mainly of a reactive character, into generative purpose programs, including specific modes of interaction, codes, and values relative to the general context. More disciplinary autonomy might initiate a design evolution from a fuzzy subsystem towards a clear and distinct cosystem of economy.

6. Scenario-based Methodology

Methodology integrates and puts into operation the product development process. It has to be abstract and flexible enough to cover projects in firms, educational projects of any size, public development projects, and policy-making projects. And it has to leave room for individual approaches.

By emphasizing systemic description, providing intervention strategies, and methodological openness and interactivity, it takes account of the stakeholders´ involvement in the process, and performs the intermediate step from first- to second-generation methods.

29 Schütz, *Der sinnhafte Aufbau der sozialen Welt. Eine Einleitung in die verstehende Sozio-logie*, 82.

Though (or because) the methodology is directed at people, the concept of the individual as the center of design production and reception has to be abandoned. To illustrate, when designing an object (e.g., an ATM), we do *not* have to take into account the "whole person" (whatever that might be). But we do have to take care of the communicative/interactive needs of persons related to this specific situation, as far as these are recognizable. What is the whole person? Those who can observe it from the outside, cannot observe it from the inside, and those who can observe it from the inside, cannot observe it from the outside.

Everything else is, in my view, a misconceived and idealistic/romantic concept of "wholeness" which does not work. This means: don't care for individual people (they are inaccessible anyway). Instead, care for their communicative patterns of behavior. This should not be considered as antihumanistic, but as methodological.

6.1 A Process Framework for Reflective Involvement

Figure 5 shows the outline of a broadened concept of the design process covering such requirements as universality, future-orientation, reducing contingency, and providing feedback.

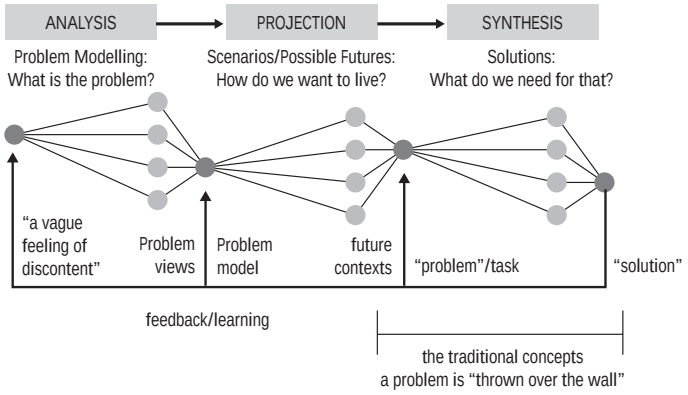


Figure 5
Broadened concept of design (designing).

SYNTHESIS is the phase in the design process which, traditionally, is the focus of interest. An apparently clear and distinct "problem" is given/"thrown over the wall," and has to be solved. This step should not be neglected or disregarded (a common misunderstanding, sometimes fear, of traditional product designers concerned with this approach), but it is not the main interest here. In times of accelerated technological and social change, and globalized economies with saturated markets, the two preceding steps become increasingly important. It is not at all trivial to find an answer to the question: What is the problem? (ANALYSIS). And it is just as challenging to ask: How might the future environments look in which our solutions have to prove their worth? (PROJECTION). It becomes a design problem to define the design problem (see the concept of "problem design" [30]).

30 Wolfgang Jonas, "Design as Problem-solving? Or: Here Is the Solution—What Was the Problem?" in *Design Studies* 14:2 (April 1993).

6.2 Scenario-building as a Central Concept

Scenarios are images of possible, probable, or preferable futures or futures to be avoided, and sometimes comprise the steps to achieve them. Early scenarios (except Utopias such as Bacon's *New Atlantis* or More's *Utopia* are, for example, those of Kahn.[31] Coming from the military field and public policymaking, they entered business planning (e.g., the Shell scenarios by Wack[32]). The concept comprises a broad range from global models to user scenarios as already widely used (e.g., in HCI design). Scenario building is a central concept in design, shifting the focus from the object to the process of communication and interaction, and covering all phases of the design process:

ANALYSIS: analytical scenarios
(e.g., sensitivity modeling)
PROJECTION: context scenarios
(possible futures, dealing with uncertainty)
SYNTHESIS: user scenarios
(e.g., human-computer interaction).

Hasdogan[33] worked on user-oriented scenarios in design. The approach presented here combines analytical scenarios (for sensitivity modeling, see Simon[34] and Vester[35]), contextual scenarios (see Schwartz[36] and van der Heijden[37]), and user scenarios; and explores their usefulness in design projects.

Scenario-building is the process of reflected involvement. It invites open communication and participation in creating new information and knowledge. It can be performed only by participating persons / stakeholders / authors that influence and themselves are influenced in the process.

The following introduces the example of a context scenario which, in the concrete project, was related to analytic and to user scenarios.

Possible futures are determined by those external forces (variables) which have a "high impact" on the system and, at the same time, display "high uncertainty" in their future behavior. They can be de-

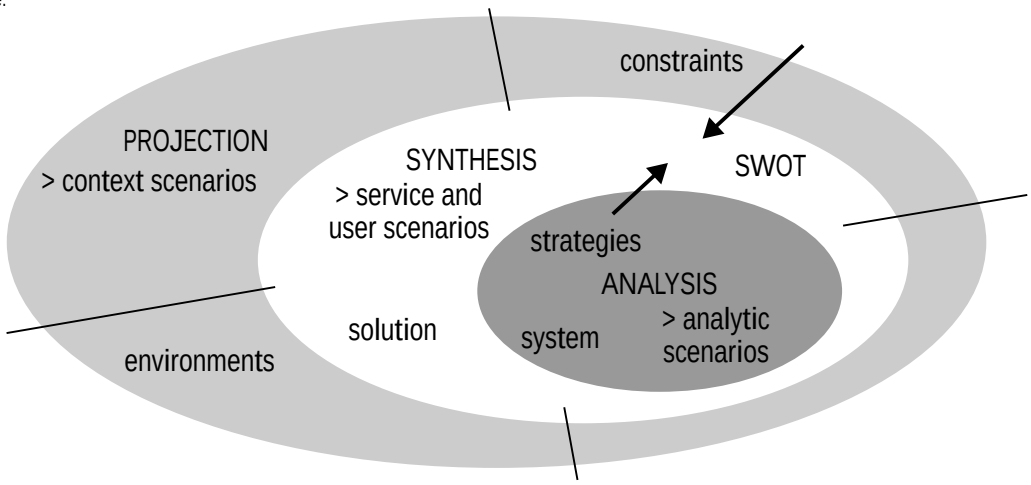


Figure 6
Design solution space between system and context. Design acting as an interface discipline.

31 Herman Kahn, *The Year 2000: A Framework for Speculation on the Next Thirty-Three Years* (New York: MacMillian,1967).

32 Pierre Wack, "Scenarios: Uncharted Waters Ahead" and "Scenarios: Shooting the Rapids" in *Harvard Business Review* (Sept./Oct. 1985): 73–89, and (Nov./Dec. 1985): 139–150.

33 Gülay Hasdogan, "The Role of User Models in Product Design for Assessment of User Needs," *Design Studies* 17:1 (January 1996): 19–33.

34 Herbert A. Simon,*The Sciences of the Artificial* (Cambridge: MIT Press, 1996).

35 Frederic Vester, *Sensitivitätsmodell Prof. Vester. Ein computerunterstütztes Planungsin-strumen-tarium zur Erfassung und Bewertung komplexer Systeme* (München: Studiengruppe für Biologie und Umwelt GmbH, 1993).

36 Peter Schwartz, *The Art of the Long View* (New York: Currency Doubleday, 1991).

37 Kees Van der Heijden, *Scenarios: The Art of Strategic Conversation* (Chichester: John Wiley & Sons, 1996).

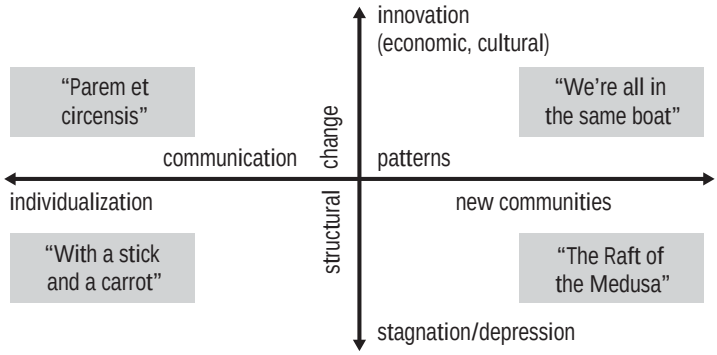


Figure 7
"Quattro stagioni": Frame of four scenarios derived from two variables, with two extreme states each.

termined intuitively or discursively (e.g., by consulting experts in the field or stakeholders involved in the process—see Schwartz[38]). It also may be possible to use the findings from cross-impact analysis and sensitivity modeling, especially the highly active (independent) and highly critical variables, for that purpose.[39, 40]

"Quattro stagioni" is an approach, following Schwartz[41], for the creation of four extreme contexts using those two variables with highest impact and highest uncertainty. Because of the uncertainty, it is possible to identify two extreme states of each variable (flip-flop). The combination of two extreme states of two variables each results in a frame of four scenarios. For example, the variables "communication patterns" (individualization—new communities) and "structural change" (stagnation—innovation) provide the scenario frame of figure 7.

Fleshing out the four quadrants with characters and events yields four stage sets, contexts, or testbeds for subsequent design activities. Figure 8 shows the above-defined frame illustrated with strong metaphoric images. The choice of concise titles and strong images is of utmost importance to the communicative function of the scenarios for their recognizability and for their function as focal point for design considerations, as well as for organizational learning. The four, related narratives are not given here.

Solutions emerge in the field of tension between the system (analytical scenario) and its environment (context scenario), as shown in figure 6. On this level, service and user scenarios play an important role in developing solution concepts. Solutions have to take into account the strengths and weaknesses of the system, and the opportunities and threats of the contexts (SWOT analysis).

The matrix of decision options (figure 9) is a tool to systematically test solution variants before the background of the different scenarios. How does the scenario act on the solution? What happens if the solution has to survive in this context? Viewing the options in one row will result in the robust options, (i.e., those that are useful in all possible contexts). Considering the options in one column will lead to the range of competencies which will support optimum viability in one, specific scenario.

38 Schwartz, *The Art of the Long View* .

39 Van der Heijden, *Scenarios: The Art of Strategic Conversation*.

40 Michel Godet, *From Anticipation to Action. A Handbook of Strategic Perspective* (Paris: UNESCO Publishing, 1994, originally, 1991).

41 Schwartz, *The Art of the Long View*.

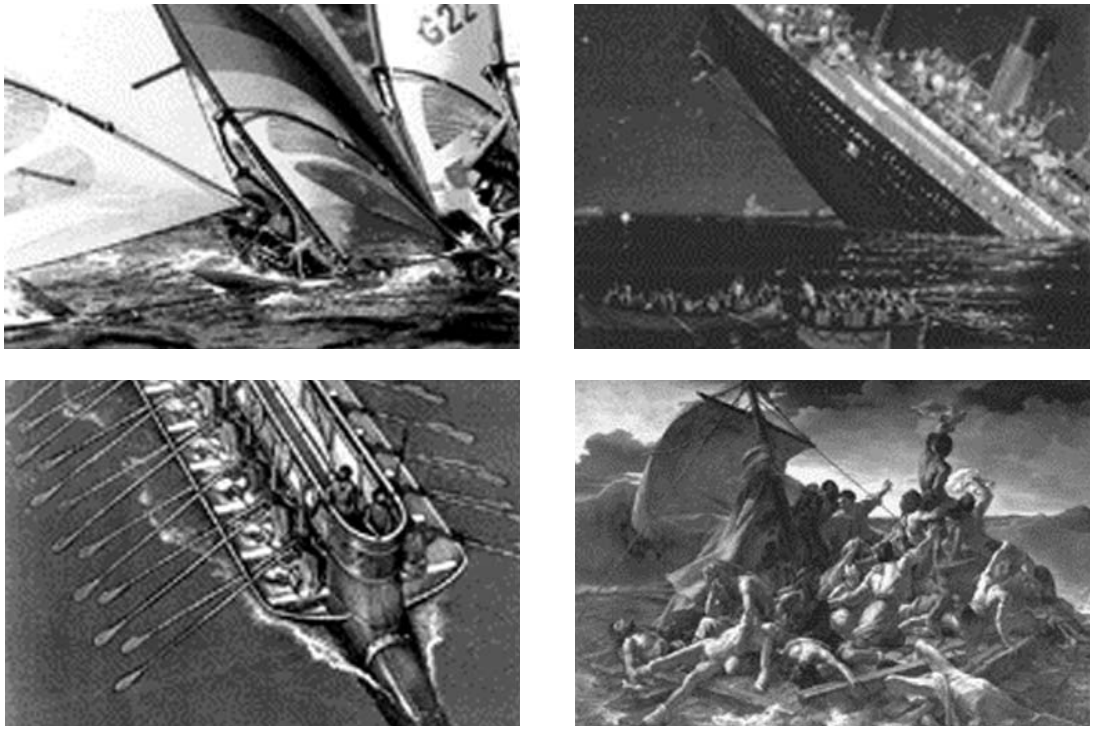


Figure 8
"Quattro stagioni": Scenario frame filled with strong metaphoric images.

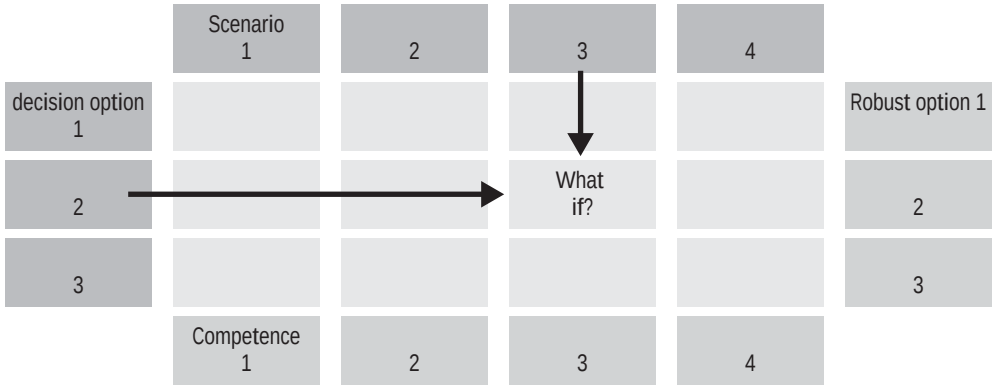


Figure 9
Matrix of decision options.

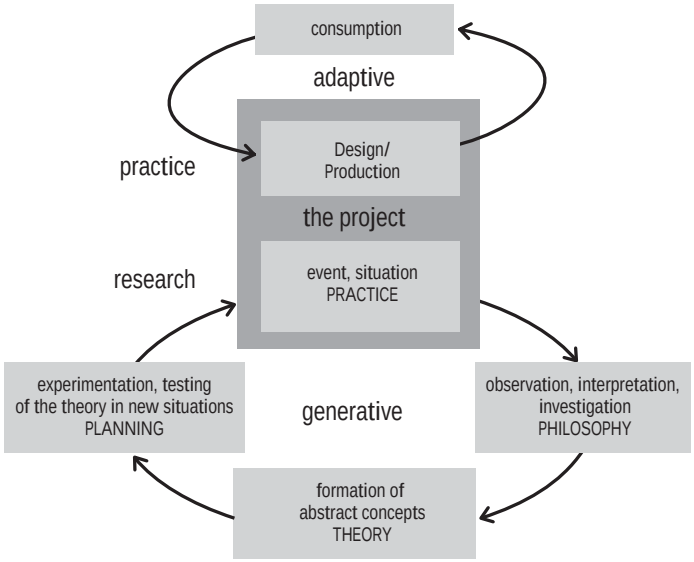


Figure 10
Double-loop learning in design.[44]

7 Research Fields and Disciplinary Perspectives

Design research has to be strengthened in order to stabilize the delicate dynamic balance between autonomy and context-dependency (figure 3). Otherwise, we perpetuate the well-known practice of frequent "paradigm-shifts," starting from scratch every ten years or so, and claiming to finally have found out how it "really" is. If it is true that the process of intervention into complex autopoietic systems will be the design product of the future (see Krippendorff[42] and Willke[43]), then research has to focus on the *process of design*. Apparently, a circle of double-loop learning has to be established for that purpose.

This can best be accomplished by research *for* design, i.e., by researchers involved in the process, and in the disciplinary learning cycle in education and practice. Research *about* design, which is mainly backward-oriented (figure 2), delivers essential contributions but can, in principle, at least, be done by anybody as distant as possible from the discipline (e.g., an art historian studying medieval architecture).

The project, as a more or less arbitrarily cut out piece of the continuous flow of time, delivers the experimental setting or framework for research. The form of a workshop might be a further refinement. A research program has to crystallize around the concept of project and projection activity as the main features of designing. Design research is project-oriented research, making the design process a subject of design. Research, as an inherent component of education, creates a strong link between theory and practice. The project, as subject matter, is the link.

It turns out that there is a strong interrelation between the process of design practice and the process of design research; sometimes the two are hard to distinguish. And there is a further problem: neither practitioners nor most theoreticians like this con-

42 Krippendorff, "Redesigning Design. An Invitation to a Responsible Future."

43 Helmut Willke, *Systemtheorie II: Interventionstheorie. Grundzüge einer Theorie der Intervention in komplexe Systeme* (Stuttgart and Jena: Gustav Fischer Verlag, 1994)

44 Jonas, "Research for the Learning Design School."

nection. Practitioners want instant-to-apply recipes (if at all), while theoreticians prefer to stay in their protected niches because practice could spoil the purity of their preferred approaches. But this combined effort is necessary in order to become a discipline. And it is the only way providing the advance of education before practice.

Hasdogan[45] points out that *scenario building* is the core activity in the design process. It can provide a thematic core for design research, because it:

- Deals with involvement (understanding understanding),
- Is a communicative process (organizational development),
- Is projective (linking design to futures studies),
- Is transdisciplinary (developing a language of autonomy—exchange), and,
- Generative (creating wholes which produce "solutions").

Design might become a respected autonomous partner in a hypercyclic network of future-shaping disciplines. Designing (figure 4) might emerge as a functional subsystem of society, with its own language/code to allow increased internal complexity, and with its own disciplinary ethics, concerned with the quality of the decision-making process instead of individual ethics.

The general perspective can be described as the establishment of design thinking as the guiding paradigm, not only in product development, but also as a central concept in the process of decision making in social life (organization, firm, and community). So "design as one of the most important and least recognized arts of human culture" [46] evolves towards a respected discipline which is not concerned with the necessary, but with the contingent, and the artificial.[47] Maybe, there now is a critical mass of researchers and practitioners to push things forward.

Perhaps in the very distant future, we could achieve Glanville's point, where design thinking is the paradigmatic model for scientific research, as opposed to the present practice, where design tries hard but vainly to be scientific according to well-established standards.

45 Hasdogan, "The Role of User Models in Product Design for User Needs."

46 Buchanan, "Education and Professional Practice in Design."

47 Vester, *Sensitivitätsmodell Prof. Vester. Ein computerunterstütztes Planungsinstrumen-tarium zur Erfassung und Bewertung komplexer Systeme*.

Communication Among All People, Everywhere: Paul Arthur and the Maturing of Design[1]

Michael Large

In response to the social and technical dislocations of the second half of the twentieth century, the conceptualization of function in communications design has broadened from the formalist concerns of modernism.[2] The trend has been towards an integrated, user-centered approach, based on collaborative research within related scientific disciplines. Performance-based criteria, derived from the study of user perception and behavior, have been emerging, redefining assumptions about audience, function, and purpose.

The career of Paul Arthur, a Canadian designer who has worked extensively in Europe and the United States, spans the last fifty years and offers a useful paradigm for the growing sophistication and maturity of the discipline of communications design.[3] He has devoted much of his career to issues of wayfinding in three-dimensional space, including navigation, legibility, and readability, which have been highlighted in Web design in recent years, but play an important role in all media. Using taped interviews with the designer, I trace Arthur's development from his discovery of the international style to his reevaluation of its lessons as he tackled major environmental graphics projects, and his development of standards for graphic systems (figure 1).

A Career Overview

Arthur's long and distinguished career has encompassed key developments in the growth of visual communications for identification and orientation from the 1950s to the 1990s.[4] With no formal design training, he moved from a devotion to Swiss typographic principles to a much broader definition of function, seeing design as improving the quality of our lives by making information easier to find, understand, and use. Although Arthur worked extensively on identity programs for corporations and governments, the topic here is his growing sense of design's social mission, so the discussion concentrates on his environmental communications design.[5]

Trying to meet the needs of a vast and varied audience grappling with the problems of an increasingly complex environment, Arthur was an early exponent of graphic design as part of an interdisciplinary system, integrated with other aspects of communication and spatial planning. He began with major airport projects in 1961, and subsequent programs include Montreal's *Expo 67*, univer-

1 The title is taken from Margaret Mead and Rudolph Modley, "Communication Among All People, Everywhere," *Natural History* (August-September, 1968), in which they discuss and categorize graphic symbols. Modley is regarded by Arthur as a mentor, and a copy of the piece is in Arthur's papers, held in Archive of Advertising and Design at the Royal Ontario Museum, Toronto, Ontario.

2 The growing interdisciplinarity of design, particularly its links with the social sciences, is well documented. For example, a close parallel with developments described here can be found in Jorge Frascara, "Graphic Design: Fine Art or Social Science," in Victor Margolin and Richard Buchanan, eds., *The Idea of Design: A Design Issues Reader* (Cambridge, MA: MIT Press, 1995), 44–55, and *User-Centered Graphic Design: Mass Communications and Social Change* (London: Taylor and Francis, 1997) by the same author.

3 Interviews are referred to by date in the notes.

4 Based on two biographical sketches by the author: "A Good Sign: Paul Arthur gets the Order of Canada" *Graphic Design Journal* 1:3 (The Society of Graphic Designers of Canada, Ottawa, 1995) and "Paul Arthur" in Sara Pendergast, ed. *Contemporary Designers* (Detroit: St. James Press, 1996, third edition).

5 Arthur's major projects in the field include Stelco (1970), the Province of Saskatchewan (1974), and Canada Post (1989).

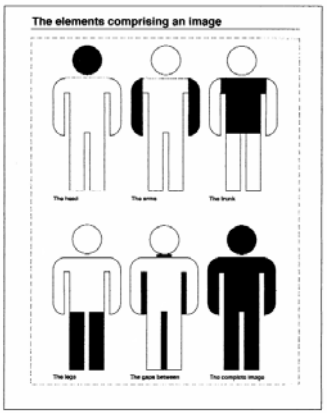


Figure 1
Components of the standard male figure, from Picto'graficSystems©, a comprehensive system of pictographs for worldwide use under license (1998). Permission of Paul Arthur VisuCom, Ltd.

sity campuses, hospitals, the U.S. Postal Service, and Parks Canada. In 1973, Arthur became a founding member of the Society for Environmental Graphic Design (SEGD) in Cambridge, Massachusetts. Since then, he has written several reference texts for environmental graphics, including two standard manuals for Public Works Canada: *Orientation and Wayfinding in Public Buildings* (1988) and, with Romedi Passini, *1-2-3 Evaluation and Design Guide to Wayfinding* (1990).

The term "wayfinding," defined as spatial problem solving, marks a realization that information design must be user-centered. Arthur's 1992 book, *Wayfinding: People, Signs, and Architecture,* develops the theme by analyzing how people orient themselves, and emphasizes the need for graphic designers and spatial planners to work together.

> The only way to approach wayfinding issues intelligently is for architects and designers to pay attention to how people perceive and understand the environment, how they situate themselves in space, and how they use information in the decision-making and decision-executing processes.[6]

His extensive contributions to the theory and practice of creating visual systems for orientation were recognized in 1995, when he became the first communications designer to receive the Order of Canada (presented to Canadians "whose contributions enrich the lives of their contemporaries"). The award cited his pioneering work in the development of pictographic systems and his coauthorship of Canada's national standards for signs and symbols.

Discovering Modernism

Arthur studied English language and literature at the University of Toronto, with a three-year interruption for war service in the navy. His family background and love of literature led to an interest in book design.[7] When he left the university in 1948, he felt there were no training opportunities in Canada and moved to England, where he worked in publishing and book production. He discovered modernism when he went to Switzerland to work for Walter Herdeg at *Graphis,* where he served as assistant editor from 1951–56. Arthur didn't think of himself as a designer, and described design in Switzerland as "rather like a priesthood."

> That is where I learned everything, because across my desk came the best work of every designer in the entire world. I guess I'm an intuitive designer because I've never had any training of any kind. I told Walter Herdeg that I would like to do layouts. He laughed and laughed...and told me he had to study for seven years to learn how to do what he did. English language and literature wasn't proper preparation.[8]

6 Arthur and Romedi Passini, *Wayfinding: People, Signs, and Architecture* (New York: McGraw-Hill, 1992), 5. Arthur has completed two related manuscripts, as yet unpublished, *Effective Environmental Communication Design* and *Pictographs and Graphic Symbolism.*

7 Arthur is the son of Eric Arthur, a prominent Toronto architect and author.

8 August 25, 1996.

Eventually, however, Arthur did most of the layouts for *Graphis* and for the *Graphis Annual.*

In 1956, Arthur decided to return to Canada, and set up an office in Ottawa (Paul Arthur + Associates) which he ran until 1974. Initially, the work of the office was print based, and Arthur was Director of Publications at the National Gallery and the editor of *Canadian Art.* He has described Ottawa as a backwater when he arrived, but there was a great deal of work and he employed many of the finest young designers in Canada. The company's approach was firmly in the Swiss modernist camp, a stance which he now abhors:

> ...we graphic designers were so blinkered by our desire to make type as illegible as we could make it, and to make patterns on paper that had nothing to do with legibility or anything else. ...For instance, in those days, we never allowed cross heads to interrupt the beautiful flow of grey matter on the page (this all came from *The New Typography*). We were very keen on this; we were a real fortress of Swiss typography in North America.[9]

From Print to Signage

A decisive point in Arthur's change of vision came in 1961, when his office was given two major airport signage projects by the Canadian Department of Transportation, at Edmonton and Winnipeg. Arthur recalls that, to his knowledge, they were the first signage projects in North America that were actually designed by a design firm. He worked closely with industrial designers for the first time, and sees this as the beginning of environmental graphics.

Arthur brought back from Europe a strong belief in systems design, which he saw as the application of strategic planning to design problems, and very different from standard North American practice of the day:

> It is not a cookie-cutter approach, nor was it inhibiting to a true designer.... The systems approach was used in the print work that I was doing prior to 1961–1962. The airports were, without question, done to a definite system. [North American designers] were brilliant and we got on, but I didn't like the way they worked. I didn't understand how you could just pull things out of your back pants pocket. To me, this was far too much like the artist, and I was scathing about it.[10]

Other aspects of late modernist design thinking were less useful, and Arthur began to see Swiss typography as a purely formalistic system, not based on human factors. In the transition from designing for publications to designing for signage, for example, scale, distance, and viewing angle forced designers to abandon the tight

9 August 25,1996.

10 June 13, 1997.

Figure 2
Parking lot use of animal pictographs at *Expo 67*. Permission of Paul Arthur VisuCom, Ltd.

spacing of modernist print design; there was a chronic lack of reliable, objective data on which to base decisions.

The progression from books, to signs, to environments in Arthur's development ran parallel with his broadening conception of the designer's role in visual culture. In the 1950s and '60s, there was an emerging trend towards inclusiveness-vaulting the boundaries between different sections of the population, and attempting to include all cultures and different user needs. Arthur found the still-dominant assumptions about high and low culture frustrating. He was an early collector of folk art and, as the editor of *Canadian Art,* he challenged hierarchical views by producing issues on cars, photography, design, and television, which were controversial in the 1950s.

> Pop art reeducated the establishment quite a bit, but that hadn't happened yet, as we were still in the throws of Barnett Newman and so on. It was to be taken very seriously, and the people who did it were the priesthood.[11]

In this view of visual culture, design was the "captive handmaiden" of a purist modernism dominated by fine art. Arthur began to move on from a concept of "good design," derived from a limited view of functionality, by working towards performance-based criteria rooted in how people perceive and process information.

The Need for Standards

In the late 1960s, Arthur was involved with two enormous projects, *Expo 67* (the Montreal world's fair of 1967) and the New York State University Construction Fund.[12] There are three key features in his approach to this work. One is systems design. As with the earlier airport signage, the scale and complexity of the projects demanded a rational overview, expounded in the guidelines Arthur produced for the many designers from different disciplines working on the projects.[13] Second is technological advance in sign fabrication, which now used pre-spaced legends.[14] Third, and most significant, is the growing importance of learning how people see and use information.

Arthur made a proposal to the organizers of *Expo* and in the *Graform Report,* argued that color, graphics and street furniture all should have an integrated design approach.[15] The project was a pioneering effort to produce a totally coordinated information system, with innovative results. At the suggestion of Martin Krampen, a consultant for *Expo 67* (and a well known professor at Michigan State University, the University of Waterloo, and the Hochschule für Gestaltung Ulm), Arthur's team used pictographs more extensively than ever before. One example is the use of animal symbols to help people remember where they had parked their cars (figure2).[16]

11 August 25, 1996.

12 The State University Construction Fund was responsible for building all of the SUNY campuses. Arthur worked on twelve of them, from 1969-1974.

13 For example, the *Standard Sign Manual* and the *Printing Guide* produced for the Canadian Corporation for the 1967 World Exhibition.

14 In signage, a legend is a verbal (text) or nonverbal (symbol) message. They were invented in 1965. Arthur recalled in 1997: "... the major change in the development of signs was the creation of pre-spaced legends for messages, which previously had been hand painted. We pioneered those at *Expo.* They were not done by computer, as they are today."

15 Graform Associates Limited was founded in Ottawa in 1964 as a joint venture of Paul Arthur + Associates and Girard, Bruce and Garabedian. The report was subtitled "A Draft Concept for Colour, Graphics, Industrial Design and Lighting."

16 Arthur has cited the work of Masaru Katsumie at the 1964 Tokyo Olympics as a precedent. For Krampen's views, see "Signs and Symbols in Graphic Communication," *Design Quarterly* 62 (1965): 3–30.

Figure 3
The effect of viewing angles, from *Campus Signage Interim Report. Criteria/State of the Art* (Albany, NY: State University Construction Fund, July 1970). Permission of Paul Arthur VisuCom, Ltd.

Extensive research was conducted for the industrial design aspect, but Arthur is critical of the lack of research for the graphics.

> Back then, we did not have a proper, mature approach to research, and the graphics at *Expo* were under-researched. I had done research on letter sizes at Guelph University...I was aware of letter size and contrast, but we weren't conscious of blind people or the rights of people with disabilities, or anything to do with cognitive and perceptual impairments.[17]

Arthur found it impossible to fund further research, and the lack of reliable data was apparent in his first meeting in Albany with the State University Construction Fund in 1968. He was asked to write the report, *Campus Signage Interim Report: Criteria/State of the Art,* as a result of the recognition that informative guidelines were needed.[18]

> I was talking about performance standards because the people for whom this book was intended were people like Ivan Chermayeff and Tom Geismar. I didn't want to tell them how to design, but what I wanted to tell them was what performance was to be expected of their designs...If you talk about signage, you're just talking about a bunch of hardware. Wayfinding, however, has to do with a process. Accessibility and inclusive design are another step. In *Campus Signage*, I tried to establish a series of broad criteria based on data. I imagined that a lot of it wouldn't stand up

17 June 13, 1997.

18 *Campus Signage Interim Report: Criteria/State of the Art* (Albany, NY: State University Construction Fund, July 1970). *Campus Signage* was issued under the name of an interdisciplinary team called the Design Collective, founded in Knoxville, Tennessee in 1970 by Paul Arthur, architects Bill Lacey and Frank Kelly, engineer Arlyn Orr, and industrial designer Hugh Spencer. The report was widely used in the development of signage for many public buildings in New York State, including universities and jails, and some of the data appeared in the *Americans with Disabilities Act.*

Figure 4
"20/20 Vision" from Paul Arthur and Robert Dewar, *Pictographs and Graphic Symbolism* (unpublished manuscripts, 1998–9). Permission of Paul Arthur VisuCom, Ltd.

> to scrutiny in a laboratory. On the other hand, a lot of it has stood up empirically rather well, so there may be no evidence for it apart from the fact that it does work.[19]

Campus Signage contains tables and charts to cover topics such as letter spacing, typefaces and sizes, legibility from moving vehicles, the effects of angular distortion and color, and value relationships between text and background (figure 3). The report, in addition to guidelines for fabrication and maintenance, and design parameters for consistency in size and position of signs, tries to establish performance-based criteria for readability and legibility. Though it was a remarkable attempt at summarizing design parameters, technical data, and human factors, Arthur was aware of the limitations.

> It was…called "State of the art," which meant that this is what the state of the art was in 1970.… I'm not at all sure that I was as aware as I should have been of the challenge to the designer of designing inclusively, of what we now call universal design. In the '80s, I was enraptured by it, but in the '70s I was insufficiently aware. I must take the blame for some of the things we did which did not take into account people with perceptual problems. We did take into account halation and good contrast, for example. This was done because I believed, and still believe, that we should do a good job for the able-bodied, what I call the temporarily abled. If we did a good job for us, we would immeasurably improve the ability of people with perceptual or cognitive problems to function in our built environment. But we're still doing a terrible job, really.[20]

Pictographic Systems

Arthur cites his friend Rudolph Modley, with whom he had extensive discussions, as having the greatest impact on his pictographic systems.[21] Another significant influence was Henry Dreyfuss, who commissioned Arthur to produce a review of signage at the Dallas-Fort Worth airport. Arthur recalled a specific instance of Dreyfuss's thinking which greatly influenced his own:

> When I said to him that the beauty of using a diamond instead of a triangle for warnings is that you don't have to reduce the pictograph by 15 per cent he replied by asking me if I was interested in graphic design or communication.… The two should be inseparable but, in practice they are often sadly out of joint. I promptly stopped using diamonds.[22]

The need for clear communication prompted Arthur's increasing concern with accessibility and performance-based criteria in the 1980s and '90s. It is reflected in his graphic systems for the Canadian Electrical Association (CEA) and Parks Canada, and his collab-

19 June 13, 1997.

20 June 13, 1997.

21 Modley included work by Arthur in his *Handbook of Pictorial Symbols: 3250 Examples from International Sources* (New York: Dover, 1976).

22 June 27, 1997.

Figure 5
Standard figures for signage from the report prepared by Western Ergonomics Inc. in association with Paul Arthur VisuCom Limited, *Natural Hazard Safety Signs* (Canadian Parks Service, Western Region, March, 1996). Permission of Paul Arthur VisuCom, Ltd.

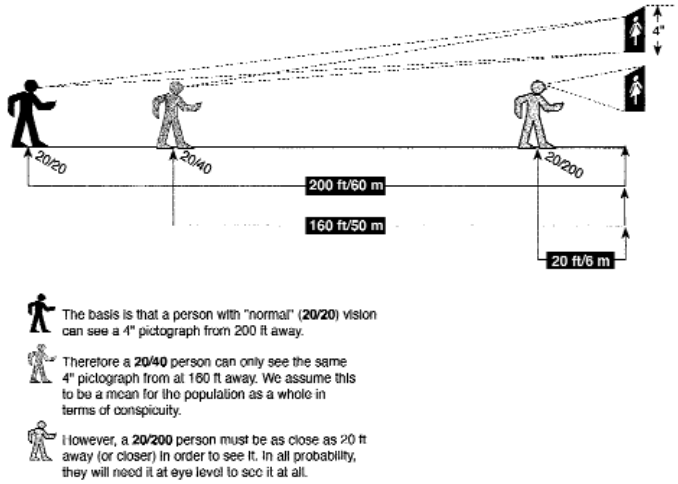


Figure 6
Example of hazard warnings from the report prepared by Western Ergonomics Inc. in association with Paul Arthur VisuCom Limited, *Natural Hazard Safety Signs* (Canadian Parks Service, Western Region, March, 1996). Permission of Paul Arthur VisuCom, Ltd.

orations on wayfinding with Romedi Passini (of the University of Montreal) and on testing with Robert Dewar of the University of Alberta (figure 4).[23] The work was conducted while Arthur made strenuous efforts to establish standards nationally (the Canadian National Standard, Z321) and internationally for the use of pictographs, reflecting the need for a standardized language in effective visual communication. Arthur's work eventually was not used by CEA, but has been implemented by Parks Canada in the western region, and also was sold to parks in the United States.

The development process for the Canadian Electrical Association (CEA) and Parks Canada was the same. Investigation was followed by development and testing; hazards were identified and image content descriptors created, then tested on sixteen-hundred people before publications, signs, and documentation were developed. Arthur has noted that many solutions to problems of representation came directly from the test groups. The third phase was prototyping, followed by a problem statement and discussions with fabricators, and finally a master plan for implementation.

The first step in the investigation phase was to find out what had been done with wilderness signs in other parts of the world,

23 Arthur, *Effective Environmental Communication Design*, and Arthur and Robert Dewar *Pictographs and Graphic Symbolism* (unpublished manuscripts, 1999).

which was very little. A range of approximately twenty key, hazardous situations occurring in different seasons were then identified, and designs created for testing (figures 5 and 6).

> We then wanted an image content descriptor of each of those and where they will be, because I'm not only interested in the graphic content of symbols, prohibitions, and so on, but also the physical context, which is enormously important. We got this description, which was one page for each one, and discussed it with the client until we thoroughly understood it. I then took a little man and tore his arms and legs off and had him do all kinds of terrible things, a sort of catalogue, and put them in the context of a vocabulary of animals and landscape elements (rocks, rushing waters and so on). We combined those to create the pictographs.… Are you testing for effectiveness, for glance legibility (which means if you see the thing for a thirtieth of a second, can you still see it and recognize it?). Or are you testing it for acceptability, like the presence of the toilet in the man / woman symbol, which was unacceptable for many years and now is acceptable? [24] (figure 7)

Extensive research then was conducted by Professor Robert Dewar.[25] All the pictographs were tested in the laboratory. Those comprehended by 67 percent of the audience (a requirement of the International Standards Organization) were then tested in situ. Testing included recognition, legibility, and acceptability, and respondents were drawn from a wide range of demographic groups. Various forms of pictographs, and different combinations of pictographs and words in a range of languages (English and French, or German and Japanese) were tested. The design team decided that the signs should be in comic strip form, showing the danger and what could happen. As with Arthur's work for the Canadian Standards Association (CSA) on the Z321 standard, it was impossible to create the convincing gender-neutral figure which he had wanted (this was a cultural issue he took seriously).

The symbols used by Parks Canada conformed to the Canadian National Standard (Z321) partly because it offered some legal safeguards. Z321 first appeared in 1977, was modified in 1994 with the addition of text, and published in 1996. The effectiveness of purely visual communication proved to be severely limited:

> We found that the standard wasn't being used because those pictures weren't worth a thousand words.… There are, in fact, very few pictographic images that can stand on their own and be recognized by 67–75 percent of people. The ones that can are toilets, telephones, and certain things to do with food. There are only about 20 to 25. We have text signs which are entirely text, signs with text and symbols, and a very few with no text at all. The "no smoking" sign

24 June 26, 1997. The figures were designed by Terry Brown.

25 *Reevaluation of Selected Warning Signs at Hydro Electric Stations* by Western Ergonomics (June 1994). Dewar has worked extensively in the United States for the Highway Research Board and with designer Don Meeker.

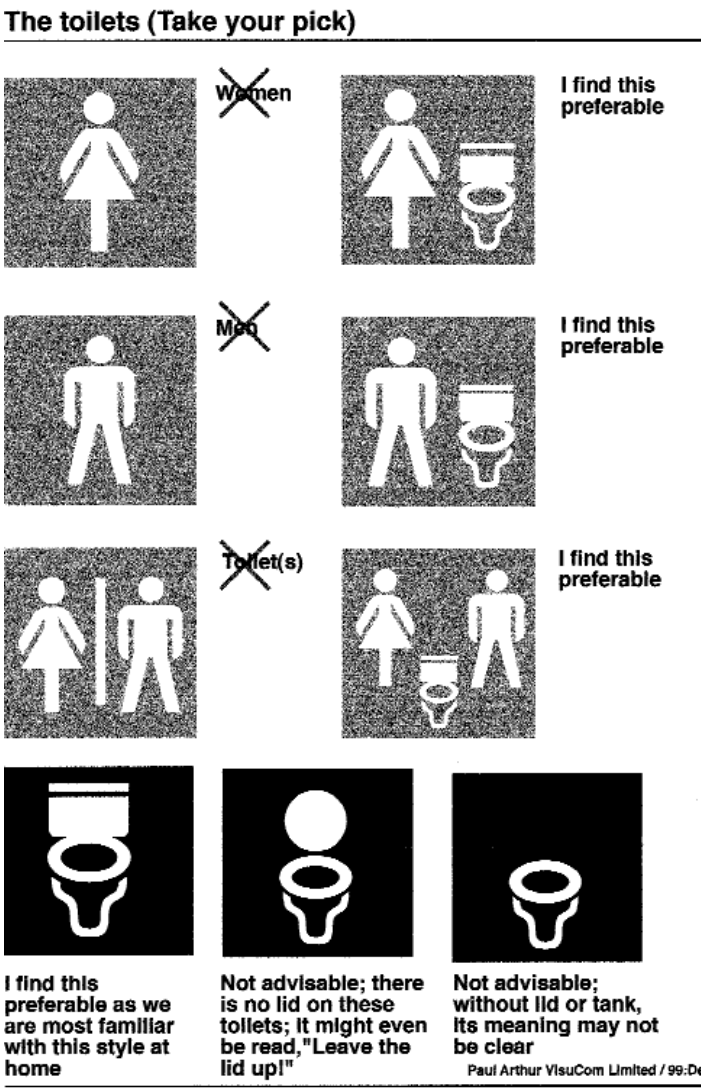


Figure 7
Recommendations for toilet symbols produced for the Government of Ontario in 1990. The one preferred by Arthur is now the ISO 7001 standard. Permission of Paul Arthur VisuCom, Ltd.

and the "no entry" sign need no words. The need for text does not mean that the whole idea of using pictographs to get around the idea of illiteracy is self-defeating. First the words must be simple, grade 6 level. Then the context will help you.[26]

Summary

The development of Arthur's inclusive view of functionality demonstrates that transcending the barriers to communication is a broader and more complex project than many designers realized in mid-century. Recognizing the significance of context (cultural, technological, geographic, and graphic) for communications has contributed to a mature assessment of the role of designers, users, and design, increasingly integrated into the design process and educational programs.

26 June 26, 1997.

Arthur's early insistence on user needs as the basis for design revealed to him how much designers did not know, and the necessity for collaboration with other disciplines for information and expertise. Multicultural trends have demolished any possibility of a single, dominant aesthetic view of design, while technology has democratized design by placing powerful tools in many hands, inducing a reexamination of purpose and professional education. The continuing legacy of models for design derived from fine art and science often results in arbitrary oppositions between expression and system, which should be replaced with a central core of information structuring to maximize participation:

> There still is far too much emphasis on aesthetics, but that is changing, certainly in the United States, where the [Americans with Disabilities Act] mandate says absolutely that it's against the law to discriminate against people because they have perceptual or cognitive problems. I don't think we were conscious about that as a problem.... I was not terribly sensitive, and neither was anybody else, to the fact that there was a whole series of disenfranchised groups out there who could not make use of our facilities.[27]

Designing and Using Design Are Social Processes

Not only are physiological, psychological, and cultural data needed in order to meet the needs of users, but users can actively contribute to the design process, as in Arthur's work for Parks Canada. In all communications design, but, perhaps, most evidently in environmental and interactive media, users always will bring unexpected resources and patterns to their use of tools provided by designers, as illustrated by Arthur's and Passini's conceptualization of wayfinding as an active, decision-making process.

Arthur is well aware of the limitations imposed on designers by their traditional, narrow role:

> I would like to think that of every dollar spent on a designer, eighty-five cents is spent on research, thinking, and problem solving. That would be wonderful but, unfortunately, it isn't like that—fifteen or twenty percent is spent on that, and the remainder is spent on getting the job, keeping the job, presenting the job, and making pretty pictures.[28]

In Arthur's assessment, designers must become mediators and moderators, more inclusive and more modest. He found that the process of developing standards through large committees was at times very frustrating, with the results often being compromised by the accommodation of different stakeholders, but for modernist dreams of international communication to be realized, design must be seen as a collective process in which many groups have to be involved..

27 June 13, 1997.

28 August 25, 1996.