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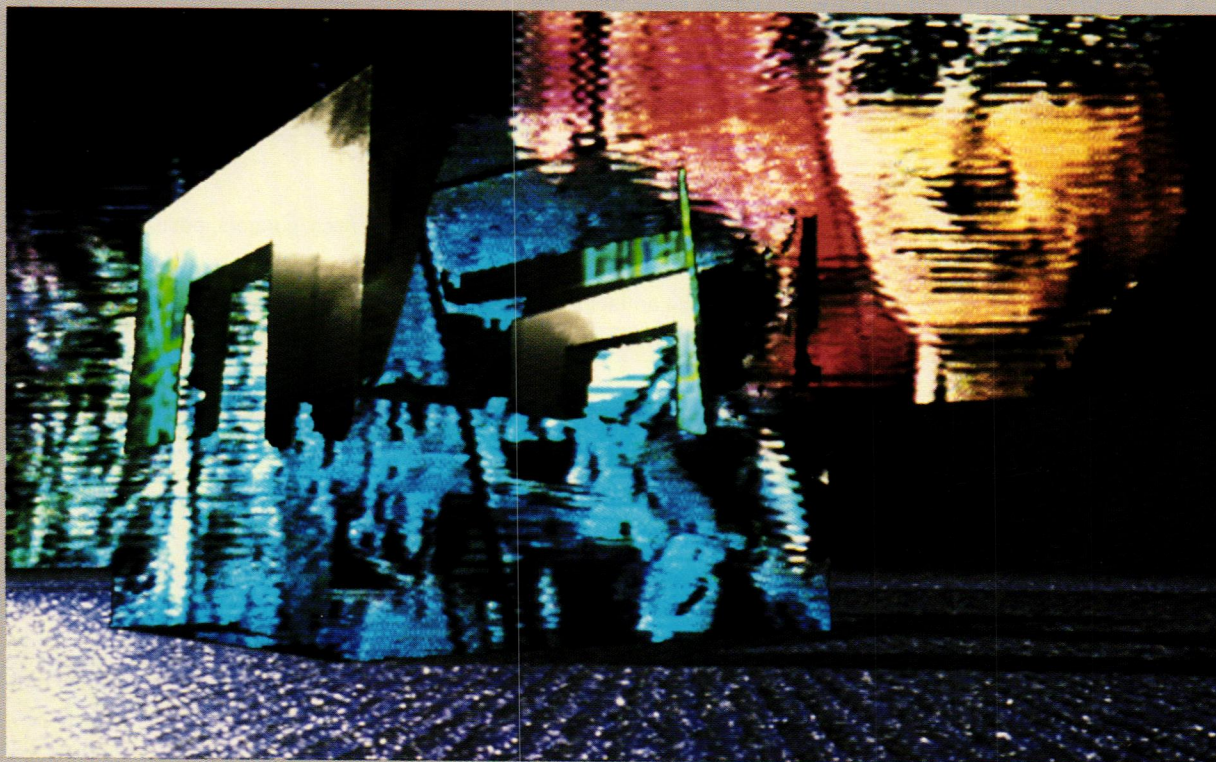
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EVIEW



COMPUTERS 'R' US

Issue 27 – Winter 1993

ALEXANDER TZONIS
AND LIANE LEFAIVRE
The Two New Sciences of Representation

WILLIAM J. MITCHELL
Cyberspace, Time, and Architecture

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CyberIdaho: The Reality of What's Not

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RIITTA NIKULA
Temptations of Nordic Architecture

GREG CASTILLO
Thermonuclear Family Values

Architecture

Urbanism

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ANAT Australian Network for Art and Technology
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Winter 1993

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Design Book Review (ISSN 0737-5344) is published quarterly (Winter, Spring, Summer, Fall) by The MIT Press, 55 Hayward Street, Cambridge, MA 02142, for the editors of *Design Book Review*, 1418 Spring Way, Berkeley, CA 94708. Copyright © 1993 by the Massachusetts Institute of Technology. Second-class postage paid at Boston, MA, and additional mailing offices. Postmaster: send address changes to *Design Book Review*, MIT Press, 55 Hayward Street, Cambridge, MA 02142.

Business Offices: Subscriptions, address changes, and mailing list correspondence should be addressed to *Design Book Review*, MIT Press Journals, 55 Hayward Street, Cambridge, MA 02142, (617) 253-2889, hiscox@mitvma.mit.edu. Subscriptions are \$30.00 for individuals, \$70.00 for institutions. Outside the United States add \$14.00 per year for postage and handling. Canadian subscribers also add 7% GST. To be honored free of charge, claims for missing issues must be made immediately upon receipt of the subsequent published issue. *Design Book Review* is distributed in the USA by B. DeBoer, Inc., 113 E. Centre Street, Nutley, NJ 07110.

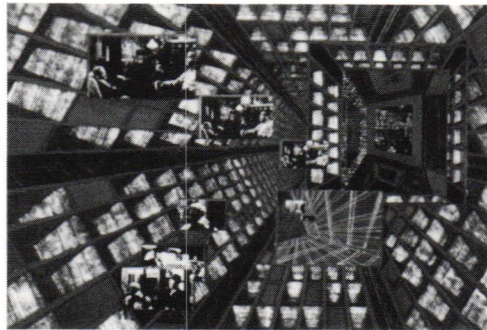
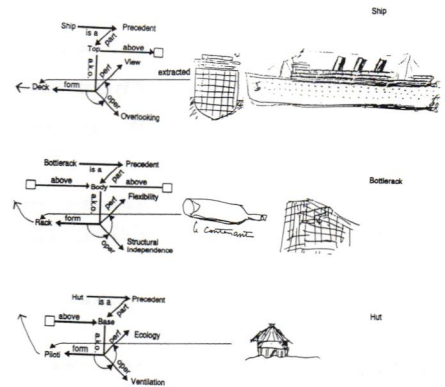
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Editorial Offices: Books for review and editorial correspondence should be sent to: *Design Book Review*, 1418 Spring Way, Berkeley, CA 94708.

Design Book Review is available on microfilm from University Microfilms, 300 No. Zeeb Road, Ann Arbor, MI 48106.

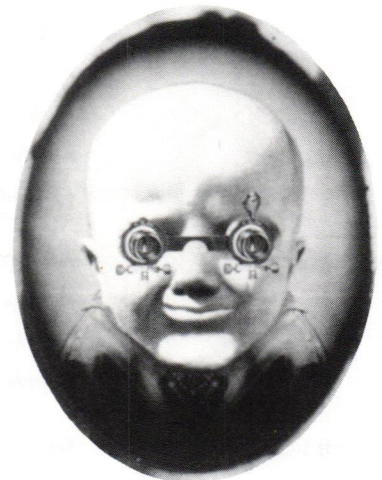
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Front and back covers: Raoul Hausmann's *Ghost I and II*; Marcos Novak, 1992.

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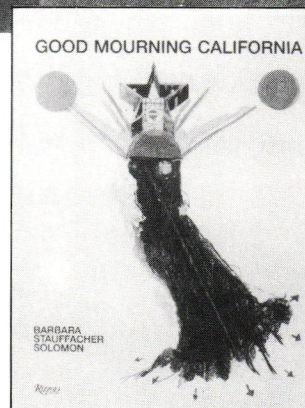
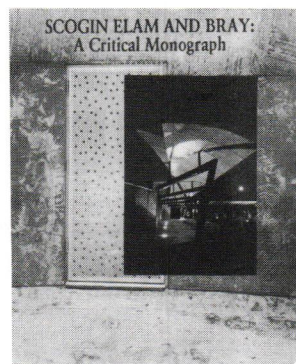
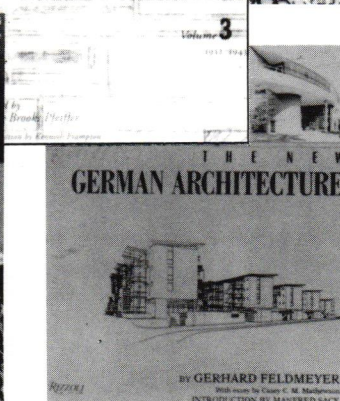
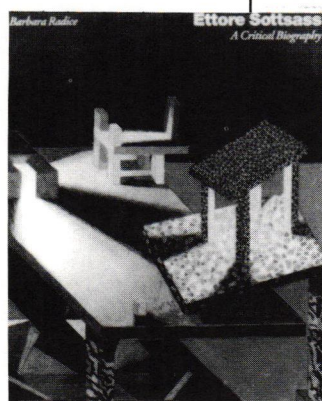
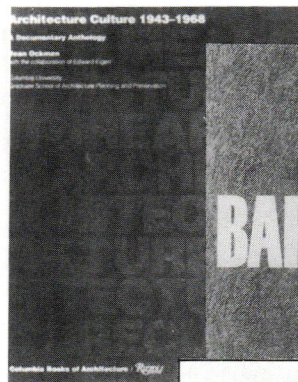
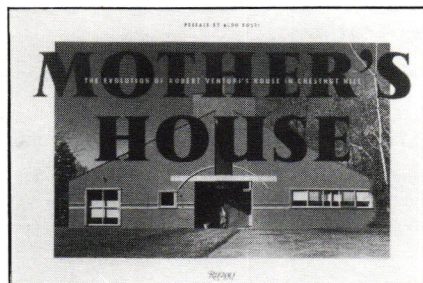
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Computers 'R' Us

Anyone born before 1968 who has learned to use a word processor probably underwent a minor metaphysical showdown in which skepticism about mechanical intrusions into the human realm of writing, compounded with fear of submitting to machine domination, eventually yielded to an exhilarating sense of individual accomplishment boosted by mastering a new tool. Those born after 1968 and raised on computer video games probably do not feel quite the same sense of zealous conversion, but nonetheless feel the same sense of power. The transition was almost cult-like: over the course of a decade, millions of altar-like monitors appeared in homes and offices, and provided a liberating feeling of both autonomy and connectedness in an increasingly decentered universe. The triumphant spread of the personal computer, which conquered the mass market with its "user friendliness," has triggered a second industrial revolution based on information and technologies that now seems as inevitable as the universal adoption of electric lights.

The most significant effect of this new revolution will be the rearticulation of class structure: at the top, the infocrats, who control the production of electronic information; far below them, the cyberproletariats, who depend on computers to carry out any form of labor (which currently ranges from office work to the agricultural and commercial sectors). Cyberproles will make up the vast majority of income earners, who, despite the increased productivity of cybernetic technologies, seem to work longer hours and make less progress toward realizing traditional middle-class goals. Finally, at the bottom will be a growing underclass, the lumpentrash, which will include entire nations. Lumpentrash are those who literally do not, and probably will never, compute.

In proposing such a bleak analysis, I do not intend to agitate for a neo-Luddite movement that attacks the machine for social inequities. Would any momentous so-

cial palliative result from a slogan of resistance such as "cyberproles of the world unite; you have nothing to lose but your software"? Unlike the first industrial revolution, the political distinction between the user and the tool can no longer be so clearly drawn because the computer is a machine that increases mental rather than physical capacities. Like the machines of the first industrial revolution, computers improve the efficiency of production, but, in addition, they penetrate human consciousness at an unstoppable rate, and thus the political problem may not be neatly relegated to the user pulling the plug.

The official ideology of computeriza-

Cyberproles of the world unite; you have nothing to lose but your software

tion is clearly in the positivist tradition that knowledge is power. In that respect one might locate the political issues as questions of controlling technologies in the manner of Michel Foucault. There is a latent ideology, however, that has evolved with the use of digital technology that favors the displacement of the human body. On a crude level, displacement refers to the layoffs that occurred first in newspaper plants due to computer typesetting and then in almost every other arena of employment, including architecture—the displacement of the bodies of workers. Displacement of the body in a less conflictual sense refers to the atopic status of computer users. Through the enhanced flexibility of fiberoptic technologies, the body using the computer rarely needs to be in a specific place; space is thus no longer a limitation on being. Finally, carrying such potentials to the prognostication of cyberspace, it is imaginable that people

will eventually be able to abandon their bodies by transferring their consciousness to an "immortal" machine. This ultimate displacement of the body represents the new utopia: literally a no-place where peace will be inevitable because there are no territorial issues, and where injustice will be nonexistent because without the body, there will be no pain. As always, utopia obviates the need for politics.

Whether the ideology underlying computerization is about controlling bodies or displacing them, it clearly cannot be ignored. One of the most conspicuous concerns of critics and philosophers during the past two decades has, in fact, been the discourse of the body. The means with which society tries to control the body in the long run may not be as problematic as the virtual disappearance of the body. Among the astute observations of philosopher Hubert Dreyfus, who recently updated his critique of artificial intelligence in *What Computers Still Can't Do* (MIT Press, 1992), is that although the machine may have already attained superiority in the amount of information it can store and process, it will always be limited by the fact that "intelligence needs a body." This is because the contextual issues surrounding one's own body lead to an understanding of relevance that is phenomenal and spatial. If information technology is proposed without commensurate attention to what happens to one's own body and to the bodies affected by information, can its users expect it to be relevant, intelligent, or, more importantly, responsible?

Richard Ingersoll

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Published quarterly by
The MIT Press in
winter/spring/summer/fall.
ISSN 0737-5344.

MIT Press Journals
55 Hayward Street
Cambridge, MA 02142
TEL: 617 253-2889
FAX: 617 258-6779
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Dialogue with Alexander Tzonis: Artificial Intelligence for Intelligent Architects

Alexander Tzonis is the chair of architectural theory at the University of Technology at Delft, Holland, and is the director of Architectural Knowledge Systems, a multidisciplinary research group. He attended graduate school at Yale University and taught at Harvard between 1967 and 1981, where he came into contact with the early research in artificial intelligence then being undertaken in Cambridge.

*Tzonis coauthored, with Serge Chermayeff, *The Shape of Community* (Penguin, 1971) and soon after published *Towards a Non-oppressive Environment* (i press inc., 1972). He has a consuming interest in architectural theory and its documentation, and is the chief editor of the *Garland Archives*, a multivolume series which has published the complete archives of Le Corbusier, Louis Kahn, Mies van der Rohe, Walter Gropius, R. M. Schindler, and Alvar Aalto. (See DBR 18, "Architectural Publishing").*

*With Liane Lefaivre he has written numerous articles and books, including *Classical Architecture: The Poetics of Order* (MIT Press, 1986), *The Roots of Architecture* (SUN, 1984), and *Architecture in Europe Since 1968: Between Memory and Invention* (Rizzoli, 1992). He has edited a forthcoming book, in collaboration with Ian White, *Automation-Based Creative Design* (Elsevier, 1993). In 1990 he published his first novel, a murder mystery about problem-solving, computation, and morality, entitled *Hermes* and the Golden Thinking Machine (MIT Press, 1990).*

*The specific agenda of the doctorate program directed by Tzonis, known as *Architectural Knowledge Systems: Artificial Intelligence for the Intelligent Architect*, is the documentation and analysis of architectural knowledge using computational, cognitive methodologies.*

DBR interviewed Professor Tzonis in Delft in December, 1992.

DBR: Reading the program description of your research group, I see the largest number of the participants are preoccupied with computers. What relation does the supposedly automated sphere of knowledge have to the more humanistically based "architectural knowledge"?

AT: I strongly believe that no computational theory or methodology or techniques of architecture can be developed without deeply founded architectural knowledge. As to whether the reverse is true, this is a most interesting question. Up until very recently most people in architectural theory or computer-aided design worked independently. They stayed in one direction, looked exclusively at architectural theory, and tried to understand it independently of computational aspects, which they viewed with suspicion. Or they concentrated on computer applications and tried to expand and improve them, disregarding architectural theory, which, in turn, they eyed with misgivings. It seems that the situation is changing now. We realize that neither architectural theory nor computer techniques can develop in isolation. The "development of architectural theory" encompasses cognitive as well as historically rooted rule systems. The closer we get to understanding architectural practice, the more we realize that it instantiates preexisting rules and activates predefined systems, despite the fact that it appears to improvise in a freewheeling manner.

DBR: Of what use are computers to history and theory? It seems to me that they are better suited to the more mechanical demands of practice.

AT: We should use the computer as a tool for both, and we do. Computers are one of the means for studying and thinking in general, and design-thinking in particular. With computers, we can approximate a kind of replica of the mind, which, however crude and reductive, is still the best tool we have. Cognitive scientists cannot test the brain to confirm hypotheses about structure-function relations of the mind, but they can collaborate with artificial intelligence scientists and test their hypotheses, experimenting freely with the organization of machines and their performance. After completing an initial phase of investigation dealing with more general kinds of intelligence (such as vision, language, and movement in space), research in artificial intelligence has

reached a second phase where more complex kinds of intelligence (such as spatial and visual thinking, and design) are now approachable.

DBR: How would a computer-aided historian proceed, and what are the potential consequences?

AT: Like many other researchers we try to find actual cases of professional practice, document their methods in use, and reconstruct their underlying methodology. Where our group differs significantly from others is that we try to carry out such reconstructions in historical cases of exceptionally creative, intelligent performance. A considerable part of our activities are devoted to historical documentation and compiling archives because, without scientifically organized archives, an empirical study of creativity, dealing with highly contrasting cases and claiming a high degree of generality, would have been impossible.

DBR: Are you interested in the constants of what you call design intelligence, or in historical change?

AT: Both. What we find in our research is the fascinating dialectic between the architecture of the mind, which is more or less invariable, and the architecture of culture and society, which keeps on growing. The way social forces and social perceptions shape or are shaped by knowledge has its own constraints. It constitutes a structure that was referred to in the mid-1970s as "socio-formations." I believe we are going through a phase where we recognize another kind of formation which is subject to strong changes, and that's the formation that comes out of the mind, out of cognition, on which society builds and whole systems—belief systems, ideological systems—are built. On top of it you have society, economics, politics, cultural superstructures that are always shifting, changing, reflecting the totality of society rather than the single cell of an individual mind. Architectural knowledge is a partial case of

such belief systems. Architecture is nothing but a component of human thinking—not only an application component, but a component that is deeply rooted in the very nature of the mind. Creating architecture is a very human activity, like creating language or music. At its most fundamental level it has to do with spatial thinking.

DBR: I would like this to be made more concrete. Let us come back to architectural practice for a moment. If I understand correctly, the premise of the research program at Delft, the Architectural Knowledge Systems, is that in order to achieve technical breakthroughs, you need theoretical groundwork. How does that relate to the “structure” of knowledge?

AT: I will give you an example. Imagine, for instance, the making of a CAAD drawing. It can be produced very elegantly, quickly, without mistakes, and employing people who are not necessarily talented at drawing; it results in a reliable plan of a building. Someone from technology or a completely different area in the building profession walks in and introduces four kinds of requirements that necessitate the redrawing of the plans. These changes might be relatively trivial—adding a bit of diameter to columns here, cutting a wall there, changing the fenestration and so on. Now, as we look at a CAAD drawing, we can easily envisage the changes because the mind grasps them quickly. That is why we call them trivial: they require no special thinking or knowledge to be carried out. While we modify dimensions on one end of the paper, we must calculate their repercussions on other components of the building that are connected to the ones that change. Trivial as they are, these changes still take time and energy. They are disruptive and expensive, whether the redrawing is done by hand on transparent paper, or by a machine.

One would have to go through more or less the same process of redrawing when using CAAD techniques because once automated redrawing gets more sophisticated, it is impossible. Why? Because, for CAAD, there is no meaning in the lines. The computer only

knows vectors and their coordinates. These lines do not represent objects, which have properties, or identifiable components of architecture. But when you or I look at the drawing, we understand precisely those identifiable objects, parts, and components, which may also have acceptable shapes, tolerances, dimensions, and various properties—geometrical, natural, symbolic, aesthetic spatial, cost microclimatic, and so on. If we want to develop a truly sophisticated and highly practical “redrawing technology” for an architectural office, then we have to introduce into the computer this component of intelligence and knowledge. There’s no way to introduce it except through a highly theoretical analysis of what it involves to draw and recognize shapes that have meaning—technical, aesthetic, symbolic, functional, and so on. Theoretical analyses and theoretical breakthroughs should thus become a prerequisite for the most practical, efficient technology to be introduced in an office.

DBR: Is this kind of trivial redrawing job the main area of architecture where computers are moving?

AT: Not really. I will give you another example that involves more sophisticated skills: all architects begin with a sketch. Then the problem arises of how to translate the sketch into an architectural drawing. What happens frequently in an office is the following: the architect in charge of developing a concept does the sketch, then it may be decided to translate the sketch into an architectural drawing to test the idea. Most of the time, another architect takes the sketch and redraws it into a more accurate architectural drawing. This is a trivial job, but at the same time, it requires a very sophisticated understanding of what is involved implicitly in the sketch. From the technical and economic point of view, it is desirable for a machine to do it. But a machine cannot do it unless we do develop a sophisticated theory of what is involved when we look at a sketch and read the implicit things within it about what is to be built. It might involve the smallest, most minute change of a line,

but this line is charged with technology, with architectural history, with symbols and all the other knowledge-loaded aspects of design. Now, imagine the drawing made by the assistant confronted with another modified sketch by the concept architect. Imagine how simple it is for a knowledgeable viewer to understand what changes are needed in the architectural drawing, but look at how difficult, impossible for a CAAD-loaded machine to automatically carry out this “mechanical” job. It cannot even control basic stylistic rules or historical constraints implied in a sketch, not to mention issues of function.

DBR: What about shape grammars? Don’t they do exactly that—link history with CAAD?

AT: If you go to a CAAD conference, you will find a lot of teachers who claim they do historical work in their computers because they use shape grammars, and actually do end up with drawings that look very historical. This truly could give both history and computers a dubious reputation. First, shape grammars do not capture the richness and complexity of the works of the past. The authors of such grammars are deceived by the *apparent* simplicity of some of the so-called historical styles. Take classicism, for example. It appears so elementary, either when you look at a Palladian villa or when you listen to a Mozart sonata.

Some people are under the false impression that any beginning piano student can play Mozart. Well, they may be “playing” Mozart, but they’re not *interpreting* Mozart, because the real theory behind a Mozart piece is not only loaded with a whole overlay of rules and principles, but also requires a familiarity with the dialogue that Mozart’s work has with a large number of precedents to which it constantly connects. Similarly, shape grammars deceive their users. They give them the impression that they are in control of the methodology of historical works, while in reality, very little is explained to them about it and no real effort has been made to reconstruct this methodology.

Second, the computer itself is used in ways that are inferior to its capability to capture the complexity of the mind. A rigorous analysis of style presupposes knowledge of architectural theory in all its depth and richness, and the reconstruction of its categorical organization and principles. This in turn presupposes robust spatial semantics and an understanding of language, vision, and cognitive restraints. All that, to be handled computationally, requires computer programs and algorithms that are far more sophisticated than the ones employed by shape grammars. The irony is that such sophisticated tools turn out to be much easier to use.

DBR: Don't you think computers invite such simplistic attitudes?

AT: Computers are indeed very prone to reductionist interpretations, like any scientific approach. What we are trying to do is exactly the opposite: we try to introduce difficulty. Our ally in this approach is reality. One can observe that all the reductive approaches are very successful for six months, and then reveal their limitations. Ultimately, they are exhausted very quickly.

The issue of function is conspicuously absent from most discussions about CAAD and shape grammars in particular. The reason is obvious: neither paradigms were made to function. In other design domains, however, where artificial intelligence was

applied, form and function cohabited from the very beginning. And this is how we have been approaching architectural design in our laboratory.

DBR: How is your program structured?

AT: The Delft program of Architectural Knowledge Systems is organized into three branches. The first is "architectural documentation," where those who are interested in developing a basis or substructure for architectural research develop architectural documentation by looking to the literature, criticism, poetry, legal documents, religious documents, and so on. The student puts it into a package that can then be subject to rigorous interpretation. In many cases, the documentation takes place outside the university. The common link is the Garland Architectural Archives project, for which I am the general editor.

Occasionally the research involves an even more basic aspect of documentation, such as identifying and structuring the sources of architectural discourse. This was the case with a study carried out by Dr. Al-Abed on early Arabic discourse of architecture.

The second branch is given to interpreting the architectural documents, and developing from them an explicit reconstructed theory. This involves the systematic analysis of the documents, which have an implicit

theory, an explicit reconstructed theory, which is still precomputational.

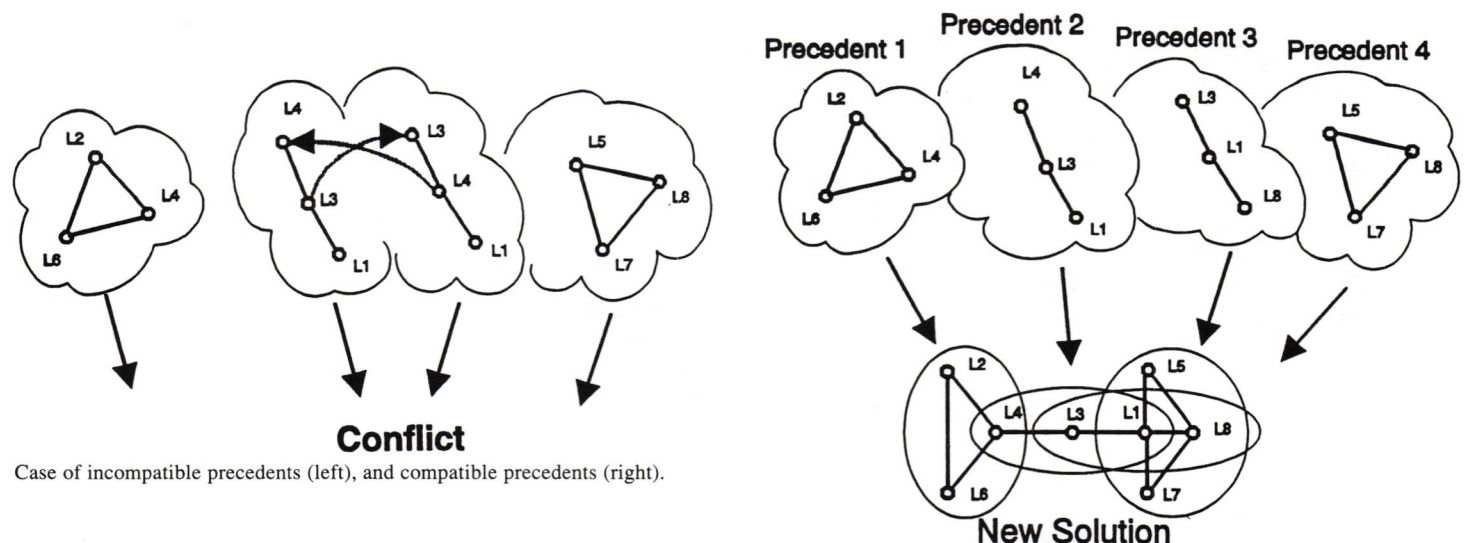
The third phase is to turn this knowledge, or knowledge systems (because they're not empirical data any longer but implementational) into machine-based systems that have a descriptive and explanatory power or a predictive design power. In other words, through those systems you can design new objects.

DBR: How can you relate descriptions and explanations to predictions? How can you make design out of documentation?

AT: The fundamental departure in our approach is that creative design is based on precedent—in other words, that creating design from a tabula rasa is impossible. While many have believed and still believe that the creative act happens on a clean slate, we are trying to show that it is an illusion. In fact, our work explains why a large number of utopian *ex nihilo* schemes led to disasters, with or without the use of computers.

This can be shown by investigating how architectural thinking works and by showing, on the cognitive level, how it is impossible to deliver satisfactory products unless operating under constraints. Looking at architectural history, we identify these constraints as precedents.

Accumulating all kinds of cases for their own sake doesn't work. To start with, you



have no way of selecting them, sorting them, reusing them. For this you need some preexisting principles, some precedents. But they are of a different kind than those we get from experience. They are deeper and much more abstract and generic. They are “pre-wired,” so to speak, in our design apparatus. Then we have another type of precedent rule: those that we extract from individual cases carried out in the past. Precedent, pre-wired principles make this extraction possible. Certainly, we always keep precedent cases as isolated objects as well, to use whenever needed for special, “non-generalizable” situations, for example.

History and cognition research need each other. An understanding of cognition is very important because it can demonstrate precisely why “precedentless” design is impossible. And this is where history is also very much needed. It can show that those incredible leaps of the imagination, pure creative acts, were in fact examples of recasting old information into new shapes—of *rethinking*. Analogical design thinking allows designers to cannibalize information, knowledge, solutions of the past into completely new mean-

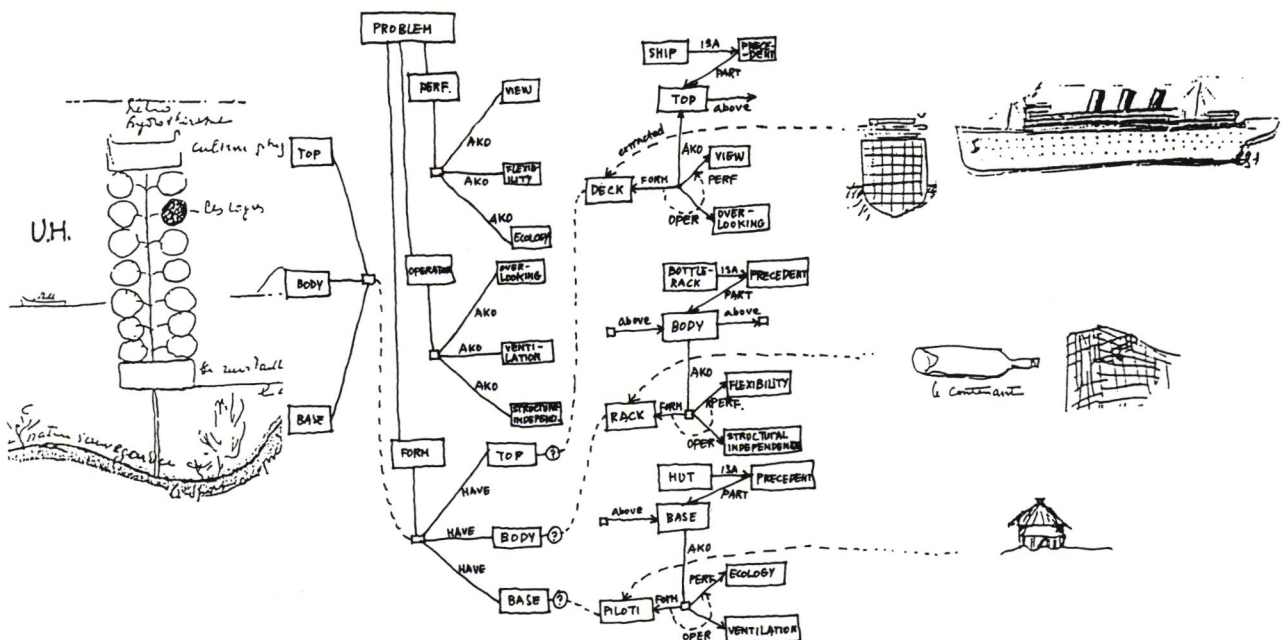
ings for the present. So we have a number of examples where we try, through case studies, to demonstrate this idea and to build systems out of them which can generate design.

DBR: How do you situate this work in relation to what has been done in the past, in places like Berkeley with Design Methods (D.M.) research or, on the other hand, with Christopher Alexander?

AT: We know a little more than D.M. researchers did about the complexity of design problems, and we also take cognition more into consideration, as well as the finitude of the human mind. Bringing the two things together, it becomes increasingly clear how it is impossible to solve problems with any degree of complexity *ex nihilo*, as the D.M. approach assumed. Designing a huge warehouse might be possible without precedent. Its complexity is superficial. But if you try to rearrange your bedroom *ex nihilo*, out of the sheer combinations of demands, it gets much more difficult. Of course, Christopher Alexander has already said this in his *A Pattern Language*. What

reformed Alexander, a one-time advocate of *ex nihilo* design, was the theory of language patterns inspired by natural language pattern studies of the 1960s. Language patterns are, of course, based on precedents; the problem with Alexander is that he does not supply a methodology demonstrating what is and what is not a precedent, or how, once you have patterns, the patterns can be combined in any way. Or how patterns are sensitive to different contexts. In other words, you had a surface analysis rather than a coherent system. The more you are dealing with a closed community, which changes very little, the more these patterns are operational. But the more you are dealing with buildings that are generated by innovating programs or with alien environments, the less potent these patterns are. For these reasons, Alexander’s theory lacks depth. But his initial intuition about precedents was actually correct.

DBR: Can you give us an example of any of the cases you have investigated involving your holy triad, history-theory, cognition, and computers?



Analogical problem-solving in architecture; the case of Le Corbusier’s Unité d’Habitation in Marseille: Semantic network representation of precedent design solutions and new solution synthesized out of precedent components.

AT: One of the most exciting cases has been the analysis and reconstruction of the conception of the Unité d'Habitation by Le Corbusier. The idea of design through precedent follows a model we research in which you have new programs, you have precedent, and then you have a frame through which they can be combined. And out of that, you have the development of new solutions; you need the two components, plus the theory contexts within which it is possible to marry new questions with old answers, and rephrase, reorganize the old solutions.

Here, for example, is a case study of creativity, reconstructing what went on in the mind of the designer. We take the ship, bottle rack, and hut used by Le Corbusier as sources for the Unité d'Habitation. He's confronted with a program, he wakes up tortured by a number of questions, but instead of trying to develop answers *ex nihilo*, he turns to his memory and asks, Do any of those questions remind me of something I already know? Slowly, from inside his conscious memory emerge very concrete, integral objects. Now he focuses on each and extracts from it the part that is relative to the solution. For example, out of the Swiss hut, he extracts the component of the *piloti*, which will be applicable to the Unité d'Habitation, and he uses several aspects of it that obviously ignore material, scale, number, configuration, but provide something, a fundamental gestalt of the design solution. At the same time, he pulls a similar extraction out of the bottle rack, which contains the interdependence of bottle to bottle rack the way the units to the structure will. Finally, he chops off the top of the ocean liner. The astounding ability of the mind is that, out of those fragments, it assembles and is then able to "make them new," to adopt a phrase from Ezra Pound, to synthesize them into an unprecedented whole. This appears crazy and incredible unless we try to interpret it; then we discover that there are certain fundamental structures of how objects are put together, of how space is put together, or how functions are interrelated inside forms that permit the re-gluing of those pieces into the new whole. So here you have the theory and the knowledge behind every object, a kind of gestalt.

Another case we have been investigating is the triangular bastion by Leonardo da Vinci in the 15th century, where *sciagraphia* (the art of drawing shadows) is rethought and renewed, to serve as a precedent for developing the algorithm for drawing the plan of the optimal fortification. Another of the studies in our group analyzes the way experts work today in the context of Beijing's old city in developing new housing. The method is reconstructed cognitively and computationally.

DBR: Do you have a more synthetic project in mind?

AT: Yes—an *Architectural Thesaurus*, an organized, intelligent memory whose structure reflects architectural knowledge constraints. It contains design principles capable of capturing large numbers of design rules drawn from precedent cases. The system contains the following modules: (1) Plan recognition: the development of methods for automatically *recognizing* architectural drawings; (2) Architectural program interpretation: the development of methods to analyze, parse, and accept constraining elements, normative or factual, from the discourse of architectural programs; (3) Analogy: the development of analogical design inference for searching and retrieving architectural precedents in the *Thesaurus*, matching architectural programmatic constraints of form-operation-performance. Analogy as a complex mechanism of inference is characteristic of most intelligent thinking.

DBR: But isn't this a project that should have been undertaken in collaboration with other groups, at least on the level of putting together all the data needed?

AT: It is an idea that we have been exploring.

ALEXANDER TZONIS AND
LIANE LEFAIVRE

The Two New Sciences of Representation

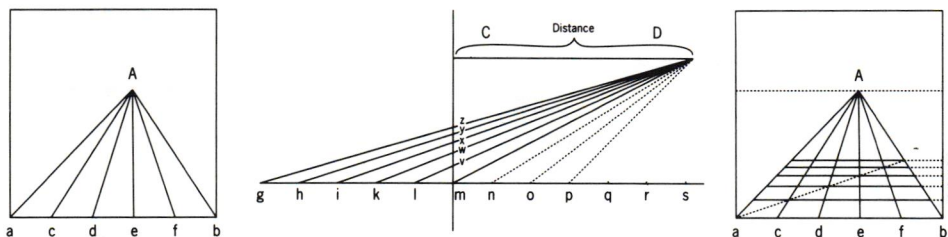
Gyorgy Kepes once called science "the angel with the sword, evicting us from the smaller, friendlier world in which we once moved with a confidence born of familiarity, and plunging us into a bigger, alien world where our unaccustomed sensibilities are forced to cope with a formidable new scale of events."¹

The invention of perspective came like one of those angels, causing a change of mind and an eviction into a strange new world. The change was slow in coming, starting at the end of the classical period in Greece, and never fully realized until the early mid-15th century. In the course of these centuries the path of perspective was halting and full of reversals. Looking over the whole period, however, a progressive pattern does emerge. But progressive in what terms?

One of the obvious answers is that, as the years went by, a system of representation of increasing realism was developed. Descriptions carried out through this system became increasingly matched with the "way the world is out there." This criterion of progress might be called "externalist," as Hilary Putnam termed it in her book, *Reason, History, Truth* (Cambridge: Cambridge University Press, 1981).

But there is a second criterion of progress, what Putnam would refer to as the "internalist" one. Looking at things in relation to it, images created through various stages in the perfectioning of perspective became increasingly rational—in other words, increasingly coherent in the way that all their parts fit together, independent of their correspondence to an external reality judged by God's eye.

Accordingly, with few exceptions, every successive century can be seen as producing pictures that become internally free of contradiction. Visual lines, the cone or the pyramid of vision, the horizon—all the devices employed in the practice of perspective—



Perspectival construction of the checkerboard-type "ground square," according to Leon Battista Alberti. Left: preparatory drawing executed on the picture panel itself. Middle: auxiliary drawing executed on a separate sheet (elevation of the "visual pyramid," which yields the intervals of the transversals v , w , x , y , z). Right: final drawing (transfer of the depth intervals obtained from the auxiliary drawing onto the preparatory drawing; the diagonal serves only to control the results). (From *Perspective as Symbolic Form*.)

help not only in developing more naturalistic icons, but also in informing more consistent constructs. Given this model of development, at the beginning we ought to find pictures composed of fragments, and ending with pictures that are totally systematic. Indeed, historical evidence confirms this hypothesis. Frescoes, mosaics, and pottery of late Antiquity all contain isolated islands of systematic foreshortening—a ceiling here, a table there, part of the floor in one case, a combination of a side-wall with the ceiling in another—until suddenly, these islands merge into a unified landscape, and all the aggregates come together and are subjugated, without exception, to the rigor of the *intercisione della piramide visiva*, or convergence of the visual pyramid.

Without doubt, the appearance of these new objects created through perspective must have come as a shock. Was this effect unpleasant? Was it akin to the shock of finding a stranger in the intimacy of a *hortus occlusus*, to use another of Kepes' similes? Far from it. It was a surprise, but a very pleasant one, to the degree that it was greeted by Paolo Uccello with the exclamation, "Oh, che dolce cosa é questa prospettiva!" ("Oh, how sweet a thing perspective is!"), as Giorgio Vasari reports.

The thrill felt might be explained by the illusionistic impact of perspective-based realistic pictures. People were drawn to such new idols as the birds were to the fruits in the painting of Zeuxis, as Pliny relates in his *Natural History*. Yet applying Putnam's second criterion—that of internal coherence—to the case, we might find another reason why perspective-based pictures were such an in-

dulgence to create and so hedonistic to behold. It was because of how they were structured, because of their coherence which reflected the way the mind was made; it was because the visual pyramid projected natural objects onto the canvas, and the constitution of the mind onto the world.

Pictures made according to the new system of representing perspective were descriptions within which every form to be found was tagged with categories of the mind, or, more specifically, spatial categories. The tripartition that characterized the organization of perspective-based pictures corresponded to the tripartite cognitive framework of front-middle-back, up-middle-down, right-middle-left—categorical structures internal to the mind. Consequently, what the viewer recognized in such paintings was nature categorized, humanized. Perspective paintings were not only naturalistic images, but also mental images.

To quote Putnam once more, the forefather of this "internal realist" position is Immanuel Kant, whose impact on the history of science, technology, and art has been enormous. His influence among German-speaking art historians in the first part of the 20th century—in particular, his magisterial philosophy of symbolic forms—was carried out through the writings of Ernst Cassirer.

Erwin Panofsky's book, *Perspective as Symbolic Form*, tells, or rather outlines, the story of this "anthropocratic" takeover of the world, "the translation of psycho-physiological space into mathematical space (or logico-mathematical space) . . . an objectification of the subjectives." Panofsky's text, originally published in 1927 in the *Vortrage*

der Bibliothek Warburg 1924–25 (Leipzig & Berlin, 1927) has been published in English by Zone Books, decades after it was translated into Italian and French. Scholars using the Fine Arts Library at Harvard University might have encountered a precious, unauthorized, typewritten translation of the text, accompanied by a short initialized note by Panofsky himself warning the reader, in Latin, of potential errors. *Perspective as Symbolic Form* is a short text followed by a formidable barrage of notes. It is a pity that the newest publication of this brilliant and very influential document lacks an index.

The accent in this seminal essay centered more on aspects of internal-coherence criteria than on external ones. Additionally, in an intriguing turnabout, Panofsky suggests that the Kantian internalist approach had its roots in the emergence of perspective as a paradigm. From the outset, the Kant-Cassirer orientation is obvious given that, in the original German title, "Die Perspektive als 'symbolische Form,'" "symbolic form" is set off in quotation marks, in reference to Cassirer's *The Philosophy of Symbolic Forms* (first published in German in 1921, and in 1977 by Yale University Press). Unfortunately, the quotation marks were dropped in the English translation.

There is an evolutionist view combined with the neo-Kantian one in Panofsky's study of the incremental systematization of the perspective-based artificial world through the centuries. The progress of cumulative systematization had an order. Despite the brevity of the study, there is a sufficient delineation of the phrases. The same evolutionist order is also found in the development of other cultural systems in their progress toward coherence. The poetics of classical architecture emerged out of antiquity and reached its maturity in the Renaissance in a similar way. Related internalist/externalist criteria can also map this path. In some cases, such parallel ways were autonomous; in others, they were intimately interlinked and reinforced each other. The investigation of such correspondences could lead to the identification of hypermaps of intercultural influences, as well as the identification of deeper forces,

such as the growing mentality of bourgeois rationalization which produced such structures as bureaucracies, the systemization of economic affairs, the legalization of everyday civic life, leading a variety of cultural developments.

Unlike his later book, *Gothic Architecture and Scholasticism* (1951), Panofsky's study on perspective rarely refers to factors exogenous to the phenomenon of the development of perspective (one rare exception is when he notes that "the space of Giotto and Duccio correspond[s] to the transitional high Scholastic view of space."). Compared to *Gothic Architecture and Scholasticism* in which he deals again with the problem of incremental systematization/conceptualization of the artificial world, *Perspective as Symbolic Form* is a relatively single-plot narrative.

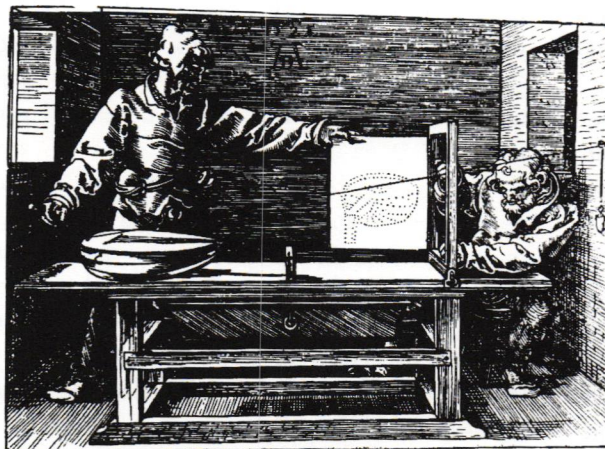
Hubert Damisch's *L'Origine de la Perspective* offers us a good overview of the abundant work carried out on the topic since Panofsky's seminal essay, and goes to great lengths to establish such relationships between multiple layers of the movement. The passages about the relationship between Renaissance perspective and the ideal city are particularly intriguing.

Current appetite for multilayered contextual studies of culture will certainly be opened by the efforts of Christopher S. Wood in his introduction to Panofsky's essay. He brings out very clearly the relation between Panofsky and neo-Kantians. Wood's introduction situates Panofsky's essay in the context of German art historical scholarship and of the tensions that existed there between an ahistorical structuralist philological as opposed to historicist-contextualist thinking. He also elaborates on the discussion of the conflict between the subjective-versus-objective identity of perspective representation system with which Panofsky's essay ends. This he links with a current debate about the history of culture, science, and art as posed by one of the most radical exponents of relativism, Paul Feyerabend.

The representation system of per-

spective explicitly presupposes a juxtaposition between object and subject, the world as is and its maps as they appear. Depending on the individual point of view, such a representation system leads to descriptions that can differ considerably from each other even if they stand for the same object. And none of the descriptions are necessarily more "true" than the others. This invites, by analogy, implications about the incommensurability of human beliefs. Wood belongs to a different belief outpost than Panofsky. Siding with Damisch, with whom he shares many opinions, Wood appears to regret Panofsky's "totalizing" mentality and last-minute rejection of "perspectivism" which the study of perspective could have easily implied.

The implications of the invention of perspective were not only critical or epistemological, but also technological. Constructing a perspective description according to the perspective representation system became a completely reliable and standardized procedure, an algorithm—so much so that it easily led to its mechanization through the invention of the camera. It also contributed significantly to the creation of an even more automated system of representation two centuries later: computer-image generation. But while the camera appeared to have inherited the "conservative" aspects of perspective, or those related to its "totalizing" character, the computer offered a radical, "perspectivist" alternative. Once more, however, the angel of scientific change was full of shocking surprises.



Albrecht Dürer's perspective machine anticipates the principle of ray-tracing. (From *The Reconfigured Eye*.)

This radical alternative created new uncertainties. Perspective had its critics, two of whom Panofsky refers to toward the end of his essay: Plato, who condemned perspective as it was born because "it distorted the 'true proportions' of things, and replaced reality and the *nomos* [law] with subjective appearance and arbitrariness"; and El Lissitzky, who attacked perspective because it "limited space, made it finite, closed it off." In order to overcome perspective's "closed" character, Lissitzky proposed a solution which Panofsky recounts: "The conquest of an 'imaginary space' by means of mechanically motivated bodies, which by this very movement, by the rotation or oscillation, produce precise figures (for example, a rotating stick produces an apparent circle, or in another position, an apparent cylinder, and so forth)." Panofsky looked down on Lissitzky's proposal because, despite its aspirations to go beyond the "Euclidean" prison-house, it led to "Euclidean" space pictures itself. Lissitzky's vision, on the other hand, implied something more: it presaged in a fascinating way the kind of work students would be turning out as standard practice on computers half a century later. In other words, it appears that the new system of generating descriptions of space, offered today by the computer, was in direct response to Lissitzky's critique of perspective.

One of the most fascinating capabilities that the computer offers is that, once it has helped us build perspective images on the basis of planar data, such as plans and sections, it then allows us to control them. Pictures are stored and recalled, cut and pasted, squeezed and expanded, and finally, if not restored, erased. In other words, computers instantiate the program Lissitzky envisaged, a new kind of painting beyond the confines of perspective. Lissitzky's dream was, in fact, misunderstood by Panofsky who concentrated only on the end-product of a process that Lissitzky was discussing. The artist was referring to a dynamic process that departed from an initial perspective description of an object, what he called the "rotating stick," to arrive through an intermedi-

ate series of steps at a second transformed description, an "apparent circle" or "apparent cylinder." Thus, the representation system that Lissitsky envisioned was an open system, a dynamic system within which objects could be "parametrized," to used CAD terminology, a system which computers contain today.

The story of this new invention, its possible applications as well as its possible implications, is found in William J. Mitchell's new book, *The Reconfigured Eye*. Like Panofsky's book, which charted the development of perspective in an evolutionary manner, Mitchell's investigates the development of computer-based picture generation. In so doing, Mitchell sees photography as the necessary precondition for the emergence of electronic photography, still video, and digital camera—the basic distinction between photography, or, in his words, a "modern" representation system, and digital image synthesizing, a "post-modern" system lying in the "analog" (continuous) character of the former as opposed to "digital" (discrete) character of the latter.

Mitchell uses an architectural metaphor to express this difference: the continuous motion of rolling down a ramp versus the discrete sequence of steps down a staircase. In the first case, you cannot count your steps reliably. In the second, the discreteness of the stairs makes the counting very easy. Thus, computer-based spatial descriptions can be stored efficiently and effectively, but can also be very easily manipulated, much more so than their ancestors, the camera-based images.

Perspective was the presupposition of photography. But it was also the presupposition of computer-based pictorial representations. Without perspective, the mathematization of space necessary for computer representations would have been historically impossible. It is interesting to keep in mind that, at their inception, perspective descriptions were conceived as digitally constituted. The perspective system of representation was based on the ballistic paradigm, what has been called "the arrow in the



Wide angle and telephoto views taken from the same station point.
(From *The Reconfigured Eye*.)

eye." Rays are "shot" at, or from, the eye (depending on the assumed general theory of optics) piercing an intermediate plane. Since the act of shooting is discrete, the traces on the plane are assumed to be discontinuous points rather than lines. This is quite explicitly stated in Albrecht Dürer's famous engraving of a man drawing a lute illustrating the second perspective apparatus (from *The Painter's Manual*, which was first published in German in 1525, and in 1977 by Abaris Books).

Not only does the illustration clearly show a picture made up of dots rather than a sweeping line, but the accompanying text makes the digital paradigm and its consequent procedure explicit. The description is generated by "marking the spots, moving from point to point" discretely until the whole object has been "scanned and its points transferred to the tablet" (a translation of "das die ganze lauten gar an die tafel punctirst," Dürer's emphasis).

The Reconfigured Eye engagingly shows the computer's capability of storing massive information and of rearranging images endlessly—this, with today's desktop technology, which is accessible with comparatively modest budgets (according to Western standards). More pragmatic, not to mention more detailed and broader in its applications, is the *Digital Design Media* (Van Nostrand Reinhold, 1991), also by William Mitchell, along

with Malcolm McCullough. Its tone is that of a textbook, and its structure and selection of references make it a helpful companion to a general-purpose computerized design course. It's important to note that both the text and diagrams in this book are more pleasant to peruse than those in the classics of this genre.

The Electronic Design Studio, edited by Mitchell, McCullough, and Patrick Purcell, is even closer to the classroom than *Digital Design Media*. This is a collection of papers initially presented at the CAAD Futures Conference in 1989 in Cambridge, Massachusetts. The thirty-three papers are all equally passionately engaged in bringing computer tools to the design studio.

What's interesting is that all the participants share a common orientation toward architecture and computers. Unfortunately, the authors also share, to a high degree, a continued dedication to traditional CAD. With very few exceptions, current developments in artificial intelligence, computer vision, cognition, and "architectural knowledge" are given short shrift. The variety of contributions come together and form a kind of medium-sized orchestra on the topic. The virtuosity of the individuals is uneven, however, as is usual in such cases.

Computers can not only describe and control objects in space geometrically in the tradition of perspective, but can also capture more complex, conceptual spatial aspects of the world by employing space-related cognitive structures. They can describe, explain, and predict compositional organizations in a sophisticated, nonreductive way, like an expert. In addition, they can describe, explain, and predict moving in space, causal chains of events—such as social interaction in buildings as constrained by spatial configurations—and the interdependence of multiple processes occurring within the environment. In doing so, they employ a design intelligence that is not embodied ("enminded" is perhaps a better word) by traditional CAD.²

From recent evidence, the situation seems to be changing drastically, and most CAAD researchers have moved quickly

into such advanced territories of computer applications. Follow-up applications are certainly eagerly awaited.

Ironically, *The Reconfigured Eye*, which is, by its genre, more identifiable as an essay of ideas (and a lavishly illustrated one at that), is the most desirable of all the books mentioned as an educational support tool. Moreover, it will no doubt be the most lasting contribution on such a swiftly changing subject. Mitchell's prognosis of future uses of computers is modest and pragmatic in comparison to the more wild speculations put forth by current publications such as Michael Benedikt's *Cyberspace* (see reviews on pages 17 and 19), a book that meditates on a grandiose and more utopian scale about the possibilities of such manifold image storage and facile manipulation of high-tech engines.

Despite their relatively conservative character, Mitchell's projections might still come up against serious difficulties in being implemented. As in the case of CAD, digital image technology will always be confined unless supplemented by a more advanced methodology. In both cases, the computer's power to store and process information is highly overestimated. It isn't that computers cannot perform ambitious tasks such as those that CAD and digital image theoreticians imagine and aspire to; but such feats of performance cannot be founded on a reductive modeling of design thinking and an unchallenging theory of design intelligence, because of limits of memory and time, which constrain even the most advanced computers.

The Reconfigured Eye is explicit about such limits when digital image applications grow in size. The sheer "shrinking" of the information contained in the recorded images, however, is insufficient. The answer is to be found in neither software nor hardware improvements; rather, the place to search for this special intelligence is in the culture of architecture and in the nature of the mind. Culture and nature have already developed many efficient and effective strategies, through history as well as natural evolution, enviably mastering the tasks of hoarding huge amounts of images and reconfiguring them inside our heads.

It is no accident, at this moment of chal-

lenge posed by the reconfiguring eye—with so much refocusing on design intelligence and rethinking about visual cognition now occurring—that Panofsky's text on perspective has been remembered, translated, and commented upon.

Like Uccello, Mitchell is captured by the sweetness of the new representation system and its challenges. And one might speculate that he is drawn not only by its potentials but also by the fact that, through the new system, we see projected in the world the structure of our internal cognitive apparatus—as in the case of perspective.

But unlike those who wrote about perspective in the Renaissance, Mitchell's book is preoccupied at least half of the time by

potential problems and dangers which the new system might bring about. His point is not only excellently argued, but also very well taken. How can we guarantee that an explosion of fake images, images that can be very easily and abundantly manufactured by today's machines, does not destroy the integrity of our culture in the near future? Plato was worried that perspective would populate the world with fake imitations of the Ideas. Mitchell is troubled with the proliferation of fake documents reconfigured through new technology emerging constantly during our lives. Another equally important question is how will we cope with problems of intellectual property without frustrating the enormous potentials of "reconfiguration"; or, if we opt for giving total license to re-creation, how will we reward the initial creators? These are some of the headaches that will come, along with the hedonistic moments, in the new machine-based fantasy of tomorrow. After all, the angel of change holds a sword with a double-edged blade.

NOTES

1. From the Winter 1960 of *Daedalus: The Journal of the Academy of American Arts and Sciences*, dedicated to "The Visual Arts Today"; Gyorgy Kepes was the guest editor.
2. The resulting limitations can be seen very clearly in *Possible Palladian Villas* by George Hersey and Richard Freedman (MIT Press, 1992).



A perspective anamorphosis. (From *The Reconfigured Eye*.)

PERSPECTIVE AS SYMBOLIC FORM, Erwin Panofsky, translated and introduced by Christopher S. Wood, Zone Books (distributed through MIT Press), 1991, 196 pp., illus., \$24.95.

L'ORIGINE DE LA PERSPECTIVE, Hubert Damisch, Flammarion, 1987, 416 pp., \$60.00.

ELECTRONIC DESIGN STUDIO: ARCHITECTURAL KNOWLEDGE AND MEDIA IN THE COMPUTER ERA, Malcolm McCullough, William J. Mitchell, and Patrick Purcell, editors, MIT Press, 1991, 505 pp., illus., \$19.95.

THE RECONFIGURED EYE: VISUAL TRUTH IN THE POST-PHOTOGRAPHIC ERA, William J. Mitchell, MIT Press, 1992, 273 pp., illus., \$39.95.

WILLIAM J. MITCHELL

Cyberspace, Time, and Architecture

It probably helps to imagine Rod Serling setting up a *Twilight Zone* premise. Consider, if you will, a miniature prosthetic device—let us call it a laser microscanner—that paints a tiny stereo pair of video images directly on your retinas. When you wear this device you do not just look *at* a virtual world behind the video screen: you are *in* that world. (I hasten to add that only clunky approximations to this device currently exist.)

Now take this speculation a step further. Imagine combining this display technology with a position sensor, a powerful computer, and appropriate software for updating the displayed images at thirty frames a second in response to your movements. You become a cybernaut—an inhabitant of a virtual three-dimensional world. You can “walk” around this world, or “fly” through it.

This virtual world need not be silent. You might wear a pair of headphones—just as with a Walkman—so that stereo sound streams are directed to your ears. But there is a new twist: as your position changes and

your head rotates, the computer adjusts these sounds in real time to create the illusion of movement relative to sound sources positioned in space. (This component of the technology actually works quite well right now.)

Still, as the figure of speech so tellingly puts it, you are not yet completely in touch with your virtual world. This can be remedied by donning a gesture-sensitive glove or suit, and extending the software so that objects in the virtual world now respond appropriately to your movements. You can pick up and move virtual objects, or even use your dataglove to greet a similarly equipped distant friend with a virtual handshake. (Marvin Minsky was vividly speculating about telepresence in the 1970s. He imagined “a comfortable jacket lined with sensors and muscle-like motors” so that “each motion of arm, hand, and finger is reproduced at another place by mobile, mechanical hands.” The necessary technology is now developing quite nicely.)

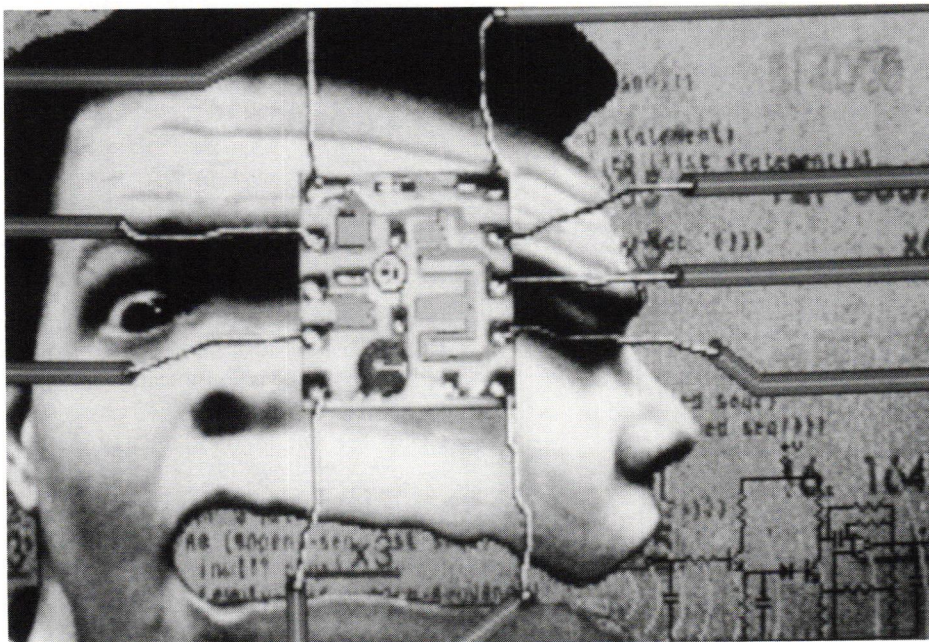
But picking things up feels very strange and virtual handshakes are unsatisfyingly limp if there is no tactile feedback. So the next step is to add pneumatic force feedback effectors to the dataglove or datasuit.

Just as the laser microscanner puts moving patterns of light directly on your retina, an artificial second skin now distributes moving patterns of pressure over all the tactile sensing surfaces of your body. With suitable programming, the virtual objects that you lift can seem to have mass and inertia, the virtual surfaces that you touch can seem rough or smooth, and you can feel the clasp of your distant friend’s hand. You press, and simulated skin presses right back. So it has not escaped the notice of virtuality hucksters that, in the age of safe sex, there is probably a big market for cybercondoms.

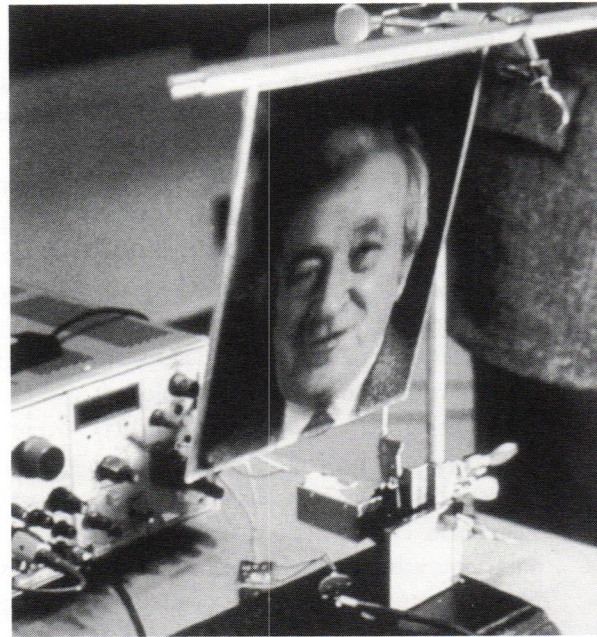
The details of the next bit of technology seem even trickier to work out, but extension of the principle to taste and smell is at least conceivable. You would need some kind of micro device directing a computer-controllable stream of stimuli to your palette, and another stimulating your nasal membranes—some sort of cybernetic snuff. For example, when you enter the virtual garden of Eden that some hacker has created, you might see a simulated apple, pick it up, feel its weight in your hand and sense the texture of its skin, experience its crunch between your teeth, taste its crisp tartness, and smell its fruity aroma.

If this prosthetically invoked virtual apple seems rather difficult to swallow, you might prefer, like the cyberpunk laureate William Gibson, simply to imagine short-circuiting the whole camp getup of eyephones, earphones, nosephones, and intelligent spandex. Think of a dataplug behind your ear; you might just jack into cyberspace.

How can you tell (apart from checking for that tell-tale plug behind the ear) that you are not jacked in right now? How can you show that this very text is not an insidious piece of self-reflection designed to enhance the illusion? Begin by checking the fine detail; reality has complex detail right down to the subatomic level, but virtual reality is constructed at some finite—and probably relatively coarse—resolution. So, if you look through a sufficiently powerful virtual magnifying glass, you will eventually see pixels. Next, try moving your head very quickly.



Art generated from computer “paint” programs; Christopher Crowley. (From *The Media Lab*.)



The original "Talking Head," circa 1979, had gimbals to replicate head movements such as sideward glances and nodding. It would enable people in different locations to meet around a "virtual" conference table. (From *The Media Lab*.)

Reality always updates itself perfectly in real time, but virtual reality can lag perceptibly. No matter how fast the computer that recalculates the stereo images in response to your movement, it requires *some* finite amount of time to do so. If you move fast enough, then, you will eventually detect flicker or jerkiness.

The practical development of virtual reality systems, as breezily and entertainingly chronicled in Howard Rheingold's *Virtual Reality*, has essentially been a struggle to build the necessary sensor and effector devices, to increase the resolution of virtual worlds to an acceptable level, and to reduce update lag to a point where it is imperceptible. It is a long story. The first working prototype was constructed approximately a quarter of a century ago by Ivan E. Sutherland—the computer graphics and robotics pioneer who also built the first working CAD system. The Boston Computer Museum now has Sutherland's original equipment and some historic videotape of it in action. You can see, as the wearers of this inspired kludge saw, a wire-frame cube floating incongruously in the center of Sutherland's laboratory.

Rheingold tells this tale, and also recounts the other standard virtual reality origin myths and certified significant moments: the Link trainer, Morton Heilig's amazing Sensorama, Myron Krueger's early interactive installations, DARPA and NASA projects, SIGGRAPH graphics hacker heroes, the irrepressible Ted Nelson's steamy speculations about teledildonics, Autodesk's ill-fated foray into the VR business, appropriation of the idea by old pharmacophiles like Timothy Leary and technoid New Agers like the *Mondo 2000* crowd, and the 1980s proliferation of VR start-ups and university labs. *Virtual Reality* is an able if slightly breathless piece of oral history (most of the pioneers of the field are still around, and Rheingold tracked many of them down), and an indispensable introduction to the topic.

One of the research loci frequently cited by Rheingold is MIT's Media Laboratory. Stewart Brand's *The Media Lab: Inventing the Future at MIT* provides a detailed, well-crafted account of its activities. The research agenda of the Media Lab includes but is by no means limited to technologies that have been taken up by VR enthusiasts and the burgeoning cadre of cyberspace flacks; it is concerned broadly with the evolving electronic, digital environment, with media integration, and with person/machine interfaces. Designers should watch it carefully. It grew out of a notably brilliant research group in a department of architecture (Nicholas Negroponte's old Architecture Machine group), it is as much art as it is engineering, and it asks provocative questions about a future in which the media environment is as important—and as deserving of design attention—as the familiar material and spatial one.

Unless you count yourself among the hardcore hardware freaks, though, the details of the devices and their programming are not the interesting part. Cyberspace and

virtual reality are most fascinating as thought experiments—like brains in vats, Turing tests, visiting Martians who do not know our language games, and trying to imagine what it is like to be a bat. It is a way of probing the boundary conditions of architecture, and of fleeing the flaccid grayness that the waning light of poststructuralism casts on current architectural discourse. It is a riff of gonzo ontology, a welcome whiff of in-your-face intellectual delinquency.

It gives the gaze/body/hegemony clique something new to think about. Your cohabitants of cyberspace do not see your usual meaty, cloth-hung embodiment, but whatever virtual body you might choose to present. Like a fairy tale witch, you can embody and mark yourself in whatever way you want—as Madonna rampant or couchant, as Senator Jesse Helms, or as Gregor Samsa in his sorriest state. You can even, if you wish, lurk invisibly. Cross-dressing seems tame by comparison with electronic cross-embodiment; gender and class markings become infinitely mutable and unstable. And without stable body markings, architecture just does not preserve power and patriarchy structures as it is supposed to do. How do you know who gets to use the virtual men's room? Or the virtual faculty club?

Does the idea of virtual places seem outlandish? Well, it is worth noting that the virtual workplace has actually been with us for some time, and seems to have been accepted with very little comment. When you work on a Macintosh, or a computer running Microsoft Windows, you are presented with a virtual office in which "documents" reside in "folders" on a "desktop" and are dropped into a "trashcan" when no longer needed. (The scare quotes here code virtuality.) The mouse is a crude dataglove, and the mouse-controlled cursor is a highly simplified virtual hand. This "place" is only two-dimensional, it is sparsely and not very

elegantly furnished, and the graphics are quite rudimentary, but these are temporary and unimportant technical consequences of using low-powered computers: it is easy to imagine—with the many more MIPS (millions of instructions per second) that no doubt will soon be available—a very much slicker and more convincing three-dimensional version. Perhaps, since architects will not have much real office space to design for quite a while, they should turn their attention to this sort of virtual real estate.

The contributors to *Cyberspace: First Steps*, edited by Michael Benedikt, speculate on these questions and many more. Their texts vary widely in quality and sophistication, and some contain some gratefully awful technobabble, but most repay careful consideration. It would be easy to sneer at the evolving discussion of cyberspace and virtual reality as represented in this pioneering volume—to dismiss it as an affair of incorrigible technocrats and air-head California kids unschooled in cultural matters such as the exegesis of Walter Benjamin and the higher intricacies of intertextuality. But that would be a mistake. They are on to something.

VIRTUAL REALITY, Howard Rheingold, Touchstone Books, 1991, 415 pp., \$12.00.

THE MEDIA LAB: INVENTING THE FUTURE AT MIT, Stewart Brand, Viking Penguin, 1987, 285 pp., illus., \$12.00.

CYBERSPACE: FIRST STEPS, Michael Benedikt, editor, MIT Press, 1991, 436 pp., illus., \$24.95.

PETER ANDERS

CyberIdaho: The Reality of What's Not

Pick up a newspaper or turn on the TV. Check out the “real” world. The characters on “Sisters,” a television series, are delighted that they will be the subject of a made-for-TV movie. Real audiences are pushing buttons to determine the plots of movies being shown in Manhattan. Brazil is shocked at the breakup of Daniella and Guillermo, leading characters in a Brazilian soap opera. Hours after breaking up in the drama, the actor murders the actress in real life. The actress’ mother will continue to script the series, having to provide a fictional explanation for her daughter’s death.

This sense of vertigo is not limited to the Americas. Benjamin Woolley, in his book *Virtual Worlds*, recounts a recent incident in Great Britain. A series of television advertisements for the yellow pages featured an elderly gentleman seeking an out-of-print book entitled *Fly Fishing* by J. R. Hartley. At the end of the commercial the viewer discovers that the man is Hartley himself. The British audience was so moved by the ad that bookshops and libraries were swamped with requests for the book, even though the book and its author were entirely fictitious. Woolley writes, “So the publisher Random Century decided to create one. It commissioned writer Michael Russel to ghost-write the book, and hired the actor Norman Lumsden, who had played Hartley in the original advertisement, to pose as the author. The result was a fiction turned into fact—artificial reality.”

Mediated reality is upon us. We live in a post-Marshall McLuhan world where communication and information industries extend our senses far beyond our bodies. They also create new fictions for the mind.

Last year Joseph Weintraub, inventor of the *PC Professor* program, won a competition based upon the Turing test for artificial intelligence (AI). Alan Turing proposed in

1949 that a computer could be tested for intelligence by creating a blind dialogue between the machine and its user. If the user remains unaware that he or she is conversing with a computer, then the machine is deemed intelligent. Weintraub’s relatively simple program was filled with enough ambiguous responses to fool most of the judges. While not cutting-edge technology, the program showed the progress made in AI research in the past few years.

Virtual reality (VR), a new area of computing, differs from AI in the users’ interaction with the machine. It assumes that computer graphic space is potentially indistinguishable from “real” experienced space. This is an important distinction. Computers based on the human interaction model will only answer questions they are asked, passively concealing information if the right questions are not posed. A computer based on a spatial model reveals information wherever the user’s attention may go. The user can graze for information, picking up leads from the corner of the eye.

VR has existed as a concept for nearly thirty years. Only now has it caught fire with new technologies and the attention of the media. Even pop imagery of the computer has been updated. Compare the personality of the HAL 9000 computer in *2001: A Space Odyssey* to the unnamed computer featured in *Lawnmower Man*, a recent film featuring VR. The paradigm shift between these films changes the role of the computer from a centralized personality to that of an ambience. This shift is at the heart of a changing attitude toward computers and information.

VR is the result of many parallel developments: military applications of computers, flight simulators, toy manufacturers, and computer hackers are among its motley sources. Computer games and entertainment were important catalysts for VR research. The first computer graphics were a by-product of MIT’s efforts to produce a flight simulator for the U.S. Navy in 1944. By 1949 the engineers had managed to get their oscilloscope screens to produce moving dots that mimicked bouncing balls.

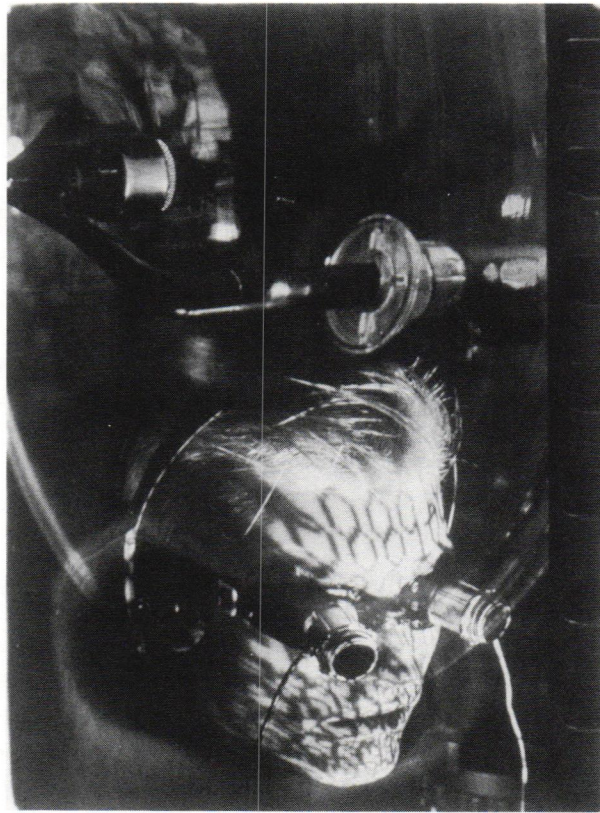
Later, they developed a simple game that allowed the ball to fall through a hole. Despite the “wasted” tax dollars, this form of play led to undisputed scientific advances: computer graphics and interactive computing.

Computing lends itself to play, encouraging users to assemble their thoughts and to act upon them. In his book *Virtual Reality*, Howard Rheingold writes that due to the tactile modeling capabilities of computers “progress in pharmaceutical design and medical imaging will benefit indirectly from the success of the true industrial giants of the future VR industry—who are more likely to be video game companies than scientific toolmakers.”

Morton Heilig’s Sensorama, a simulator designed in the 1960s, was an early attempt to convey the illusion of traveling in space. Had it been built, the result would have been a video game with sound and smell simulations. In 1981 Warren Bushnell started Atari in Sunnyvale, California, which attracted many young researchers who eventually formed their own companies. Notable among these were Scott Fisher, Thomas Zimmerman, and Jaron Lanier. Lanier later founded VPL, one of the first manufacturers of VR interface equipment.

Paralleling these developments were efforts by the military and NASA to create simulated environments. The elaborate flight simulators used by the military and commercial airlines partially owe their existence to Tom Furness’ research in visual display simulation, which he undertook while working with the U.S. Air Force. At MIT this technology was also being created for architectural purposes by Nicholas Negroponte and the Architecture Machine group in the 1970s and 1980s.

This period is marked by unallied research happening at various sites, for various purposes. Only within the past few years have these developments been seen as a cultural phenomenon and not merely a



How to identify a cyberpunk? (From *Mondo 2000*.)

technical novelty. Rheingold writes that “the convergent nature of VR technology is one reason why it has the potential to develop very quickly from scientific oddity to a way of life.”

BETWEEN THE LINES

The conception of virtual reality can also be traced through specific texts that inspired its research. One of these founding texts is Ivan Sutherland’s academic paper entitled “A Head-Mounted Three-Dimensional Display” written in 1968. Considered by many to be the inventor of VR technology, Sutherland previously wrote a paper entitled “The Ultimate Display.” Its description was darkly prophetic: “The ultimate display would . . . be a room within which the computer can control the existence of matter. A chair displayed in such a room would be good enough to sit in. Handcuffs displayed in such a room would be confining, and a bullet displayed in such a room would be fatal. With appropriate programming such a

display could literally be the Wonderland in which Alice walked.”

In 1965 when this was written, computers were huge machines able to create only the roughest graphics. Sutherland’s vision of computer graphics took him beyond representation to manifestation at a time when computing was in its infancy.

Another important text is the novel *Neuromancer* by William Gibson, written in 1986. This book is accepted by many as setting the cultural stage for the development of VR technology. Nearly every book on the subject of virtual reality refers to Gibson’s book as a crucial work. *Neuromancer* extrapolates current computer capabilities into a future where information is the very stuff of reality. Gibson’s novel has the dystopic feel of works like *Blade Runner*, describing a life between two universes: one in the heavy world of reality, the other in a realm of pure information and energy—

cyberspace.

Cyberspace is far from ideal and Gibson’s book is as admonitory as it is visionary. Gibson himself doubted that “cyberspace,” a term he coined, had been understood by the VR industry as he had intended. “I sometimes get the feeling that technical people who like my work miss several layers of irony,” he said recently.

The eager acceptance of Gibson’s vision is evidenced by Autodesk’s creation of a VR department called Cyberia. Autodesk is a major producer of CAD software. Before Cyberia’s creation, Autodesk’s founder, John Walker, wrote a memorandum now known as the “Through the Looking Glass Memo,” perhaps in homage to Sutherland’s proposal. It is considered a crucial document in the history of VR technology:

I believe that conversation is the wrong model for dealing with a computer—a model which misleads inexperienced users and invites even experienced software designers to build hard-to-use systems. Because the computer has a degree of au-

tonomy and can rapidly perform certain intellectual tasks we find difficult, since inception we've seen computers as possessing attributes of human intelligence ("electronic brains"), and this has led us to impute to them characteristics they don't have, then expend large amounts of effort trying to program them to behave as we imagine they should.

When you're interacting with a computer, you are not conversing with another person. You are exploring another world.

The public has embraced the phenomenon of VR with uncritical enthusiasm. It has been covered in arts and science magazines. It was even featured as a cover story in last October's issue of *BusinessWeek* and, more recently, in *Time*. Any innovation in science, whether fractals or superstrings, has a brief honeymoon with the public, owing to its novelty alone. The counterculture in particular has a field day with any scientific justification for challenging the establishment. Cyberpunk fanzines like *Mondo 2000* ride the waves as the floodgates are opened. Terminology explodes with neologisms. Consider the synonyms for "computer users" alone: cyberpunks, hackers and crackers, phreaks and wireheads.

There is some preening that goes with the revelry. Like recent developments in chaos science, VR is another triumph of a counterculture augmented with computers. The anarchic/utopian ambitions to undermine the establishment by using its tools seem realized. It is the "whole earth" culture updated to the information age. (And it's no coincidence that two of the most prominent VR authors today, Rheingold and Stewart Brand, were founders of the *Whole Earth* catalog, a cultural landmark that was among the first to establish technology as a populist tool.)

Despite these cultural concerns, the popular fascination with VR fixes on the paraphernalia associated with it. The computer, called a "reality engine" by those in the VR industry, usually takes backseat to "techie" encumbrances like headsets and arthropodan gloves. Most of the intrusive in-



A possible urban landscape of a matrix; Stan George, 1989. (From *Cyberspace*.)

struments like headsets and heavy gloves may eventually be phased out as more transparent systems evolve. "The idea that people are going to put on gloves and scuba gear to go to work in the morning requires at least some skepticism," says Myron Krueger, one of the proponents of a non-intrusive VR technology.

Another limitation of the technology is a distinct lag between the motions of the user's head and the images projected by the systems. This is due to the massive load of calculations that are required to generate the illusion. The most powerful workstations, such as those of Silicon Graphics, can process a few thousand polygons per second. This gives a fairly smooth cartoon-like imagery but cannot be mistaken for reality. "Reality is eighty million polygons per second," says Alvey Ray Smith, a key figure in computer graphics culture.

Besides gloves and goggles the basic setup includes the following: a Polhemus position sensor to determine the rotation of the headset as the user turns; a matrix multiplier for recalculating the relationship of lines in the illusion; a vector generator for drawing the lines on the video screens used in the headsets; precision acoustic speakers for locating objects within the space. In 1990s prices, Rheingold's *Virtual Reality* lists the cost of setting up a system: a Polhemus position sensor costs \$2,500, a VPL DataGlove \$6,300, an EyePhone \$9,400, and a software package \$7,200. All

this comes to \$25,400 *not counting* the \$100,000 workstation required to operate it.

Although the equipment gets much media attention, we seldom see the environments and creations envisioned within these systems. Krueger warns us that although the development of tools is important, we should not overlook the philosophical, cultural, and artistic potential of the medium. Rheingold states it plainly: "If our technology ever allows us to create any experience we might want, what kinds of experience should we want?"

TOWARD ANARCHITECTURE

The influence of design on VR is in its earliest stages. According to Mark Bolas, founder of Fake Space Labs, "At the same time that we're building hardware and software for NASA and others, we are trying to sneak a little design into virtual world building. I'm amazed at how little time people actually spend inside virtual environments and how much time they spend talking about polygons per second."

As any architect knows, the role of the computer model has rich potential. Fredrick Brooks, a well-known VR researcher at the University of North Carolina, worked with the architect of the new computer-science center on campus and created walkthroughs that gave its architect and client a "reality" check on the building's design.

There are tantalizing possibilities for the design profession once VR is freed from imitating reality. Randall Walser and Eric Gullichsen wrote in 1989 that VR would lead to the creation of new professions, a "new breed of professional, a cyberspace architect who designs . . . cybernetic scenarios. The talents of the cyberspace architect will be akin to those of traditional architects, film directors, novelists, generals, coaches, playwrights, video game designers. The job of the cyberspace designer will be to make the experience seem real."

Before discussing the experience, we must understand the medium that conveys

it. One of Jorge Luis Borges' stories describes royal cartographers who created a full-scale map of the kingdom in such detail that, when overlaid upon the terrain, it was accurate down to the last blade of grass. Virtual reality offers us this paradox: the map *is* the terrain. The virtual universe is made entirely of information and resembles reality only at the option of the user. Navigation of VR is the navigation of its map.

Various types of space are already encountered in the use of computers: simulated graphic space; telepresence as a medium between robots and controllers, and stereolithography, the manifestation of computer graphics in actual space. Computer applications allow one to compose concepts spatially, and word-processing is no exception. For instance, the sentence you are reading is not where it was originally placed in the word-processor. It was moved from from one place to another for editing purposes.

What will be the character of future cyberspaces? In *Neuromancer* Gibson envisions a Matrix, a lattice of information created by global corporate structures. But it is unlikely that there will ever be a single Matrix as the writer imagines. Gibson missed Marshall McLuhan's point regarding the decentralizing role of computers in culture: "Persons grouped around a fire or candle for warmth or light are less able to pursue independent thoughts, or even tasks, than people supplied with electric light. In the same way, social and educational patterns latent in automation [computers] are those of self employment and artistic autonomy. Panic about automation [computers] as a threat of uniformity on a world scale is the projection into the future of mechanical standardization and specialism, which are now past" (from McLuhan's *Understanding Media*, 1964).

Recent history has been hard on monoliths (cartographers today scramble to keep up with changes in Eurasia), and the robust logic of decentralization applies to computers as well. It is more likely that the information format of Gibson's Matrix will be customized by each user, who will optimize

it for particular applications. Even today, users can adjust computer desktops, icons, and interface instructions. With the advent of faster and cheaper equipment it may be possible for one to customize the "universe" for one's own needs, which may lead to some surprising structures.

Suppose we took all existing computer documentation and loaded it into cyberspace. The coordinate system for most computer graphic spaces originates at a point, say (0,0,0). Because most graphics are likely to occur within view of the origin, the area near (0,0,0) would be incredibly dense with information. The rest of this artificial universe would be largely vacant. Travel through this particular cyberspace would probably not be along the axes with which we are most familiar. Instead we would be "moving" along various increments of a fourth dimension, passing through various states of (0,0,0). In CAD this is analogous to moving between layers of drawings.

A merging between VR and actual space might also be possible. This is the empowerment of real objects to exist symbolically. Imagine looking at an engine and seeing its internal operation simultaneously. Objects in real space could become symbolic con-

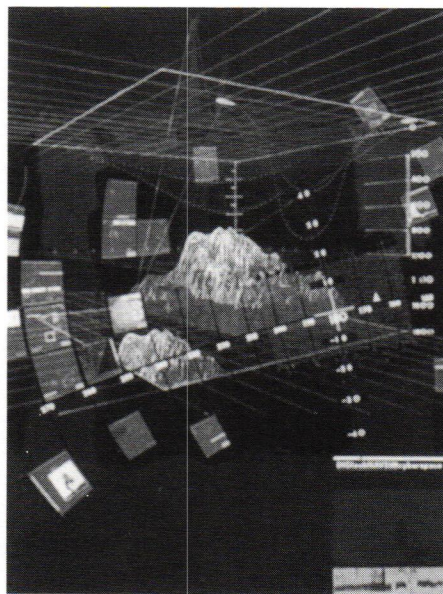
trols that are specifically tied to and interpreted by a computer. This computer could be sensitive to its environment and take its cues from objects within it rather than the conventional user/machine interface. In the industry this is called "embodied VR," or "hyperreality."

Computer errors may also become unintended elements of cyberspace geography. Not long ago, our office had trouble printing out a CAD document. The file had become much larger than the system could handle and printing a small portion of the architectural drawing took hours. Charles Felton, of our staff, discovered that the graphic space of the document included a circle some four hundred miles in diameter, so large that it was invisible to the user at the scales at which we were working. Once this VLO (very large object) was eliminated the problem went away. It is likely that errors like this may slip into a shared computer environment and so affect the geography of cyberspace.

THE UNEXPECTED DARKNESS OF BEING

Some fascinating questions arise when the issue of personal representation in cyberspace is considered. Could it be possible to have copies of oneself replicated in VR? Would there need to be consistency between them or could they appear to be separate individuals? If present computers are plagued with viruses and worms, could cyberspace be haunted by disembodied phantoms, bogus men without users/sponsors? Where is the fine line between artificial space and artificial intelligence?

Gullichsen and Walser wrote in 1989 that in cyberspace you may initially "feel more comfortable . . . with a body like your 'own' but as you conduct more of your life and affairs in cyberspace your conditioned notion of a unique and immutable body will give way to a far more liberated notion of 'body' as something quite disposable and, generally, limiting. . . . The ability to radically and compellingly change one's body image is bound to have a deep psychologi-



A gothic cathedral of sorts, floating through an infinite store; the user plucks scenes and fragments, searching for or creating new experiences; Daniel Kornberg, 1990. (From *Cyberspace*.)

cal effect, calling into question just what you consider yourself to be.”

The fascination about sex in VR is evidenced in several books; it is called “teledildonics” in Rheingold’s book. This revolves around the issue of self and embodiment in cyberspace. There is the question of the user’s representation within this environment, and then there is the social nature of cyberspace itself. When there are no limits to the user’s options in representations of him- or herself, the question of presence becomes an issue. Would you feel offended if someone regarded your icon salaciously? Uncivilized hackers often use electronic bulletin boards to voice their fantasies. Would their anonymity lead to more transgressions once a virtual reality network was in place?

Similar questions must be asked of the environment of cyberspace. If it is potentially a social space, as Gibson proposes in *Neuromancer*, sex could become a theatrical experience, enjoyed by exhibitionist and voyeur alike. Not networked through a medium like the Matrix, the experience becomes a furtive relief for the lonely hacker. These matters underlie the somewhat optimistic accounts of what VRs promise. Will virtual sex be a liberating experience or a night in CyberIdaho?

The literature on VR is still fairly young. Several of the books reviewed refer to one another, particularly to Rheingold’s *Virtual Reality*, which is a spirited account of the author’s quest for the secret of virtuality. He is an enthusiastic guide, thorough in his research and engaging in his delivery. While occasionally hallucinatory—“I danced with a woman who had taken the form of a twelve-foot-tall, three-dimensional purple lobster”—Rheingold’s book maintains the tone of a journalist at the frontline of technology.

His peripatetic account takes us on a global tour of think tanks and garages. His reports on research in Japan are leavened with wry commentary on cultural differences that lead to success and failure in VR technology. He takes us to England to visit the founders of Spitting Image Engineering, a

group of satiric puppeteers who create animated replicas of celebrities and nobility. He examines the entrails of MIT and the Silicon Valley in a constant quest for the truth of simulation.

Rheingold’s odyssey proves to have been important to the field. He underscores the fact that VR is a result of cultural convergence by noting his role in gathering and dispersing information: “I began to feel like an informational honeybee, bearing select pollen grains of knowledge in my briefcase during my pilgrimages from one laboratory to another in search of VR experiences. The Japanese had been interested in what I knew about American research . . . the Dutch wanted to know about the Japanese. . . . These people simply did not yet know about one another. I carried a few reprints away from each laboratory I visited, and let the people at the next lab make copies of the reprints I brought along with me.”

Traveling in Japan, wearing paisley

Will virtual sex be a liberating experience or a night in CyberIdaho?

shorts, a T-shirt, and a glittering baseball cap, the author becomes a self-styled Johnny Realityseed. His exuberance is infectious, although one can almost hear the whispers of his fellow passengers on the bullet train.

Unfortunately the book lacks illustrations. Sometimes a text just does not communicate as well as images. Rheingold must understand this to have written so eloquently of computer graphic engineering. Proper illustrations at critical points could help strengthen his arguments if only to validate the text. The reader has no idea of how convincing these virtual environments are, or any sense of their limitations.

Rheingold appears to have covered every angle on the possibilities of VR. While admirable in scope, the journalistic slant

does not allow him enough distance to review the situation in the larger cultural arena. His history of artificial reality barely touches on the fictional spaces created in more conventional art forms. Benjamin Woolley’s book, *Virtual Worlds*, better handles the deep cultural issues underlying VR.

The subtitle of Woolley’s book, *A Journey in Hype and Hyperreality*, sets the tone for the author’s skeptical review of the cyberspace phenomenon. The book discusses VR as being the latest form of fiction in a culture inundated with virtual truths. It is the antithesis of the high-voltage enthusiasm of hacker-cult literature from the West Coast. While such skepticism may be warranted, Woolley’s tone sometimes has a finger-wagging quality that undermines his arguments. His book is, nonetheless, a virtual reality-check, and should be required reading for anyone interested in the cultural role of technology.

Virtual Worlds is a collection of related essays, each dealing with fictions, or “virtual worlds,” that compose what we call reality. The book is a tour of recent scientific developments ranging from artificial intelligence to chaos theory and deconstruction. This provides the cultural backdrop for the author’s inquiries into cyberspace.

Throughout the book, Woolley argues that virtual reality should be developed as a simulation and not an imitation of reality. Mimicry is unreliable. The model upon which we base the imitation may be misleading, perhaps dangerous. John Walker’s “Through the Looking Glass” memorandum makes just this point regarding AI. The researcher Fredrick Brooks maintains that as computer models become more realistic, they have a greater chance of being misleading. Both Woolley and Rheingold warn us that the danger of imitation is that every model is an abstraction. “No model can be as complex as the phenomenon it models, no map can ever be as detailed as the territory it describes,” and more importantly, as semanticist Alfred Korzybski noted, “the map is not territory.”

Woolley’s use of the term “simulation,”

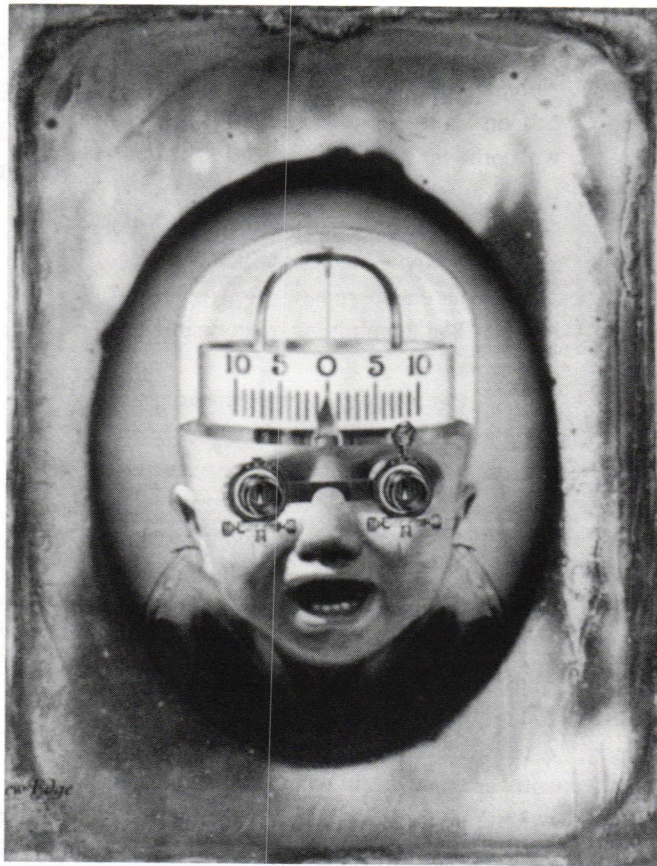
however, remains elusive. To mimic effects, such as the noise and vibration of an aircraft, is to catch only a fraction of the experience of flight. A skillful imitation may offer you a distant terrain through your window, may even make you motion sick. However, Woolley argues, the gestalt of the experience is more than an assemblage of special effects. Some quintessence separates the actual experience from its likeness. He claims that unlike imitation, true simulation would create conviction.

Since the book is a collection of related essays, this theme is never developed in a linear fashion. Instead it crops up in various sections in different lights. While in one chapter the author admits that "the distinction between simulation and imitation is a difficult and not altogether a clear one," in another chapter entitled "Hyperreality" he suggests that imitation is a possible attribute of simulation.

While imitation relies upon a model, simulation may, in fact, be without reference at all. It becomes an autonomous "fact." The author quotes Jean Baudrillard: "Simulation is no longer that of a territory, a referential being or a substance. It is the generation by models of a real without origin or reality: a hyperreality." Simulation is both the absence of presence and the presence of absence.

This disembodied concept of simulation establishes VR as a postmodern phenomenon. "Artificial reality is the authentic postmodern condition, and virtual reality its definitive technological expression," Woolley writes. By his argument we can place virtual reality somewhere between the imitation of something and the imitation of nothing. This is the half-lit world of replication and lost souls, characterized by absence. It is the void around which the images and arguments circle.

Cyberspace: First Steps, edited by Michael Benedikt, approaches VR from a



"Ultimately, the New Edge is an attempt to evolve a new species of human being through a marriage of humans and technology." (From *Mondo 2000*.)

philosophical standpoint. The essays in *Cyberspace* are largely taken from the First Conference on Cyberspace held in Austin, Texas, in May 1990. Most have been expanded in order to develop their themes. This book approaches many of the issues of virtual reality as though the technology were already in place. While other books also imply that something approaching Gibson's Matrix is presently operating, *Cyberspace* goes so far as to actually illustrate what life inside the Matrix would be like.

The subjects of the various essays range from questions of protocol of the virtual workplace to the place of eros within cyberspace. Although the writing is sometimes opaque, certain essays stand out for their clarity. "Will the Real Body Please Stand Up?: Boundary Stories about Virtual Cultures" by Allucquere Rosanne Stone is refreshing. One of the book's more personal

essays, it discusses user representation within an electronic environment. This is a discussion of ethics within a symbolic society. Stone enlivens the subject by providing anecdotal illustrations taken from today's world of computer networking. In the course of the essay she describes several virtually real social spaces ranging from text to Roosevelt's fireside chats to the promise of the Matrix.

Marcos Novak's essay, "Liquid Architectures in Cyberspace," envisions a new, unbound architecture of the imagination. Interspersed with paragraphs written as though the writer were actually immersed in a virtual environment, the essay describes the strategies of orientation within this field. His illustrations are beguiling visions of an ever-changing hallucination with gritty clusters of information that change shape according to their content.

Benedikt, the book's editor, weighs in with an informative essay on the architecture of cyberspace. Readers familiar with his book *The Kimball Museum Deconstructed* will be reacquainted with his characteristic thoroughness on a new subject.

His article is written in two parts. The first is an elaborate discussion of the various principles underlying the architecture of a virtual environment. The second part, much more speculative and engaging, projects images of architectures of virtual reality provided by Benedikt's students at the Austin campus of the University of Texas. This and Novak's essays are high points of the book: few authors on this subject are willing to visualize and present images to illustrate the architectural principles of the Matrix. This fact alone makes the book an important contribution to the field.

Like *Cyberspace*, *Mondo 2000: A User's Guide to the New Edge* is a collection of essays, but the similarity stops there. While *Cyberspace* proceeds in its measured pace,

Mondo careens. *Mondo 2000* is a hacker-cult fanzine published in Berkeley, California. Not strictly limited to VR or computers, it sports articles which in any way support a high-technology counterculture.

In popular literature, this may be as close as most of us will get to cyberpunk journalism. But don't let "punk" mislead you. This book has excellent graphics and illustrations for its articles. The typesetting principle seems to be "If you've got a font, use it!" While this makes for lively formatting and borderline legibility, the delirious enthusiasm of the text somewhat justifies the license. The book is boisterous, irritating, and funny. *Mondo* plays the role of counterculture guide with vigor, despite its tongue-in-*chic* ironies. Serious articles on nanotechnology, virtual reality, and artificial life are edited by people named Queen Mu and R. U. Sirius.

Mondo 2000 has its roots in the computer/populist strategies of people such as Ted Nelson in the early 1970s, and reflects values of the high-tech counterculture of the Bay Area. The intent of Nelson's cyber-politik is slightly subverted by the cliquish sense of this book. Many of the articles have a bit of the nudging and winking that make you feel that you are crashing a party.

The book covers a wide range of issues current with the West Coast underground. Chapters in the table of contents read like an alphabetized shopping list of subjects, starting with "Aphrodisiacs" and ending with "Zines." Among the topics they cover are VR/AI technologies, deconstruction theory, postindustrial culture, mind-expanding health foods and drugs. The chapters include interviews with techno/cultural luminaries like Brian Eno, William Gibson, and Ted Nelson himself.

Mondo 2000 is also innovative in its format and the construction of its articles. In both cases it draws heavily on the way in which computers are used and information is organized. Many articles are composites that have been edited together. They are presented as a text collage of credited components arranged in chunks. In this way many related items that may have previously existed in separate articles are brought together for review.

The articles are also heavily annotated. The left side of most pages contain the text, while the right side is reserved for color-coded paragraphs elaborating on the text with definitions and helpful asides. This allows readers conversant with the information to take the fast lane, while those who want background have it at hand. This format also facilitates grazing through the material without committing to any particular subject.

The cutting and pasting of material has its pitfalls, though. A case of autoplagerism occurs when a paragraph on page 112 shows up almost word for word on page 127. This is a new form of typo made possible by letting a machine do the thinking. AI isn't always smart.

An appendix called "The Shopping Mall" contains an alphabetized "Source of Materials for the Gourmand of Experience." This is an entertaining list of books, software, and films which play a role in cyberpunk culture, like MTV meets the *Whole Earth Catalog*. This catalog reaches like a spider's web out to other catalogs and references, and is a useful resource for the inquiring cybercultist.

What the future will bring is academic. The real question is what the *present* will bring. Cyberculture already exists. It's in the blending of information and communication technologies and in darkened rooms with glowing screens. The phenomenon is in its infancy, but the wide range of interest VR has created indicates that it will continue to grow. We may be in for surprises. As William Gibson cannily observed, "the street finds its own uses for things—uses the manufacturers never imagined."

VIRTUAL REALITY, Howard Rheingold, Touchstone Books, 1991, 415 pp., \$12.00.

VIRTUAL WORLDS: A JOURNEY IN HYPE AND HYPERREALITY, Benjamin Woolley, Blackwell Publishers, 1992, 274 pp., \$19.95.

CYBERSPACE: FIRST STEPS, Michael Benedikt, editor, MIT Press, 1991, 436 pp., illus., \$24.95.

MONDO 2000: A USER'S GUIDE TO THE NEW EDGE, Rudy Rucker, R. U. Sirius, and Queen Mu, editors, HarperCollins, 1992, 317 pp., illus., \$20.00.

MARCOS NOVAK

Automated Writing, Automatic Writing: The Poetics of Cyberspace

Here is the great secret: *The thought is made in the mouth.*

—Tristan Tzara, "Manifesto on Feeble Love and Bitter Love," in Robert Motherwell's *The Dada Painters and Poets*, 1951

I am the sea of permutation, I live beyond interpretation,

I scramble all the names and the combinations, penetrate the walls of explanations,

I am the will, I am the burning, and I will lay my love around you.

—Brian Eno, "Lay My Love" from *Wrong Way Up* (Opal Records), 1990

Art, as I see it, is essentially a question of the production of machines that yield sensations, or of machines that generate compositions. There's a question of percepts torn loose from perception, or of affects stripped free of sentiment, or of sensations extrapolated from common opinion, just as philosophy consists of the creation of concepts that lie at the crossroads of life's possibilities and mental possibilities.

—Interview with Felix Guattari, "The Aesthetic Paradigm and the Responsibility to Create," *FlashArt* (vol. 25, no. 165), Summer 1992

Technological, scientific, and conceptual advances are changing our conception of the appropriate preparation of the future architect, designer and artist. Among varieties of academic, scientific, professional, and artistic preparation, current modes of design education and practice are perhaps the most antiquated, modeled as they are on centuries-old concepts and working methods, and based on premises that are no longer true. While most disciplines are becoming information intensive, design education and practice are still labor intensive, and thus place designers at a severe disadvantage.

Additionally, other, more general prob-

lems compound the first: everywhere, it seems, boundaries are erased: philosophically, artistically, scientifically, socially, economically, all that was once clearly defined is no longer so. It is not simply that "all that is solid melts into air"; it is that a belief in the "solid" no longer exists. Either new categories are in the making, or, more radically—and more accurately, I believe—we are witnessing the end of categorical thinking (see, for example, *A Thousand Plateaus* by Felix Guattari and Gilles Deleuze).

In spite of this, computers still require precise and stable definitions of objects and processes, while the emerging worldview is that all definitions are, at best, definitions of convenience and convention, contingent on whim or circumstance. This creates a fascinating problem: how to reconcile the precise formalization that computers require with the will to transgress boundaries that characterize both our times and our disciplines. Solving this problem is by no means a narrowly construed technological problem; it is, rather, a deep challenge into the very heart of what it is to be human, because the questions raised are central to humanity's main activity: *making*.

With this in mind, in the discussion that follows, I will substitute the term "maker" for designer, architect, artist, performer, composer, and so on, and the term "trace" for the artifact produced by a maker. "Trace" can include objects, images, texts, sounds, events, performances, behaviors, and any combination of these that are appropriate to the purposes of the maker. The meaning of the term "tracemaking" follows directly from trace. Tracemaking, making, and writing are used interchangeably. Expanding the issues in this way allows us to examine current advances across many scientific and artistic disciplines.

Two questions arise: First, how can automation help the activity of making become more information intensive? Second, what information is intrinsic to making, and therefore forever beyond the reach of automation? Arch-

ing over both these questions is the larger concern about how to provide tools based on systematic and methodical approaches to disciplines whose essence is fluidity, agility, and the search for boundaries for the primary purpose of extending them.

I adapt from musicologist and semiotician Jean-Jacques Nattiez, author of *Music and Discourse: Toward a Semiology of Music*, the notion of the "semiological tripartition" of the "total musical fact" to the broader question of the total architectural and artistic fact. The semiological tripartition of the fact of making involves three levels: a *poietic process*, a *trace*, and an *esthesis process*. (*Poietic* and *esthesis* are obviously similar to "poetic" and "aesthetic"; Nattiez chooses to use the former because they are closer to the original Greek and relatively free of distracting associations.) Briefly, as mentioned above, the trace is the actual manifestation of a work; poietic processes correspond to the manners by which traces are generated, and esthetic processes correspond to the manners by which traces are perceived, all interactions occurring within a complete cultural reality. Disengaging these components in this way allows us to study each in relative independence: we can inquire into the technologies of poetics independent of particular material manifestations, and without the distractions of explicating meaning; we can inquire into the properties immanent in the trace, independent of both the maker's intentions and viewer's interpretations; and, when we

finally come to interpretation, we can study how meanings are projected upon traces with a logic that is largely independent of intention, process, or material manifestation.

The two questions raised—namely, how can automation benefit *making*, and, conversely, what aspects of *making* intrinsically evade automation—can therefore be asked from several viewpoints: that of the maker, of the trace made, of the perceiver, of the context within which the trace has been inserted. Given that each viewpoint can be examined from two opposing directions, slightly different questions and their attendant answers arise. From the maker's point of view, one must ask not only about the new generative possibilities that computation offers, but also about what manners of production need to be maintained regardless of the sophistication of newly available technological support. Considering the trace, one must inquire not just how designed artifacts can be made to contain more information (that is, what are the properties inherent in the trace, and how can a computational understanding help us produce better traces), but also, what kinds of information does a computational understanding tend to obscure. From the viewpoint of the perceiver, one must ask not simply what are the information requirements and limitations of perception and cognition, and how can computational considerations provide better information to our perceptual and cognitive capacities, but also how do these very computational considerations interfere with what

is being studied. Finally, examining the context, beyond merely questioning the codes and semiotic mechanisms used to create sense and value from the interactions between maker, trace, and perceiver, or how technology can improve our understanding of the alterations undergone by trace, making, and interpretation, as contexts change, one must also ask how technological augmentation itself constitutes a change of context, code, and mechanism.

From such an outlook, two avenues of investigation become apparent, each leading to different results. On



The Architecture of Noise. Scene from a multimedia event designed and performed using found processes; Marcos Novak, 1992.

the one hand, we can search for means for enhancing *making* that require only strategic input from the maker, and involve the use of generative processes, effecting a transposition from the role of performer to that of composer; on the other hand, we can seek to recognize those aspects of *making* that resist formalization, and contain fine distinctions of quality, materiality, mystery, resonance, evocativeness, wonder, and are judged by intuitive and holistic means.

We may term the first approach “automated writing,” and the other “automatic writing,” in direct reference to artistic experiments of the early 20th century. While most “automated writing” is directly related to the concerns of industry and production, it also pertains to an artistic tradition found in the work of the De Stijl and the Constructivists. “Automated writing” refers to writing that employs rule systems validated by reference to some conventional or “moral” understanding of constraint structures, narrow or “appropriate” pragmatics, and a utilitarian or “utopian” teleology. Making is seen as a means to an end. There are clear determinations of end conditions, and often, innumerable possible combinations.

Juxtaposed with the will to clarity, correctness, and completeness implied in automated writing are the surrealist investigations of automatic writing, and their Dada precursors, wherein processes are put into motion with the explicit intention of producing artifacts that circumvent the preconceptions of the maker. The criteria for the success of these objects is a finely honed, human qualitative assessment of poetic meaningfulness, and not an evaluation of their fit to a set of criteria established a priori. Automatic writing refers to writing that bypasses conscious choice, and with it, conventional limitations to thought, often through the employment of a found or invented process that appears to be irrelevant to the task at hand. No teleology is stated, with the only exception being, perhaps, the production of wonder. Making is seen as an end unto itself, and the oxymoron (which



SoundCluster4. Temporal/temporary fragment of algorithmic music as cyberspace architecture: sound becomes algorithm, algorithm becomes sound, sound becomes form, form becomes space, space becomes world; Marcos Novak, 1993.

automated writing rejects as unacceptable error) is embraced as a fertile provocation to new thought. Because this system of writing is heterogeneous and open, there is no way to determine the number of possible combinations, or to anticipate the nature of the finished artifact.

Of the branches of modernism that emerged at the outset of the century, the one that became predominant, the modernism of the Bauhaus, was more an end than a beginning in that it summarized the industrial revolution but did not propose anything really new. Other branches of modernism were much more active in reevaluating the substance of the changes that the world was witnessing. Foremost among these were the Dada and surrealist movements. Their work is relevant to our present situation in that it foresees both the challenges to fixed meanings that current philosophy and criticism study, and the need and promise of generative “games” whose function is to bypass preconceptions and allow access to a wider range of possibilities, all the while relying on a trust of the powers of the complete human being, both rational and intuitive. Equally important is their refusal to be lulled to comfort by dreams of utopia, insisting instead on the virtues of spontaneous action taken in the living present, with a prescience that anticipates poststructuralist concerns.

It is difficult, at first, to imagine how to permit such freedom in technologically advanced making. Among the projects of the

Dadaists and the surrealists were the mysterious, beautiful “object-poems,” assemblages of found objects in unlikely but powerful juxtapositions. Such assemblages resist even the most sophisticated design tools and theories available today in that they cannot be incorporated into any fixed set of objects, orders, or operations. In the making of object-poems any combination and operation is permitted, and any aspect of reality can be brought into the composition at any time. To extend the notion of the object-poem into the present is but a short step: we

can readily substitute “found process” for “found object,” creating “process-poems,” or “algorithm-poems,” and bring the surrealist outlook to bear on the ways we use present technologies. Opportune tools already exist: nondesign-oriented applications, primarily in medical and scientific visualization, such as laser- and CAT-scan rendition, isosurface and volume visualization, and three-dimensional image processing. All these tools promise the possibility of sampling the real world of objects, processing the sampled data, combining such arrested forms with computed objects, understanding each step according to the semiological tripartition discussed above, and eventually even outputting them in three dimensions through advanced prototyping or manufacturing techniques such as selective laser sintering.

The problem with automatic writing is that it seems to be too easy to abuse. The surrealists themselves understood this, realizing that it is difficult to reach into the requisite depths of one’s psyche. And, even then, there is no guarantee that direct expression is free from preconceptions that bind. How, then, to maintain the freedom of automatic writing without falling into a trivial self-expression?

The Dadaists and surrealists are not the only sources we can examine. Many other groups have emerged since, and their insights have much to offer. Among them are the Lettrists, Situationists, Fluxus, and Oulipo, a group whose work I find particu-

larly relevant to the present discussion. Oulipo, whose name derives from *Ouvroir de Littérature Potentielle*, or Workshop of Potential Literature, counted among its members authors, mathematicians, computer scientists, and others, including Raymond Queneau, Italo Calvino, and Marcel Duchamp. In direct criticism of Surrealism and automatic writing, Queneau, one of the Oulipo's most important figures, states:

Another entirely false idea in fashion nowadays is the equivalence which is established between inspiration, exploration of the subconscious, and liberation; between chance, automatism, and freedom. Now the inspiration that consists in blind obedience to every impulse is in reality a sort of slavery. The classical playwright who writes his tragedy observing a certain number of familiar rules is freer than the poet who writes that which comes into his head and who is the slave of other rules of which he is ignorant.

—From *Le Voyage en Grèce* (Paris: Gallimard, 1973)

In *Oulipo: A Primer of Potential Literature*, edited by Warren F. Motte, Jacques Roubaud states in his essay, "Mathematics in the Method of Raymond Queneau" (under "proposition 13"): "The Oulipo's work is anti-chance." Quoting Queneau, Roubaud continues, "We are not concerned with . . . aleatory literature." He then explains that "the refusal of 'automatism' is thus for [Queneau] in no way a rejection of mechanical procedures, but only of those that are mechanical merely through ignorance. Moreover, to the extent that all literature (like language) is subject to automatism, he is irritated by the illusion of thinking that they may be avoided by simply deciding to act as if they did not exist: jamming, etc.; proposition 13 thus means the rejection of the mystical belief according to which freedom may be born from the random elimination of constraints."

What is "potential literature"? According to Queneau, "We call potential literature the search for new forms and structures which may be used by writers in any way they see

fit." François Le Lionnais, author of the group's First and Second Manifesto, makes it clear that this is not a structuralist project: "The overwhelming majority of Oulipian works thus far produced inscribe themselves in a SYNTACTIC structurElist perspective (I beg the reader not to confuse this word—created expressly for this Manifesto—with structurAlist, a term many of us consider with circumspection)."

By their own definition, in the words of Jean Lescure: "Oulipo: group which proposes to examine in what manner and by what means, given a scientific theory ultimately concerning language (therefore anthropology), one can introduce aesthetic pleasure (affectivity and fancy) therein."

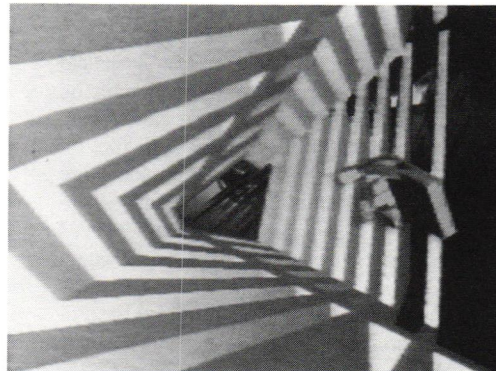
Much of Oulipo's work is concerned with systematic explorations of combinatorial structures, making this resemble automated writing. However, certain important features set this work apart from automated writing unequivocally. Clarity, generality, completeness, virtues in any system of automated writing, are subverted within the Oulipian exploration. For example, Italo Calvino proposes: "The assistance of the computer takes on an *anticombinatorial* character when, among a large number of possibilities, the computer selects those few realizations compatible with certain constraints." This, of course sounds terribly like a straightforward, conventional search through a problem space, and, on the surface, is not particularly interesting in any

kind of poetic sense. What is concealed, however, is the Oulipean willingness to invent structures that produce single works, a strange effort akin to producing an entire computer-aided design system for the sake of designing a single building, only to set the system aside in search of a new one at the next opportunity to design another building. Calvino then goes on to describe the use of computer programs in the writing of a hypothetical short story entitled "The Fire in the Cursed House." He lists objective, subjective, and aesthetic constraints that are interdependent in ways that are intransitive or mutually exclusive. Calvino concludes: "This clearly demonstrates, we believe, that the aid of the computer, far from *replacing* the creative act of the artist, permits the latter rather to liberate himself from the slavery of the combinatorial search, allowing him also the best chance of concentrating on his 'clinamen' which, alone, can make the text a true work of art."

Two important features of this outlook must be emphasized here: first, that the mechanism is not intended to provide general solutions, but rather to create a single exemplary text, and, second, that the provision for a Lucretian "clinamen" is built into the system from the outset, clarifying that what is at issue is not "truth" but richness. Other texts will then require other algorithms, and other clinamens. What is effected is a transposition in thinking, a concern with creation at the next, higher level, "found process," instead of "found object."

It is here that we can finally glimpse a reconciliation of these two outlooks, the automated and the automatic—a situation employing rigorous procedures, in which constraint "forces the system out of its routine functioning, thereby compelling it to reveal its hidden resources," in Marcel Bénabou's words, and yet maintains a place for the intervention of the maker or of chance.

If this is the Oulipo criticism of surrealism, what might the Dada criticism of Oulipo be? The beauty of Dada is in its insistence on total freedom at all



Dervish Chamber. View of a cyberspace chamber from the multimedia/virtual-world performance piece, "Dancing with the Virtual Dervish," a work in progress at the Banff Centre for the Arts, Banff, Canada; Marcos Novak.

times, the freedom to swerve like the “clinamen” being raised to a way of life. Jacques Roubaud quotes the French artist and painter Hans Arp:

Dada aimed to destroy the reasonable deceptions of man and recover the natural and unreasonable order. Dada wanted to replace the logical nonsense of the men of today by the illogically senseless. That is why we pounded with all our might on the big drum of Dada and trumpeted the praise of unreason . . . Dada denounced the infernal ruses of the official vocabulary of wisdom. Dada is for the senseless, which does not mean nonsense. Dada is senseless like nature. Dada is for infinite sense and definite means.

In *Buddhist Elements in Dada: A Comparison of Tristan Tzara and Takahashi Shinkichi, and their Fellow Poets* by Ko Won, Tristan Tzara’s own pronouncements show some of this fascinating tension: on the one hand he says, “Logic is a complication. Logic is always false. It draws the string of ideas, words, along their formal exterior, toward illusory extremes and centers. Its chains kill, like an enormous centipede stifling independence. Married to logic, art would live in incest, swallowing, devouring its own tail still attached, fornicating with itself and the personality would become a nightmare tarred with protestantism, a monument, a heap of heavy gray intestines.” On the other hand, Tzara claims that the works of Dada conceal a “constellation of necessary quality below the obvious surface.” Here, then, is the Holy Grail: the provision of the subtle necessity inherent in all artifice without enslavement by the logic of that very artifice—algorithm and clinamen. Why is this so important? Because it allows the full advantage of the algorithm without relegating judgment, discrimination, responsibility, wisdom; for here, as in the question of free will or determinism, the introduction of the possibility of a swerve *at any instant* is all that guarantees freedom.

What is all this leading to? Why stop at Oulipo, why dig up the dead Dada? Why not inquire into the work of the “language poets”? What about other sensory modes?



Worlds in Progress. View of a dematerialized architectural “atmosphere”; Marcos Novak, 1993.

The implications of *musique concrète*? And of course, one cannot proceed much farther along these lines without mentioning John Cage who, by intentionally pursuing non-intention by algorithmic means, captured both the spirit of these groups and the fertile contradictions that lurk within their cores. Clearly, this is just the beginning of a re-evaluation of precursors in the light of what we are making of *making* itself. For now, it will suffice to say that there is a renewed interest in these issues, as the insights that led to their development are encountered with increasing frequency. The language and imagery produced and consumed today, at the end of this century, creates pressures that makers resist. In *Radical Artifice: Writing Poetry in the Age of Media*, required reading for anyone interested in these topics, Marjorie Perloff writes:

Given the overproduction of such instrumental discourses in late-20th-century America, with its glut of junk mail, advertising brochures, beepers, bumper stickers, answering-machine messages, and especially its increasing video coercion (on cross-country flights, it is now customary to show the preview of the film-to-be-shown with the sound on in the entire cabin, and this is only the beginning!), poetry (at least in the industrially advanced countries, the situation in, say, Eastern Europe or Latin America being very different) is coming to see its role as the production of what we might call an alternate language system.

Automated or automatic writing? It would be too simple to embrace one and dismiss the other. As I envision it, at the poietic level,

automated writing will increasingly be concerned with what I call computational composition, and therefore closely related to investigations in dynamic systems, artificial life, and computer music. Automatic writing, on the other hand, is closer to sampling, digitizing, processing, and thus to the issues and techniques addressed by sound and image processing, electroacoustic music, and digital video. Together, these approaches promise to encompass the larger part of the ground between the totally synthetic and the totally found. Whether auto-

ated or automatic, however, any poetic approach to technology must heed the warnings of the creators of “alternate language systems,” and consider carefully the advice of the Situationists, to make sure to provide formalisms that can resist “recuperation into the spectacle.”¹

The need for better understanding of these issues—from the viewpoints of both automated and automatic writing—is heightened by the development of cyberspace and virtual realities. Cyberspace is a domain free of all the conventional constraints of the real world, a world where the only real limitations are cognitive and perceptual, a world waiting to be occupied by an architecture as yet unimagined, a world that will make attractors out of the many strange creators of our fading century: Dadaists, surrealists, proponents of Oulipo. Cyberspace is a vast new realm that can only be occupied with new tools. It is absurd to bring into this realm the limitations of the everyday world, the stifled propriety of corporate good taste, or the myopically localized concern for the plight of “the other.” What’s needed are tools for generating new architectures, in every sense that this word can be taken, based on definitions that are not fixed but variable, liquid, floating.

Perhaps at this point I should return to the semiological tripartition with which I began, and ascribe the primary focus of the various groups and approaches I’ve been discussing to one or another of its three tongues. Perhaps I should analyze how the particular flavor of each manifesto comes from a simple but distinct bias toward foresight or

spontaneity crossed against *poiesis*, trace, or interpretation. Perhaps I should set up a system and work out all the permutations to exhaustion, making each point clear and distinct myself. Perhaps I should enumerate advantages and shortcomings, executing my points with graphic "bullets." But preferring the swerve of the clinamen, the living butterfly to the one in the display case (the main difference being but a long, thin pin), I imagine Tzara, smiling:

Dialectic is an amusing machine which leads us in a banal manner to opinions we would have had anyway

As I write this inconclusion, a little icon the top right corner of my screen flashes: new e-mail. I stop writing for a moment to see what has arrived. A new issue of *Leonardo Electronic News*. The first article is "Cage Is Here" by Judy Malloy, a commemoration to John Cage on the event of his death. I chance upon the following: A diary entry of Cage's, from 1966: "Are we an audience for computer art? The answer isn't No; it's Yes. What we need is a computer that isn't labor-saving but which increases the work for us to do, that puns (this is McLuhan's idea) as well as Joyce, revealing bridges (this is Brown's idea) where we thought there weren't any, turns us (my idea) not 'on' but into artists."

NOTE

1. Margaret Crawford, "The Hacienda Must Be Built," *Design Book Review* 24 (Spring 1992): 38-42.

MUSIC AND DISCOURSE: TOWARD A SEMIOLOGY OF MUSIC, Jean-Jacques Nattiez, Princeton University Press, 1990, 272 pp., illus., \$50.00 (cloth); \$16.95 (paper).

OULIPO: A PRIMER OF POTENTIAL LITERATURE, edited and translated by Warren F. Motte, Jr., University of Nebraska Press, 1986, 209 pp., \$25.95 (cloth); \$9.95 (paper).

RADICAL ARTIFICE: WRITING POETRY IN THE AGE OF MEDIA, Marjorie Perloff, University of Chicago Press, 1991, 248 pp., illus., \$27.50.

JULIE DERCLE

On Science and Science Fiction: Two Views Toward the Future

Great science-fiction writers, like all masters of communication, gear their messages to the general public while even the greatest scientists tend to ignore us. As a result, whether design professionals admit it or not, the sci-fi community has probably had more impact on our worldview and, ultimately, the way we build than the scientific one—a view that becomes apparent upon reading two books on overlapping topics both published in 1991: Ray Bradbury's *Yestermorrow: Obvious Answers to Impossible Futures* and *Pictorial Communication in Real and Virtual Environments*, edited by Stephen R. Ellis.

My brother and I once agreed that as children no other story affected us more than Ray Bradbury's, "The Veldt" (*The Stories of Ray Bradbury*, 1980). To us, it was the ultimate science-fiction-tale-with-a-scary-twist, embodying what writer Richard Matheson once called "terror in everyday places," and the model we would later use to judge episodes of TV's "The Twilight Zone" in terms of originality. Bradbury's imagery permanently changed our way of seeing. In "The Veldt," he writes about a fantastic playroom built into the Hadley family's otherwise ordinary suburban home. Equipped with all sorts of extraordinary technological devices, the room could change into whatever environment the Hadley children desired, from the Land of Oz to the jungles of Africa. In essence, Bradbury invents the idea of a dream machine. Like stepping into a movie, it is a place that goes beyond the most elaborate virtual reality arcade game and actualizes the environments of our imagination—architecture that can transform itself into a new reality. Although the playroom provides endless possibilities for excitement and adventure, the Hadley children are obsessed with a dangerous African veldt that eventually becomes a trap for their unsus-

pecting parents. Place becomes a metaphor for pent-up human emotions.

In his preface to *Yestermorrow*, Bradbury admits that everything he does is a pursuit of metaphors. His fiction has taken his readers from nostalgic small-town America to the overcrowded inner cities of 2001 and the colonies on a not-too-distant future on Mars—all places that serve as metaphors for the way things could or ought to be, which he defines as the essence of science fiction, but could easily apply to design as well. Although best known for his novels, such as *The Martian Chronicles*, *Fahrenheit 451*, *Dandelion Wine*, and *Something Wicked This Way Comes*, Bradbury is a master of the short story. In *Yestermorrow*, a collection of twenty-four essays, written from 1953 to 1990 (almost half of which appeared previously in *Designers West*), he takes a slightly different turn. Sometimes anecdotal and highly opinionated, and not ordered chronologically or even thematically, each piece is linked to the whole by Bradbury's contagious zest for life (characterized by his childlike passion for toys) and his astute observation of human behavior. Bradbury, the self-confessed "idea man" who can toss out a "frivolous concept" and who thinks and writes in images, tackles the 20th century, looking for answers to our urban ills. What would the future be like if we followed the ideas of one of the most prolific and best-selling authors of our time, if we actualized the environments in his head?

Bradbury hints at the foundation for his concept of the future in the collection's title, *Yestermorrow*, and in the opening and closing poems. In "Fill Me With Wonder, You Architects," he points out his limitations as a theoretician and pleads with those who implement ideas to create environments filled with enough "twists and turns" and feasts for the senses to let us know the pleasures of discovery, of being lost, of being alive. "Of What is Past, or Passing, or To Come," a poem inspired by a line from W. B. Yeats, reminds us that we are uniquely situated at the end-point of history and that we carry with us into the future all the science fiction of the past. To emphasize

this point, Bradbury's "Grand Tour 2484" (the closing piece written in 1984 about the year 2484), tells of the Peregrine family, who live in outer space, and their vacation to other planets. They soon realize that when earthlings leave their home, they take their architectural past with them, building mini Empire State Buildings, pizza palaces, and French chateaux on the worlds they visit. "Space and the planets in it, light years apart," he writes, "will resemble the back lot of a motion picture studio, with its cross-pollinated structures and its ramshackle remembrance." The prediction that the universe will someday look like Universal Studios is not surprising from someone who moved to Los Angeles in the 1930s (by way of Waukegan, Illinois, his hometown) and has since called it home. In fact, throughout *Yestermorrow*, LA is a metaphor for the way Americans live.

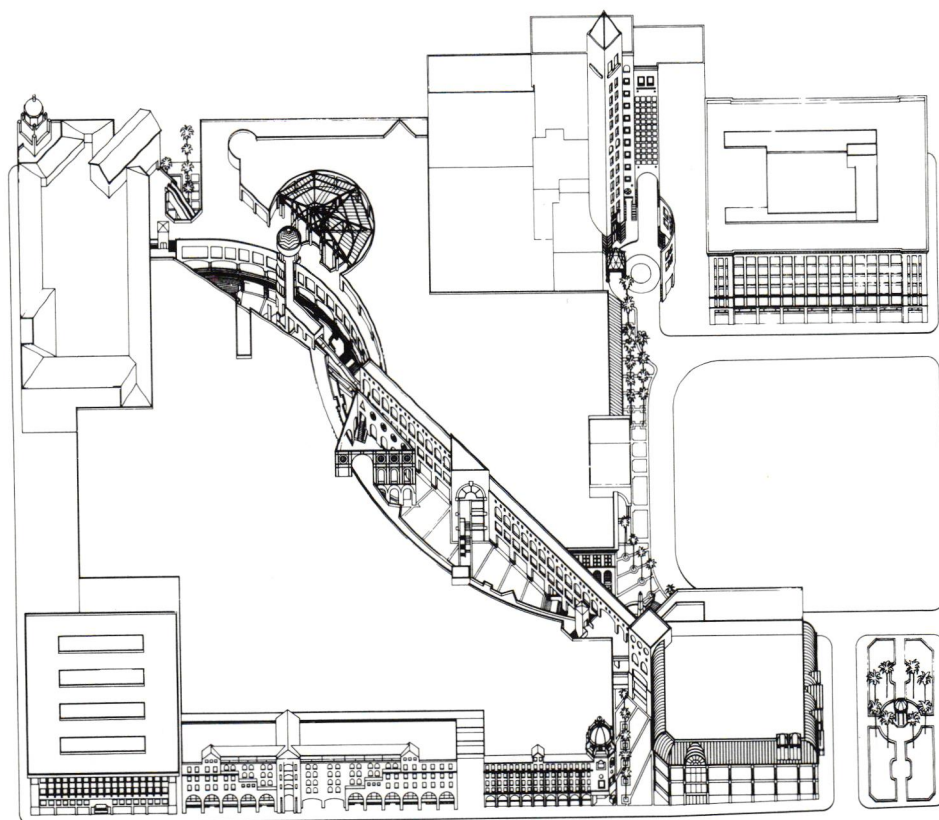
But Bradbury claims he is more interested in preventing the future than in predicting it. As a design theorist, he is in good

company. History is filled with flamboyant, forward-looking thinkers—from Plato to Piero della Francesca, Claude-Nicolas Ledoux, Le Corbusier, Buckminster Fuller, and Paolo Soleri, among others—who borrowed from the past in order to attempt to resolve present dilemmas, often casting their theories in terms of new places. Although he makes no pretenses at presenting a coherent treatise, Bradbury spins a dizzying array of ideas for improving today's cities, many based on two dominant themes of science fiction: unbridled scientific and technological discoveries, and a romantic interest in space and time travel. While the genre thrives on the dichotomy between utopia and dystopia, unlike the pessimistic possibilities typically generated, Bradbury's ideas capture his infectious optimism. Although embodying some of the current neotraditionalist thinking, most of his places are like giant toys designed to spark the imagination: a virtual reality theater; a Robot Museum of Time and Place where a visitor can chat with

Aristotle and Euripedes or step into a book (which encourages learning through an interactive, virtual reality device similar to the playroom in "The Veldt"); the ultimate hardware store designed for inveterate tinkerers; a university designed like a "five-shelled wagon train" where environments encircle each other; an enormous riverwalk that connects LA's ethnic neighborhoods; and, by far the most complex and exhilarating, a Great Electric Time Maze (conceived in 1990), a giant adventure world that includes a multisensory, dining-seeing train (where the scenery matches the cuisine), a roller-coaster through time (so we can get safely lost in the Middle Ages or Far Centauri), and a maze of shops from all ages and places (for timeless shopaholics). Beneath the technological frenzy, he calls for a global return to a childlike sense of wonder.

His most well-developed scheme, however, designed for the year 2001, is actually a battle plan "to save our skins, our social selves, the fun of living, to build instead of destroy, to survive rather than to be bored to death. To be once more the children of a wide-ranging, imaginative and vital culture, rather than the slaves of network television."

In "Beyond 1984: The People Machines, Optimism Is an Excuse To Behave Optimally" (written in 1982), Bradbury concocts in words a "People Machine," a Small Town, USA by a Frank Capra gone mad. The central idea for this new world seems to come from one of his most sensitive essays, "The Girls Walk This Way; The Boys Walk That Way," written in 1970. In it, Bradbury describes Los Angeles as eighty or ninety "separate lonely Ohio-Illinois-Kansas-style towns." What is missing in this micropolis is a sense of connection, places to gather and stare, which he believes is a universal pastime. As a remedy he calls for "a whole city block where we might meet as in the old days, and walk and shop and sit and talk and simply stare"—in other words, places that include a temporal element, filled with street theater and music, where "life begins at dusk." Bradbury reminds us "that drama and theater are not special and separate and private things in our lives. They are the true stuffs of living, the heart and soul of any



A consultant on the conceptual design for Horton Plaza, Bradbury called for a place twisting with imaginative lure and multilevels of mystery. Axonometric drawing of Horton Plaza, San Diego, California; Jon A. Jerde, 1985.

true city. It follows we must begin to provide architectural stages upon which our vast populations can act out their lives."

His People Machine is a blueprint for an architecturally based antidote for ailing city centers. The solution is typical of the science-fiction genre in which familiar environmental aspects are stretched, distorted, heightened, or distilled into caricature. In this case, he does not draw from the urban nightmare of George Orwell's *1984*, Anthony Burgess' *A Clockwork Orange*, or his own *Fahrenheit 451*. Instead, all the exaggeration is upbeat. Briefly, the heart of Bradbury's machine is the Town Plaza, bounded by the Longest Soda Fountain in the World facing a fantastic bookstore and a bike rink. Two opposing corners have great restaurants. Next to the bookstore is an old-fashioned dime store, a drug store, a record store, and a laser arcade with an Asking Room (another Hadley playroom clone, a virtual time and space travel machine). Main Street, which leads to the Town Plaza, is filled with shops and fast-food places (the kind found on sunny, seaside boardwalks). Elderly folks live above the stores so they can easily participate in the street life, and the whole is ideally located near a university to help make the place hum with possibilities. In the very center is a tower, called the Hearthing Place, where laser beams project different images onto a screen so that the downtown can be constantly renewed.

In essence, Bradbury's People Machine puts "people back into proper scale." Although filled with elaborate, mediated experiences (such as the Asking Room and Hearthing Place)—evidence of his sci-fi roots—it nonetheless hints at Jane Jacobs' anti-suburb, mixed-use philosophy, Donald Appleyard's quest for liveable streets, Christopher Alexander's search for timeless, environmental "patterns," and Gordon Cullen's definition of viable townscapes. As in Bradbury's analysis of the John Soane Museum in London (which he describes as "Ath-



Horton Plaza, San Diego, California; Jon A. Jerde, 1985.

ens-and-Rome, pretending to be London"), the People Machine becomes a metaphor for the "messy vitality," the complexity and contradiction that Robert Venturi wrote about, and a key to urban revitalization. It also embodies the ten architectural principles that Prince Charles calls for in *A View for Britain* (London: Doubleday, 1989) and the resultant community spirit. Bradbury's is the same hopeful "yestermorrow" image that has inspired present-day planners, most notably Andres Duany and Elizabeth Plater-Zyberk, to translate the imagery into a tangible higher quality of life.

There is a danger, however, in taking metaphors too literally. If one ignores the subtext, Bradbury's People Machine seems like just another—albeit fantastic—shopping mall, akin to the kind that has sprung up in dilapidated town centers and suburbs alike. While they are indeed gathering places, they are isolated islands nonetheless, agoras designed to promote consumerism and which

turn their backs to the streets and the social problems played out there. Despite its walking scale, carefree fun, and appeal to childhood energy, Bradbury's People Machine is geared toward a white, middle-class (largely male) world supposedly so numbed by electronic media it no longer values primary experience. His idea is to create a perpetual circus powerful enough to lure people away from their TV sets, and everything that ails them will dissolve. Similarly, in 1915, the poet Vachel Lindsay, an early motion-picture theorist, envisioned his utopia in the form of an American city as a permanent World's Fair. Walt Disney actualized that idea. However, Bradbury's idea goes one step beyond. His People Machine is a supra-Disney World—one with a social instead of commercial mission, a place with no admission charge (ultimately democratic), and that stays open all night. In reality, it is a naive yet good-hearted resolution to a complex problem that requires more than a quick fix with two-by-fours, painted flats, and a host of balloons. A carnival is no long-lasting

panacea for poverty and other symptoms of overpopulation and a skewed distribution of wealth. A sense of community and commitment, of connection between people, cannot be slapped on to places like movie-set facades; nor can they be designed into an instant amusement park erected in some vacant field. These only serve to mask reality, or help us to escape it. Community requires, instead, the development of such intangibles as civic participation, pride of place and ownership, and a sense of well-being dependent on the feeling of security and control over one's destiny, which includes satisfying work as well as play. It is the spirit of the great European cities of Paris, Rome, and London, that serve as Bradbury's models. Yet, these all have the patina of time, of incremental growth, replete with growing pains—the very process of life—which imaginary cities and those sprung whole do not have.

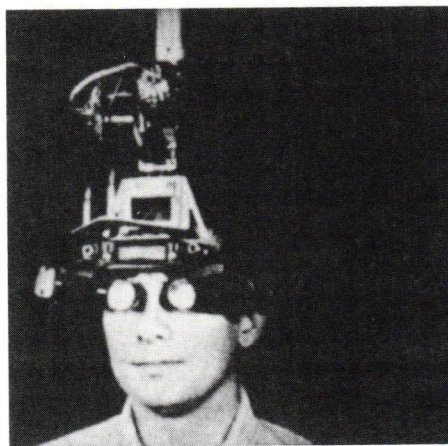
A life-promoting city is impossible to de-

sign using architecture alone. In a later essay, "Art and Science Fiction" (written in 1987), Bradbury defends science-fiction illustration as "the architecture of our dreams," maintaining that the world today is a direct result of science-fiction artwork and the imaginary places in sci-fi films and comic strips. According to Bradbury, we went to see such films as *Metropolis*, *Things to Come*, and *Star Wars* to see their cities. We need only to look at modern architecture to understand the results of that imagery. However, imaginary cities are characteristically incomplete, constructed of bits and pieces of views and visions. If by some miracle or miraculous technology we were left in the midst of Fritz Lang's *Metropolis*, for example, we would not be able to make our way down to the underground world of its workers from the information Lang provides. Similarly, Bradbury's People Machine is an incomplete world. We would expect from Bradbury—a vociferous supporter of public libraries—to provide one that would make the Library of Congress pale in comparison. There is a great town plaza, but where is the Town Hall and the soap box platforms to promote an exchange of ideas and empower a government that truly abolishes all forms of tyranny? Where are the homes of all those happy inhabitants? Where are their workplaces—the farms, factories, and offices? Where are the schools, playgrounds, and baseball diamonds? Where are the centers for spiritual renewal? And, perhaps even more importantly, where are the meadows, forests, streams, and clear skies unscathed by human hands and motivations? Where is the quiet of nature that sets the imagination free to contemplate the connection of all living things in a powerful universe?

Although Bradbury criticizes mediated experience, he has not been able to escape its force and has even contributed to its development (he has written screenplays, radio shows, and his own television show, "The Ray Bradbury Theatre," for HBO in the late 1980s). He has also helped transform his own incomplete visions into simulated worlds. He was the idea consultant

and wrote the basic scenario for the United States Pavilion at the 1964 World's Fair and originated concepts such as "Spaceship Earth" at EPCOT, and Disney World for WED's Imagineers (the design arm of the Disney organization). Through his association with Disney, he helped conceive the Orbitron at EuroDisneyland. (An elaborate, twirling amusement-park ride, it lets visitors pilot their own ships amid an animated galaxy and serves as a kinetic sculpture and icon soaring high above Discoveryland, the Magic Kingdom's realm of the future.)

Perhaps more than any other essay in *Yestermorrow*, "The Aesthetics of Lostness" is the most revealing about Bradbury's role in creating the future. Written in 1988, it is meant to be a conceptual design for San Diego's Horton Plaza. A six-and-a-half block, eleven-and-a-half acre downtown site, the multilevel maze includes 900,000 square feet of retail space (four large department stores and 150 specialty shops), a seven-screen cinema, a 500-seat performing arts theater, a 450-room hotel, and parking for 2,400 cars. It was designed by the Jerde Partnership, the firm responsible for the look of the 1984 Los Angeles Olympics as well as such LA-area malls as the Glendale Galleria, the Westside Pavilion, and the proposed City Walk development at Universal Studios. Since the



Probably the first computer-driven, head-mounted viewing device, designed to give the viewer the illusion of being in a computer-generated, synthetic world; Ivan Sutherland, 1970. (From *Pictorial Communication in Virtual and Real Environments*.)

1980s, Bradbury has served as a creative consultant to the firm. (Appropriately, the architect Jon A. Jerde wrote the afterword to *Yestermorrow*, commenting on his relationship with the writer.) In his essay, Bradbury promotes the concept of being "safely lost" and calls for infusing the mall with a twisting, turning, imaginative lure, with multilevels of mystery, with a delicious disarray of spaces that whet our sense of wonder. Jerde translated that spirit into a fanciful, gently S-curving, open-air pedestrian thoroughfare that cuts diagonally through downtown San Diego's grid of streets and is meant to encourage loafing. In contrast to the staid, surrounding office towers, the Plaza's architectural style, described as "postmodernism gone amok" by an *Architectural Record* critic, is a pastel-colored, confusing confection that pokes fun at and playfully mixes and matches such historicist elements as the Bolognese arcade with the New Mexican pueblo. There is something quite disconcerting, however, about encountering Jerde's Robinson's department store, a reworking of Palladio's Basilica in Vicenza. The experience is similar to coming upon LA's monolithic Beverly Center, another shopping mall, which vaguely resembles the Centre Georges Pompidou with its snaking, glass-tubed exterior elevator. It is as if we have landed on a new planet—like the Peregrine family Bradbury writes about—only to realize that the future, now present, is as insubstantial as a studio backlot and somehow, in all the drunken gaiety and frenzy to spend our time and money, we have lost all interest in metaphors.

In contrast to Bradbury's provocative, visual thinking in *Yestermorrow*, the book *Pictorial Communication in Virtual and Real Environments* seems brutally cerebral. The book is composed of thirty-nine chapters that originally appeared as proofs in the proceedings of the NASA-UC Berkeley conference on Spatial Displays and Spatial Instruments (held from August 31 to September 3, 1987). These proofs were subsequently organized by editor Stephen R. Ellis of the Aerospace Human Factors Division

at the NASA Ames Research Center, along with two other scientists, Mary K. Kaiser and Arthur C. Grunwald.

In the foreword, Jan Koenderink casually wishes the reader a good time. Most of us would expect from the book's title a collection of elaborate computer animation images like those from such films as *Tron* or *The Lawnmower Man*—or an allusion or two to virtual reality arcade games that enable us to fly through hyperspace. However, this book—which is geared toward the scientific community—contains nothing playful. Although highly informative, it is a very sober look at the way the human operator of computer-controlled systems *sees*, a sourcebook of theories, demonstrations, and applications drawing from such diverse disciplines as physics, cartography, optometry, psychology, and aerospace engineering. It is not an attempt to predict or prevent the future but merely to describe it as factually as possible.

Basically, human beings are regarded in the context of *Pictorial Communication* as spacecrafts. They orient, home, navigate, maneuver, and are optically guided in an environment according to fairly predictable means. The environments discussed and planned are often exotic and alien, such as computer-generated display fields, cyberspace, extraterrestrial space, or teleoperations that require remote sensing devices and telepresence dependent on slave robots. Although human “recalibration” of the senses may be required for novel technologies, the underlying slant—which can be expected from an organization dedicated to human factors research—is that, in order for machines to be used more efficiently, they must be tailored to fit humans and not the inverse. A practical application of this notion is the desktop metaphor used in computers' graphic user interfaces, such as the Macintosh and Microsoft Windows environments.

All this sounds like material ripe for a Bradbury tale. However, the authors of these papers are not concerned with the realm of possibilities, the intellectual assumptions at the core of their studies, or the



The evolution of land-surface form mapping; the chapter “Cartography and Map Display” discusses the problems of conveying the three-dimensional world in the two-dimensional map plane. (From *Pictorial Communication in Virtual and Real Environments*.)

“what-if’s” of futuristic fantasy. There is no attempt to design a playroom of the sort Bradbury writes about, although Ellis and Grunwald plan for a future when a “dense spacecraft traffic environment,” including permanently staffed space stations orbiting the Earth, will justify the development of their “pictorial orbital maneuvers planning system.” Furthermore, scientifically detached as they are, none of the researchers consider the moral or social implications of their work. For example, no thought is given to the destructive potential of remote

warfare devices or virtual cockpits (the fiercely competitive arena of developing military and civilian aviation systems funds much of the research), or the effects of the increase in robotics on labor-intensive economies, or, for that matter, how the influx of mediated experiences replacing firsthand ones (as a result of all the elaborate technology) affects human vision. The “big” question never even gets whispered: if we can perfect virtual-images and create synthetic universes, why explore, discover, or develop the real ones?

Instead, the organizing premise of this collection is that an understanding of human perception and conception of images is required in order to transfer information and communicate using pictorial means. To accomplish this, however, scientific methodology is rigorously applied and the inquiries are organized into four logical groupings. Part one, "Environment," the theater of human activity, is considered from the perspective of its content, geometry, and dynamics; part two, "Knowing," looks at how our knowledge filters what we see, while part three, "Acting," deals with updating our knowledge as a consequence of interaction with the environment. Part four, "Seeing," looks at providing the basic data with which we construct our image of the environment.

The book begins with its most compelling and readable chapter. Dr. Joseph P. Allen's "Physics at the Edge of the Earth" is a firsthand account of his experience in the frictionless void of outer space. Allen, a physicist and former astronaut, describes a mission to retrieve a wayward satellite using a Manned Maneuvering Unit (MMU). The MMU, which is basically a jet-propelled chair, is akin to a ship's dory which permits the astronaut to wander a limited distance from the spacecraft, outside in the silent void. Allen relates his physical sensations as well as his revelation about the laws of physics as his sensory-motor system adjusts to the alien environment.

Most of the following chapters describe controlled experiments, which provide mathematical models in support of hypotheses such as motion information is fundamental to everyday perception, memory distortions are biased toward symmetry, "cinerama" sickness (motion sickness without physical movement) results from sensory conflict, and so on. For the non-specialist, British psychologist Richard L. Gregory's piece, entitled "Seeing by Exploring," is a highly readable and eloquent argument for hands-on experience and the learning-by-doing method promoted by such institutions as San Francisco's Exploratorium. Chapter five, "Cartography and Map Displays," provides an excellent

overview of the problems cartographers have encountered in transforming a spherical Earth to a two-dimensional map plane. "The Making of 'The Mechanical Universe,'" a two-semester, television-based introductory physics course, provides insight into translating abstract concepts into 3-D images that can be relevant to a wide array of graphic communication applications. The chapter on medical arts discusses the evolution of the field from early two-dimensional medical illustration to the interactive electronic textbook that teaches histology to patient simulators now used for training medical personnel (in order to reduce discomfort and risk of infection in real patients) to high-tech anatomical imaging. The reading is at times fascinating. But given the price of this book, designers who seek a clearer understanding of pictorial communication would be better off with the complete works of Bradbury.

YESTERMORROW: OBVIOUS ANSWERS TO IMPOSSIBLE FUTURES, Ray Bradbury, Joshua Odell Editions, Capra Press, 1991, 240 pp., \$19.95.

PICTORIAL COMMUNICATION IN VIRTUAL AND REAL ENVIRONMENTS, Stephen R. Ellis, editor, with Mary K. Kaiser and Arthur J. Grunwald, Taylor & Francis, 1991, 594 pp., illus., \$91.00.

SYLVIA LAVIN

Reading the Unreadable

Although Victor Hugo asserted that the book had killed the building, it would seem that architecture has come back from the dead in the form of an issue of *Semiotext(e)* and is now hoping to avenge itself by killing the book. According to Hraztan Zeitlian, the issue's editor, "*Semiotext(e)/Architecture* is not a book, a fatal object." While it must be said that rumors of the death of the book have been greatly exaggerated, *Semiotext(e)/Architecture* may well be less a fatal object than a moribund book. In *Semiotext(e)/Architecture*'s fantasy of being an avenging angel, the death of the book is enacted by enveloping its contents in an illegible shroud of suffocating complexity. Illegibility, however, is not a dependable murder weapon since it refers not to an objective or constant value with legibility as a polar opposite, but rather to a standardized measure and historical convention. Architecture, for example, has not always been legible, which does not mean that architecture once was illegible, but only that architecture needed to be construed in very specific terms before its legibility could become conceivable. Moreover, the invention of the idea of a legible architecture made possible the notion of illegible architecture and the historical complicity of these terms renders both relatively harmless.

While illegibility may be the most legible feature of *Semiotext(e)/Architecture*, it seems less the point of the publication than a device used to suggest architecture's engagement with the convergence of contemporary critical theory and technology—theory is invoked to produce new forms of architectural legibility (and illegibility) and technology, particularly in the form of the computer, is mobilized to instantiate and disseminate those legibilities. Indeed, in recent years, while architecture has become increasingly concerned with its own potential to constitute a theoretical practice, and theory has become concerned with the implications of its own design, both have explored the impact of

By that I mean that his originary ethnological territories – body, clan, village, cult, corporation... are no longer



THE PHENOMENOLOGICAL APPROACH TO SPACE AND THE LIVED BODY MAKES APPEAR THEIR INSEPARABLE NATURE. FOR EXAMPLE, IN SLEEP AND DREAMS, THE FANTASMED BODY ENTERS INTO COINCIDENCE W/ THE DIFFERENT MODALITIES OF SPATIAL SEMIOTIZATION THAT I PUT INTO WORK.

nomadism. Young men ambulating along the sidewalk a walkman tucked to their ears, are looked on minutely that have been produced away, far away from their native lands. Native lands – what is this want to mean? Is it not the site where their ancestors lie, or where they were born and where they will have to die? They no longer have ancestors. They

landed here not knowing why and will likewise disappear. They have a few computerized numbers that belong to them and that home them into a predestined socio-professional trajectory, whether to be in the position of the well-fare recipient or the privileged. There is nothing to regret: the world moves in every which way, men and women cross the planet every which way, through intercrossed images and sounds, or directly through the displacement of their own person. But let us immediately pick up the para-

idea. Everything circulates: the types of music, the advertising slogans, the tourists, the computer viruses, the industrial subsidiaries and, at the same time, everything seems to freeze, to be stationery, as the differences fade between things, between human beings and facts. Everything has become interchangeable equipment within standardized spaces. The tourists, for example, travel virtually motionless, herded in the same types of airline cabins, pullmans, hotel rooms, and seeing only before their eyes landscapes that they already have encountered a

Space AND Corpority

To disengage ourselves from a false nomadism that in reality keeps us stagnant, in the void of a bloodless modernity, in order to accede the genuine errances/wanderings of desire, to the techno-scientific, urban, aesthetic and

a pleonasm insofar as the future of humanity seems to be inseparable from urban becoming. In fact, futurologists predict that in the decades to come, about 80% of the world population will live in urban agglomerations. In addi-

In fact, nature will be entitled to the same permanent care as the urban environment. The fate of one and the other being linked to the preservation of the human biosphere on which weigh very grave menaces. Geoclimatic modifica-

increasingly with the destiny of the whole of humanity on the planet.

Let us remark that this tendency of cities towards hegemonic power is not new! Since high antiquity great cities have exerted their power over the hinterland,

over barbarian

nations, and nomadic

ethnies for example,

within and beyond

the limits ("times") of

the Roman Empire.

However, during these

eras the distinctions

between the urban

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non-urban world

remained generally

very significant, often

related to religious

and political opposi-

tions. In his book *To*

live within Japanese space,

Augustin Berque fine-

ly illustrates the cultural tendency of tra-

ditional Japan to simultaneously sur-

round "the profound forest, from its illu-

sions" and from all overseas adventures

(2). But the times have certainly

changed. Japanese mountain climbers

have become great explorers of the

Himalaya and Japan's economic and cul-

tural influence is felt throughout

the planet.

Over the course of history one could not

WHEN CONSIDERED BY DISCIPLINES SUCH AS ARCHITECTURE AND MEDICINE, SPACE AND THE BODY ARE GRASPED ACCORDING TO DISTINCT AND AUTONOMOUS CATEGORIES. IT IS FROM A COMPLETELY OTHER POINT OF VIEW THAT I WISH TO PUT THEM IN RELATION: THAT OF THEIR AGENCEMENT OF UTTERANCE/ENUNCIATION.

THE PHENOMENOLOGICAL APPROACH TO SPACE AND THE LIVED BODY MAKES APPEAR THEIR INSEPARABLE NATURE. FOR EXAMPLE, IN SLEEP AND DREAMS, THE FANTASMED BODY ENTERS INTO COINCIDENCE W/ THE DIFFERENT MODALITIES OF SPATIAL SEMIOTIZATION THAT I PUT INTO WORK.

machinic deterritorialisations which, any way, make up the environment we live in. How to inflect the collective destiny in a less serial sense to employ a term dear to Jean-Paul Sartre? Everything will depend on the collective reterritorialization/rearranging of human activities and undoubtedly in the first instance on their built spaces. But what will the urban mentalities of the future be like? To ask the questions is already

THE BODY'S FOLDING UPON ITSELF ACCOMPANIES ITSELF BY AN UNFOLDING OF IMAGINARY SPACES. RIDING IN A CAR MY ASPIRATION FOR THE FRONTAL SPACE FORWARD CORRESPONDS TO A BRACKETING OF MY CORPOREAL SCHEMA, SETTING ASIDE SIGHT AND BODY PARTS THAT ARE POSITIONED IN CYBERNETIC SUBSERVENCE TO THE AUTOMOBILE MACHINE AND THE SIGNALISATION SYSTEMS EMITTED BY THE HIGHWAY ENVIRONMENT.

THE MOVIES, THE BODY IS RADICALLY ABSORBED BY THE FILMIC SPACE W/ A QUASI-HYPNOTIC RELATIONSHIP. DURING THE READING OF A WRITTEN TEXT, THE TRACES (TRACES) OF THE PHONEMATIC/PHONIC ARTICULATION DISCONTINUOUSLY LIBERATES ITS SIGNIFICATIVE SEQUENCES OF MOENEMATIC/MORPHEMIC ARTICULATION. HERE

STILL ANOTHER AGENCEMENT OF UTTERANCE/ENUNCIATION ENTAILS OTHER MODALITIES OF SPATIALIZATION AND CORPOREITY. THE SPACE OF WRITING IS W/OUT DOUBT ONE OF THE MOST MYSTERIOUS THAT OFFERS ITSELF TO US, AND THE BODY'S POSTURE, RESPIRATORY AND CARDIAC RHYTHMS, AND HUMORAL DISCHARGES INTERFERE GREATLY. AS MANY SPACES, THEN, AS THERE ARE MODES OF SEMIOTIZATION AND SUBJECTIVATION.

BUT WE MUST NOT CONTENT OURSELVES W/ THIS FIRST ASPECT OF DIACHRONIC DIVERSIFICATION. THERE ALSO EXISTS, EVERY INSTANT OF SIGHT, HERE AND NOW A SYNCHRONIC "FOLIATION" OF HETEROGENEOUS SPACES. TO PICK UP ON THE PRECEDING EXAMPLES, I CAN AT THE SAME TIME

in consequence to the increase of carbon dioxide in the atmosphere and the destruction of the stratospheric ozone layer will have a heating effect on the earth, or "greenhouse effect," which will cause the glaciers to melt and to flood numerous present coastlines. One may consider that in the future, a collective consciousness will have to emerge and take hold which will cause the urban mentalities to concern themselves

ly illustrates the cultural tendency of traditional Japan to simultaneously surround "the profound forest, from its illusions" and from all overseas adventures (2). But the times have certainly changed. Japanese mountain climbers have become great explorers of the Himalaya and Japan's economic and cultural influence is felt throughout the planet. Over the course of history one could not

This text by Felix Guattari is designed such that the reader must flip back and forth through it rather than read it from left to right. (From *Semiotext(e)/Architecture*.)

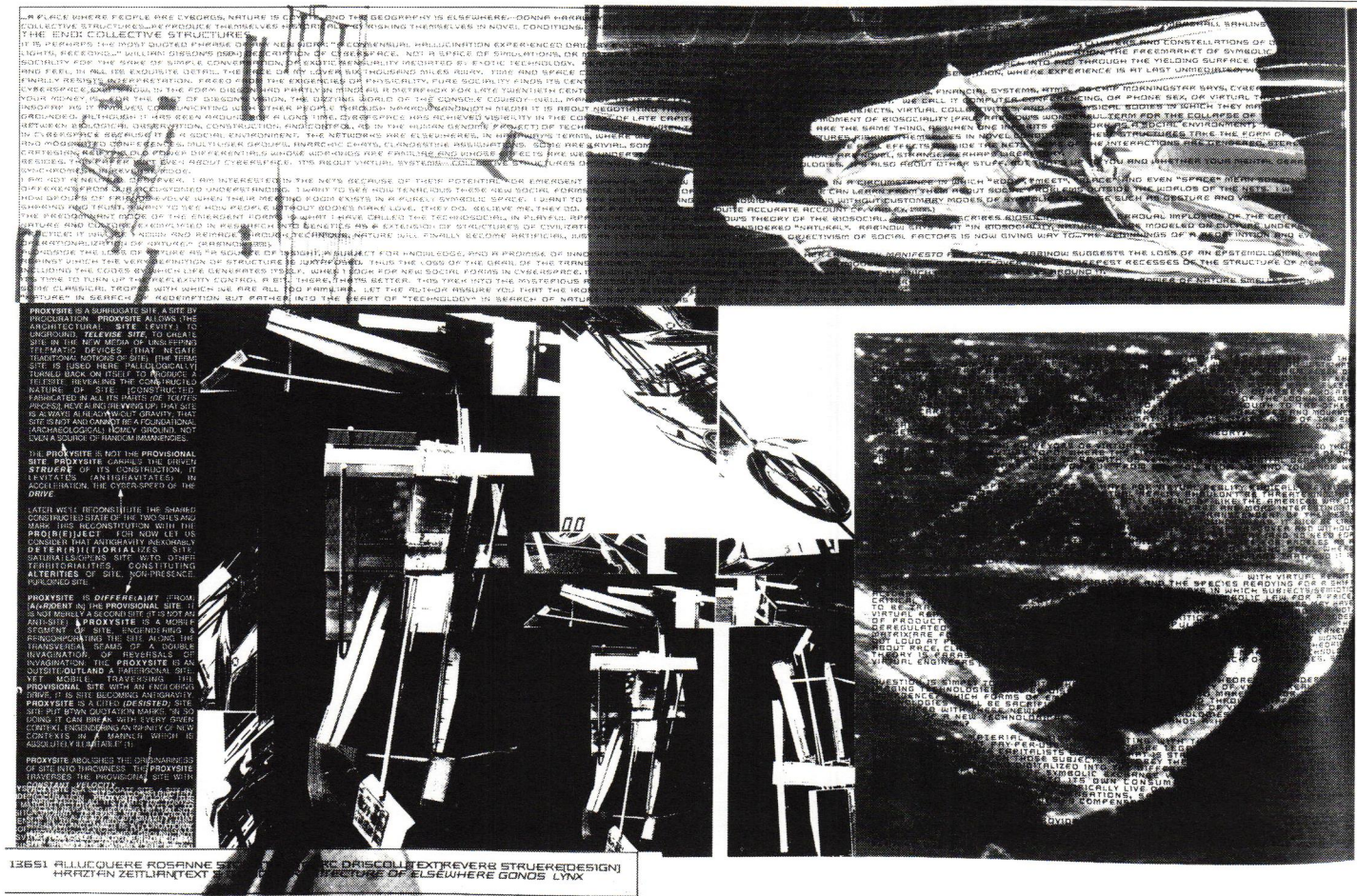
technology on these issues and the result has often been an aesthetic of complex legibility. For example, in an attempt to engage both the idea of the "death of the author" and the technology of hypertext, one of the texts (by Felix Guattari) in *Semiotext(e)/Architecture* has been designed such that a reader flips back and forth through it rather than reading from left to right. However, when this idea and this technology have coincided most productively, the result has been a liberatory attitude toward knowledge meant to reflect a reader's idiosyncratic proclivities and potential wanderings. The design of Guattari's text, however, works quite the reverse, requiring readers to flip back and forth in a prescribed and well-defined fashion. The result is the utter disarming of the capabilities afforded by either the idea or the technology.

The scars of similar games played with serious ideas mar many of the pages of *Semiotext(e)/Architecture*. One of the most

pronounced problems concerns computer programs that enable text and images to be dealt with in an identical manner. Rather than explore the possibilities offered by this technology, *Semiotext(e)/Architecture* seems to have succumbed to it by making images textual and texts into images and then simply pasting one over the other. While both text and image lose efficacy in this reduction, a kind of constant graphic texture emerges as winner. This forceful privileging of pseudo-design suggests that theory and discourse, in recognizing their own "design," have provoked anxiety in a profession that claims design as its own territory. *Semiotext(e)/Architecture* seems to fantasize about merging the writing of theory and the designing of architecture into a homogeneous and uniform activity. This fantasy is indeed fantastic, not only because it seems imposed like some unwanted and alien liberty (particularly on the texts), or because its reduc-

tiveness does not constitute a very satisfactory form of revenge, even in the face of real threats, but because it aspires to a kind of progressive egalitarianism between text and image, between verbal and visual literacy, in a context where equality is a distracting red herring. The value of what writing theory and designing architecture may have to offer one another derives in no small measure from their very substantial differences.

The fear of difference and of different ideas, projected by *Semiotext(e)/Architecture* through its persistent use of the computer as a homogenizing agent, belies the book's claim that it was made in an egalitarian way without overall editorial or design control. Although the editorial call to arms stresses that contributors were able, or were required, to design and tend to their own projects, turning the pages of this book the reader finds an editorial hand that has quarked and morphed all the individuality



A page from *Semiotext(e)/Architecture*.

of its component projects into an undifferentiated soup. If some of these projects were removed from this context and pulled away from the heavy critical mass they form as a whole, they would undoubtedly read very differently. Unfortunately, the space defined by the covers of this book seems to forcefully compress its contents into a single and monotonous mold.

Semiotext(e)/Architecture constitutes above all an effort to use superficial aspects of contemporary critical theory and technology as weapons to arm a new avant-garde. While individual projects in *Semiotext(e)/Architecture* seem designed to play the role of patriot missiles intending to disarm enemy ideas, once fused into a collective whole they are forced to suggest that ideas themselves are the enemy. Where to lay the responsibility for this fear of ideas, how to decipher the chain of command so to speak, seems by far the most complex issue posed by this publication. The individual projects

seem unable to retain enough individual integrity to hold any of them responsible—it would be like holding army grunts responsible for the wars they fight in. A soldier may be the only person we see holding a gun, and we may regret their participation in military activities, but somehow we understand that they exist as part of a large and complex system. *Semiotext(e)/Architecture*'s inability or unwillingness to confront and make legible its own structures of power—which we know exist and can recognize their impact—affects not only the participants of this printed war game but its spectators as well, for it denies us the chance to be critical readers, transforming us instead into enchanted viewers. Looking through *Semiotext(e)/Architecture* was like watching the Gulf War on television: we saw endless images of endlessly seductive technological devices that used their very seductiveness to outsmart and distract us from the true destruction they wrought—of which we were fully aware but

could not quite see or read. In fact, while the publication's intention may be that illegibility should work like a smart bomb that falls on readers and cataclysmically explodes them into a new and potentially cleansed world, the result is more like some faint echo of the futurist fetishization of war and aggression, an echo that makes the publication read not as a radical and transformative weapon but as a sad piece of nostalgia for an unhappy militaristic fantasy. That *Semiotext(e)/Architecture* has not addressed but rather has been seduced by new ideas and technologies, hence mobilizing worn-out strategies destined for outdated avant-garde battles, constitutes a tragically missed opportunity, perhaps a fatal error, but in no measure a significant reconsideration of prevailing standards of legibility.

SEMIOTEXT(E)/ARCHITECTURE, Hraztan Zeitlian, editor, Semiotext(e) Publications, 1992, 160 pp., illus., \$15.00.

JUAN PABLO BONTA

The Logic of Architecture: Design, Computation, and Cognition

William J. Mitchell

Typically, literature for architects about computer-aided design (CAD) promises a quick payoff for little or no intellectual effort: break the seal, insert the diskette into the disk drive, type "there we go," and start counting your savings. Not so with *The Logic of Architecture* by William J. Mitchell, dean of MIT's school of architecture and planning: no diskette, no savings, just lots of thinking.

Digital technology is primarily used in the middle and final stages of architectural work—for drafting, engineering, quantity surveying, and management. But Mitchell's goals are much more ambitious: he proposes an integrated approach to the entire architectural design process, from the early steps of programming and conceptual design to the final stages of criticism and feedback. Although it is based on what architects have been doing for centuries—working on paper or with models—his approach is intended to facilitate interactive processing on machines. Mitchell's quest for an electronic architectural machine has yielded a book on architectural principles that (perhaps perplexingly) joins the humanistic scholarly tradition spanning from Vitruvius to Le Corbusier. This is as it should be, for automatization requires not only better machines, but also a finer understanding of what the machine is expected to do.

Architects deal with descriptions of objects that can be conveyed in verbal language, symbolic logic, or values assigned to data structures in computers. They also manipulate graphic tokens on a drawing board, a model, or a computer screen linked to a database. Whatever the medium, the design process unfolds in a world populated by "descriptors" and "to-

kens." "Operators" are tools for manipulating tokens in the design world, from knives for cardboard shapes to computer programs for CAD. "Critical languages"—English, symbolic logic, or computer languages—are used to validate claims about states of the design world. The design world is a mapping of a construction world, which encompasses the traits of the real world that architects and critics deem pertinent to the design problem. Conventions of interpretation define the correspondences between these various worlds. As in language, there is a design "grammar" to eliminate meaningless, irrelevant, or uninteresting design possibilities. The framework is universally applicable to architectural design, regardless of time or media.

This effort toward abstraction and generalization can be justified as a means to establish a more incisive theory of architecture, and/or as a prerequisite for the computerization of certain architectural tasks. Mitchell's contribution to architectural understanding can be ascertained with an example: In one of the early chapters, he concludes, after reviewing various theories about proportion, symmetry, and beauty, "We should not look for a universal definition of aesthetic value in terms of particular formal qualities, but should recognize instead that different people, at different times, will seek and value different formal qualities in compositions." This is not a momentous contribu-

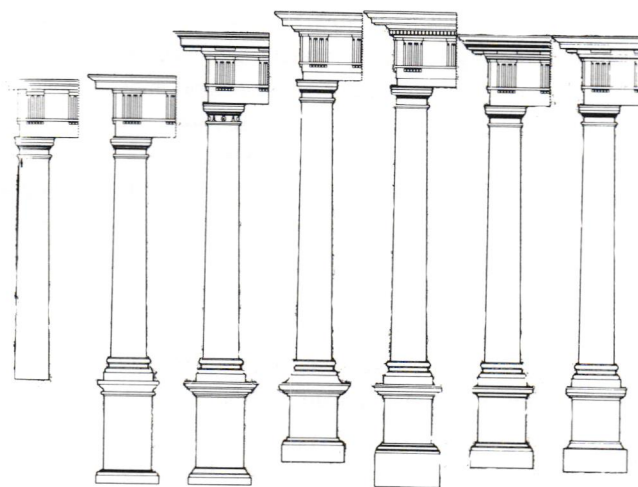
tion; it does not advance the current limits of understanding. Later, however, Mitchell comes back to the point: "Different critics may, and sometimes do, have different interpretations of a critical language in a design world." At this stage, Mitchell rigorously defines "interpretation," "critical language," and "design world"; the statement, illustrated with historical examples, becomes more illuminating than in its earlier, non-technical formulation.

The author never states that his goal is the computerization of architectural work. In fact, he often insists that his points are as applicable to the manipulation of drawings and models as they are to CAD, and that what is stated in symbolic logic and eventually in computer languages may just as well be said in plain English. The point remains, however, that his type of formalization seems an essential prerequisite for an electronic office, albeit somewhat of an intellectual curiosity in the context of traditional teaching and practice. Furthermore, several of his points—such as the discussions about shape recognition, the distinction between primitive and composite forms, or the difference between parallel and sequential replacement processes—are only relevant in a computerized environment.

Because Mitchell is equally interested in architectural theory and computation, he is forced to address two different audiences.

Readers with a humanistic bent may become impatient with the increasingly complex examples of formalization, while technically minded ones may resent his frequent admonitions about implications not discussed in the text.

Some of the architectural examples are brief and funny, as when pink triangles are presented as possible clues for postmodern work. In other cases, readers might be left wanting more. An excerpt by Peter Eisenman about his House X is quoted in length, to demonstrate the paucity of his critical vocabulary. Does Mitchell approve of this sort of architectural discourse? He does not say because he is not evaluating



Alternative abstractions of the essence of the Doric, as defined by seven eminent authorities; from left to right: Vitruvius, Serlio, Vignola, Palladio, Scamozzi, Perrault, and Gibbs. (From *The Logic of Architecture*.)

architecture but only discussing the mechanisms whereby architecture is evaluated. Those who are unimpressed with the distinction should stay away from *The Logic of Architecture*.

Part of the architectural evidence used in the book is derivative, and the same is true of the philosophical, linguistic, psychological, logical, and computer-science material, but this is how architectural literature has always been. In the grand tradition of architectural theory of the past two millennia there are only two types of works: those which are based exclusively on other architectural books, and those which bring new blood into the body of architectural literature by taking into account contemporary, extra-architectural developments. *The Logic of Architecture* belongs to the latter group.

A general systematization of architectural design principles suitable for computer-aided design and criticism may not yet be fully operational, but Mitchell helps to bring it closer. If and when Autoarchitect and Autocritic become available, I expect the manufacturers to call themselves Autochair, not Autodesk, to signal that the primary thrust of the enterprise is intellectual, not technological, and that it originated in academia.

This review is reprinted with the permission of Progressive Architecture, where it first appeared (August 1991).

THE LOGIC OF ARCHITECTURE: DESIGN, COMPUTATION, AND COGNITION, William J. Mitchell, MIT Press, 1990, 292 pp., \$35.00 (cloth); \$19.95 (paper).

JUAN PABLO BONTA

Learning From the Computerized Analysis of Indexes: Women in Architectural Literature

The following is a condensed version of material further explored in Juan Pablo Bonta's upcoming book, American Architects and Architectural Tests: An Introduction to Computer-Aided Analysis of Architectural Discourse (MIT Press).

In his novel *Cat's Cradle*, Kurt Vonnegut portrays a scholar of dubious sanity who is capable of determining the sexual preferences of the indexer of a book merely from the organization of the index.¹ I, too, profess to know how to deduce more from indexes than what meets the naked eye. From a computerized analysis of the lists of American architects cited in hundreds of writings, I can obtain insights into American architecture and its history that could not have been derived from traditional scholarly techniques. Digital technology has contributed very little to architectural scholarship and history up until now. According to a recent survey, many distinguished architectural and art historians are adverse to using computers, even for word-processing; and those who are not against computers, only envision using them for sorting data.² This is a very shortsighted view. The electronic analysis of indexes of texts (in short, index-analysis) is a new frontier in the application of digital technology to the humanities.

Of the many topics to be illuminated by index-analysis, I selected for this article one area alone—issues of gender impacting the choice of architects to be featured in architectural writing. How many among the architects most often cited in the literature are female? How many among the chroniclers and critics of American architecture are women? How does gender distribution among writers and architects vary with time? Are there any differences between

texts written by female scholars and male scholars? Do writers favor architects of their own sex in their choice of examples? Are writers today more receptive to the work of female architects than they have been in the past? These questions may not be as titillating as discovering someone's sexual preferences, but they are exciting in their own way because of the importance of the issues raised and because of the usage of a new analytical technique.

My focus is on the factual and descriptive. Readers interested in the causes or the ideological and political dimensions of the problem should refer to the significant literature produced during the past two decades.³

I collected a corpus of 325 texts on American architecture published throughout the last two hundred years. Every major work on the subject—essays, criticism, histories, textbooks, encyclopedias, guide books—is included, and many minor ones too.* (Because of space limitations, I cannot enumerate the criteria used to select the texts. Asterisks* are used throughout the article to identify topics glossed over here but subject to detailed discussion in my book.) The texts are a representative sample of the literature, if not the literature itself. Fifteen percent of the texts are credited to female scholars.⁴

Many of the texts in the corpus are outdated, out of print, or no longer in use for other reasons. There is only a finite stock of active architectural texts at any point in time, composed of the items published that year in addition to those of preceding years that are still remembered and consulted; as new texts continually appear, the oldest ones fade away.* Changes in gender distribution among the authors of active texts are more revealing than the global figures. Figure 1 shows the number of active texts of the corpus year-by-year since 1900, classified according to the sex of the author. Female authorship starts to increase in 1980, reaching near parity a few years later.

The universe consists of all architects cited often enough to become established in the popular perception of American architecture, at least as reflected in the profes-

sional literature.* How often is often enough is a matter of judgment; the larger the number of citations expected, the smaller and more selective the universe. Laypersons are likely to know of only very small universes, populated by superstars. Students are familiar with larger groups, and professionals and scholars command still wider horizons.

Index-analysis reveals the composition of the universe for various levels of citations. There are 6,725 architects cited in at least one text of the corpus, and 3 percent of them are female; 2,671 architects are cited in at least two books, with 2.3 percent of them being female. As the number of citations per architect increases and the architects in the group become fewer and more famous, female participation gradually shrinks: it is 2.5 percent among architects with five or more citations, 1.8 percent among those with ten citations, and 1.5 percent among those with twenty or more text citations to their credit.

The number of citations received provides another measurement of the imbalance. Male architects are cited, as an average, in twelve texts of the corpus; in contrast, their female counterparts are only cited in eight texts.

All this is consistent with what we know about female participation at other levels of the profession. Women account for 30 to 40 percent of the student body in architectural schools; in 1987 they composed 7.1 percent of the AIA membership.⁵ Because of the natural sequencing of stages in a professional career, it is only to be expected that redress of gender inequity occur first in the student population, then in the profession, later in the lower echelons of literary recognition, and only as a final step among the luminaries.

A review of the historical evolution of gender distribution in the universe confirms the positive direction of the trend. Figure 2 shows the yearly change in the number of male and female architects cited in at least two texts of the corpus. Not a single female architect appears in the universe during the first half of the century. In 1950 women

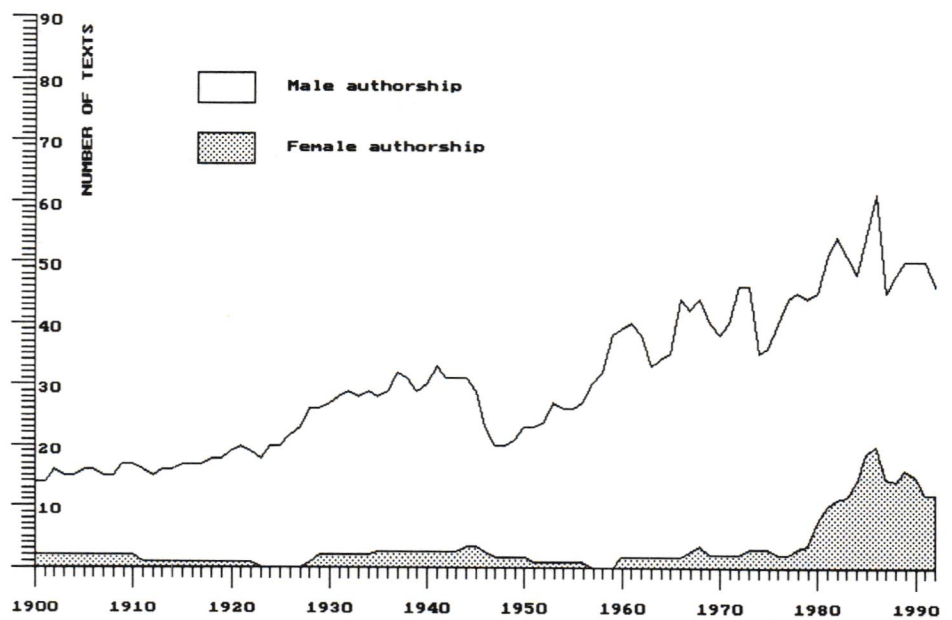


Figure 1. Active American architectural texts classified according to the gender of the author.

slowly come into the picture. Many male architects also access the universe during the same period, but the female gains are proportionally higher. This is visible in figure 3, which shows the female population in the literary universe as a percentage of the total: in 1992, it is past the 2 percent level.

A more encouraging sign appears by looking at the distribution of birth dates within the universe. Figure 4a gives the numbers of male and female architects in the literary universe born within twenty-year periods. Although the overall female presence is low, their participation among the youngest generation (those born between 1941 and 1960) reaches a sweeping 18 percent! (Figure 4b.)

Quantitative issues are but one side of the gender gap, and not necessarily the most interesting one. It would be fascinating to know whether there are any gender-specific differences, which are more likely to be cultural than natural, between male and female architectural writing. According to worn stereotypes, women are more interested in interior design or domestic architecture, whereas men write more about bridges and regional planning. Index-analysis is ill-equipped to deal with such differences, except for one significant aspect—the temporal span covered in the texts.

Each book has a *coverage span*, or the chronological period covered in the text, that may be expressed in terms of the architects featured.* For instance, a text dealing with the modern movement could deal with developments from Frank Lloyd Wright to Eero Saarinen. Coverage spans can be expressed in terms of the birth dates of the architects concerned; in the case of the example, the span would be from 1867 to 1910. Spans could be deduced from the text's title, preface, names of chapters, or list of illustrations. More conveniently, they can be derived automatically from the list of names cited. Once the coverage of every text is known, it is possible to figure out how many texts of the corpus potentially cover the work of an architect, depending on his or her birth date.

Architects' birth dates are represented horizontally in figure 5. The curves reflect, vertically, the numbers of texts potentially dealing with their work for various cutoff publication dates. As time passes and more texts are published, the number of possible citations grows.

The curves reveal the attention devoted in the literature to various periods of the past. There is a heavy tilt in favor of architects born around the mid-19th century: not only are there more architects of that period

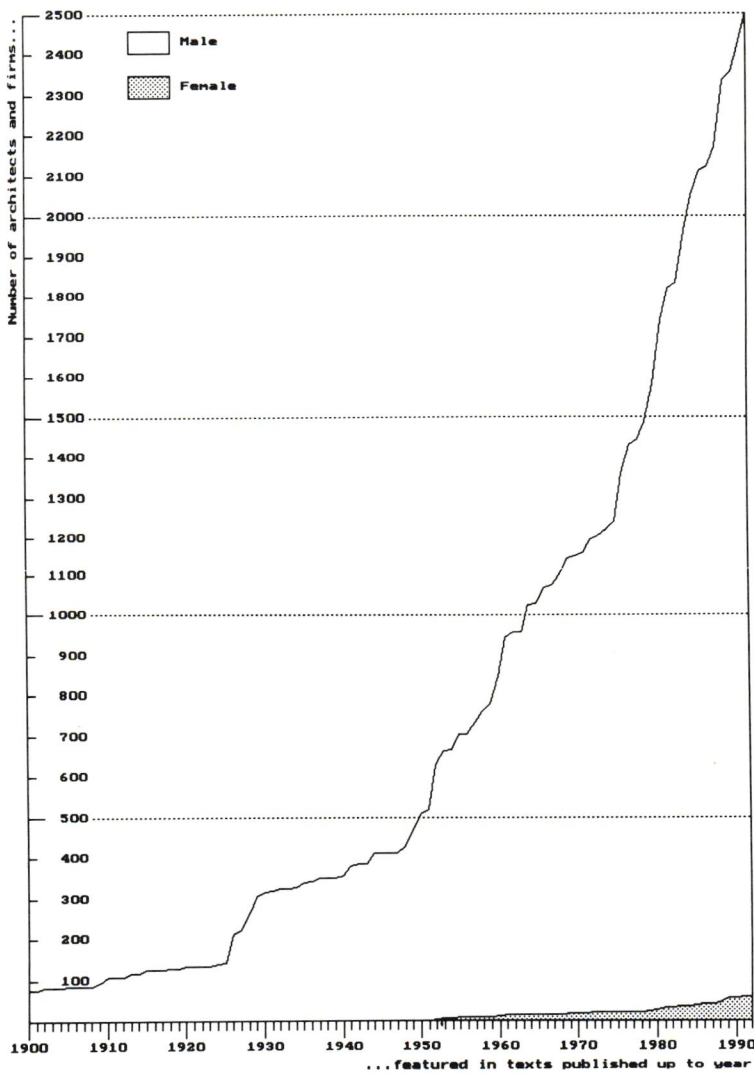


Figure 2. Architects and firms, classified by gender, featured in American architecture texts since 1900.

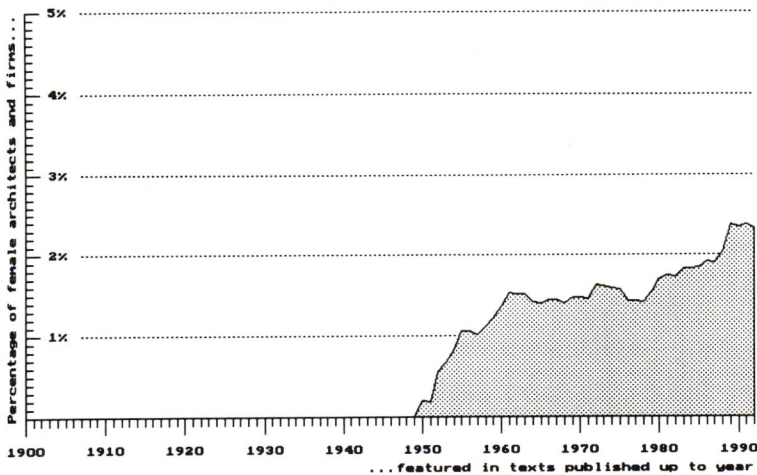


Figure 3. Female architects and firms that are featured in architecture texts, shown as a percentage of the total. (Not a single female architect appears in the sample literary universe prior to 1950. In 1992, women architects appear in approximately 2 percent of all published architectural texts.)

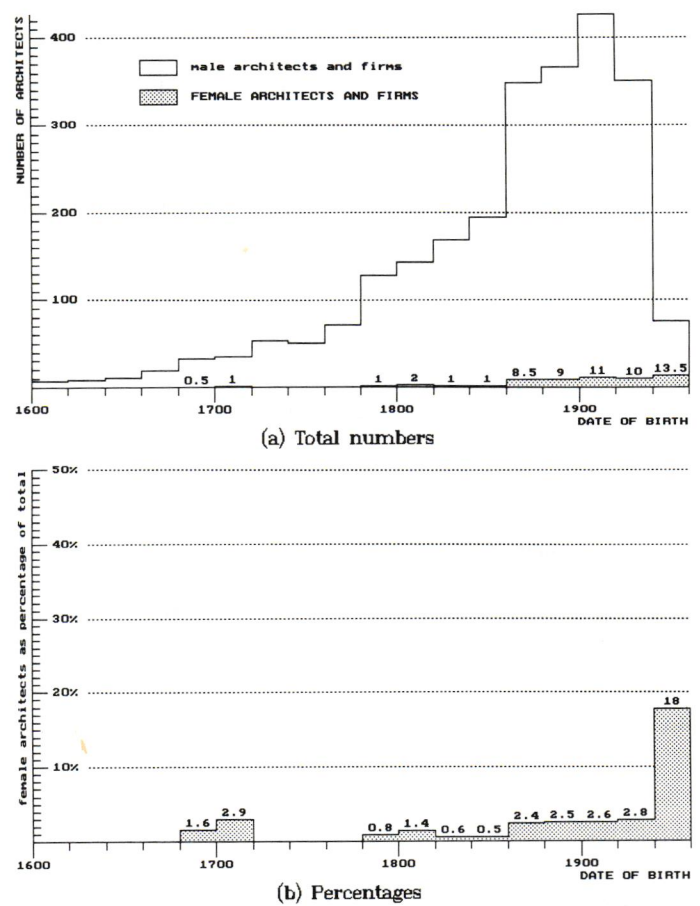


Figure 4. Architects and firms classified according to gender and date of birth. (The overall female presence is low, but women's participation in the youngest generation, those born between 1941–60, reaches a peak of 18 percent.)

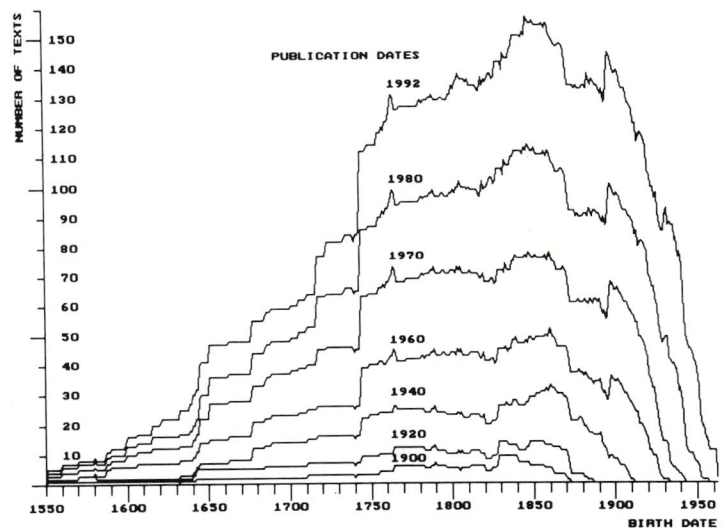


Figure 5. Number of texts covering the work of architects in function of their birth dates. (A great portion of architectural literature has been devoted to periods in the past, particularly to architects born in the mid-19th century.)

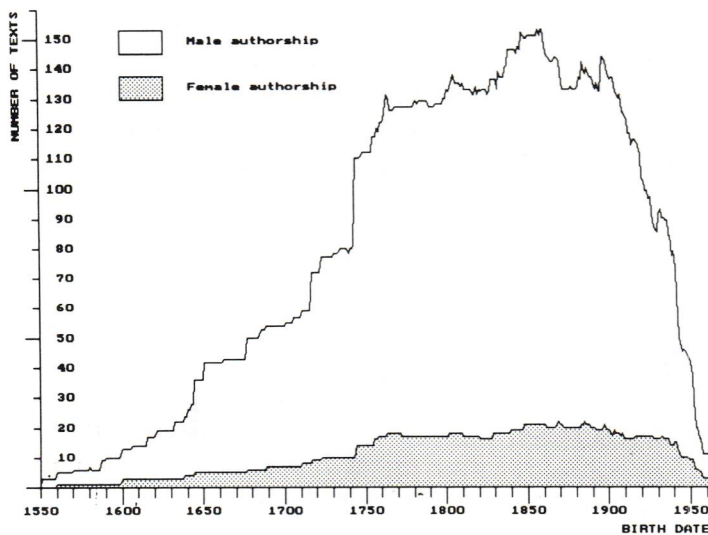


Figure 6. Number of texts covering the past discriminated by gender of the author. (Women writers displayed a more comprehensive, less fragmented view of the nation's architectural past.)

featured in the literature (as reflected in figure 4a), but there are more texts devoted to their work than to any other age group.

The diagram also illuminates shifts in attention through time. A notorious breakpoint in the curves occurs at 1743, the year Thomas Jefferson was born. Remarkably, twenty-seven texts in the corpus start their coverage of American architecture precisely at this point. But even more significant is the fact that this discontinuity only starts to be noticeable in the years following 1940. Disregard for the colonial tradition (which is the inevitable corollary to the view of Jefferson as the initiator of American architecture) is historically coincident with the rise of the modern movement. The demise of modernism, in turn, is congruent with the reevaluation of the earliest past.

An interesting difference between male and female writers emerges from comparing the coverage of the texts they wrote. Figure 6 is similar to figure 5, except that the texts are broken down by the sex of their authors rather than by publication date. The discontinuity of 1743 is all but gone in the female-authored literature: Jefferson is no longer the starting point of the historical narrative, nor is the colonial past as often ignored. The artificial break in the historical tradition during the modern movement, it appears, was pri-

marily a male affair. Women writers always displayed a more comprehensive, less fragmented view of the nation's architectural past.

Do writers give preferential treatment to architects of their own gender, citing them more often than those of the opposite sex? In other words, is chauvinism rampant in the architectural literature? Judging from the works in the corpus, the response is a resounding No.

First, I computed the percentage of female architects within the population of each text. Next, I found the average percentage of female citations for all texts written by females, which turned out to be 1.63 percent. This means that out of every one hundred architects cited in an average female-written text, 1.63 are women. The percentage of female citations in male-written texts is almost exactly the same: 1.59!

Equivalent results are obtained by tallying the citations of male and female architects from male and female writers. As an average, 17.4 percent of the citations of male architects come from female writers. The percentage for female architects is almost exactly the same: 17.6 percent.

There is a subtler measurement for each text's (or writer's) receptivity to the work of female architects.* Female architects are

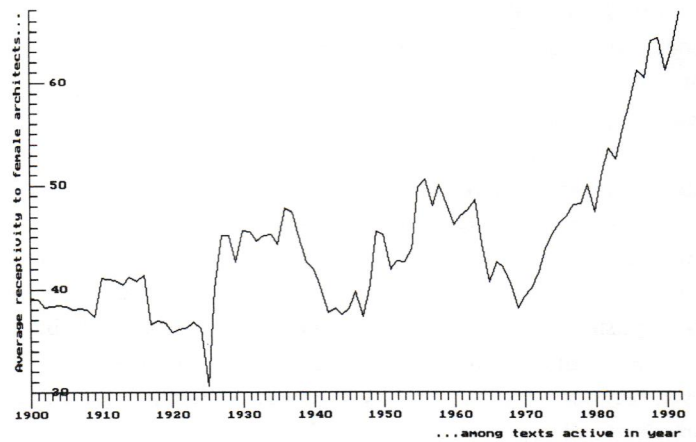


Figure 7. Receptivity to female architects among active texts.

distributed along the temporal continuum very unevenly; according to the literature, few of them lived and worked before the middle of the last century (figure 4a). Historians dealing with colonial architecture could hardly cite any women architects, no matter how genuinely they might try, whereas those writing about contemporary architecture have a much better chance to do so. In addition, even the few female architects who lived and worked in the past are only recently becoming recognized (as a result of feminist criticism) and becoming available, so to speak, for further citations; consequently, *when* a text is written also impacts the likelihood of encountering the work of women. In conclusion, the percentage of female citations in a text is governed by both the period covered and the time of its writing, more than by the inclinations of the writer. The receptivity index is based not on the actual number of female citations, but on the relationship between that number and the one that might have been expected in function of the period covered in the work and its publication date.

Perhaps not surprisingly, the two texts with the highest receptivity for women are John A. Kouwenhoven's *Made in America* (New York: Norton, 1948) and *The Tastemakers* by Russell Lynes (New York:

Harper, 1949), with their heavy tilt towards domestic design. More poignantly, two out of the three "worst" cases (the ones with the least sensitivity for women architects) were written by women—Ada Louise Huxtable and by Barbaralee Diamondstein.⁶

I averaged the receptivity for all male and female writers and obtained, incredibly, almost equal values! I found no traces of chauvinism in the architectural literature.

There is an interesting connection, however, between a text's receptivity to female architects and its publication date. The average receptivity for active texts year-by-year is reported in figure 7, on a scale from 1 to 100. Disregarding short-term fluctuations, the overall tendency is unmistakable: sensitivity to female architects has been increasing consistent in the literature throughout the century.

The importance of this finding must not be underrated. It does *not* mean that there is an increasing participation of women in the profession and the literature, as evidenced in figures 1–4; this has already been factored into the equation. All other things being equal, the curve of figure 7 would become approximately horizontal at mid-level. But all other things were not equal. Sensitivity to the contributions of women, as well as the contributions themselves, has also been growing. Whether this came as a result of political activism, I do not know. It may have been the other way around: index-analysis may reflect shifts in underlying societal attitudes, in the very climate of discourse that makes activism and change possible and fruitful.

Receptivity measurements are relative (e.g., a text is assessed in relation to other texts) instead of absolute. It follows that there is no reason for complacency with the status quo as reflected in figure 7. Mid-level receptivity would be good in an environment of justice, but abhorrent in the midst of prejudice.

Like affirmative action, increased receptivity fosters an environment conducive to the success of greater numbers of women architects. Gains in receptivity today foretell gains in their participation in the profes-

sion and in their recognition in the literature tomorrow. The struggle will continue until societal goals of equity have been met. The curve of figure 7 may be allowed to stabilize, and it will, when the curves of figures 2–4 have reached acceptable levels.

The results reported have varying degrees of credibility, depending on how many generalizations have gone into their formulation and how sweeping they are. The curves of figures 2, 3, and 4 are quite reliable, for they arise directly from name counts, gender attributions, and birth dates, all of which are unambiguous and can be ascertained with a low level of error. The preliminary conclusion about the lack of chauvinism among writers as evidenced by the similar ratio between their male and female citations is equally firm. The curves of figure 1 are affected by only one assumption, and a noncritical one at that, about the useful life of texts. The results reported in figures 5 and 6 are somewhat weaker epistemologically, because they depend on the measurement of text coverage, which in turn rests on several especially developed formulae. In addition, receptivity measurements hinge on a number of hypotheses not spelled out in this paper; the curve of figure 7 must be used guardedly. How believable are the conclusions in the final analysis? Much more plausible than impressionistic appreciations based merely on whim. They result directly from empirical data and explicit criteria and as such, they can be tested and verified. The database can be enlarged, the criteria challenged and modified, and the entire package reprocessed for increasingly more convincing approximations to the truth.

The analytical technique presented could be applied to study the architectural literature of other countries, or of disciplines other than architecture: fine arts, literature, philosophy, economy. Any field in which there is a body of literature is amenable to index-analytical scrutiny. The technique could be used to examine comparable issues such as, for instance, race and ethnicity among writers and architects (or poets or painters, etc.). The computerized analysis of

the literature (text-analysis) and, more specifically, of the indexes of texts (index-analysis) will be highly pursued in the coming years because they can be used to illuminate a variety of topics of interest to scholars in architecture and the humanities.

NOTES

1. I am indebted to Christopher Jones for this reference.
2. Marilyn Schmitt, general editor, "Present Use of Computers," *Object Image Inquiry: The Art Historian at Work* (Santa Monica: The Getty Art History Information Program, 1988).
3. I recommend especially Susana Torre, ed., *Women in American Architecture: A Historic and Contemporary Perspective* (New York: Watson-Guptill, 1977) or, among the more recent literature, *Design Book Review* 25 (Summer 1992).
4. The figure is computed disregarding a few cases in which the sex of the authors or editors is unknown, and distributing equal credit to males and females in the case of collaborative efforts.
5. Ellen Perry Berkeley, ed., *Architecture: A Place for Women* (Washington and London: Smithsonian Institution Press, 1989), pp. xv and xvii.
6. Ada Louise Huxtable, "Twentieth-Century Architecture," *Art in America* 4 (1960): 46–55; and Barbaralee Diamondstein, *American Architecture Now* (New York: Rizzoli, 1980).

MARYLY SNOW AND
ELIZABETH DOUTHITT BYRNE

Art & Architecture Thesaurus

Toni Petersen, director

Designers of all stripes or zigzags, whether or not they use computers in their work, need to know about the *Art & Architecture Thesaurus*, or the AAT. In a world of proliferating information, not to mention acronyms, the AAT enhances the ability to control, e.g., organize and retrieve, mounds of paper and scraps of design. For those designers and educators whose personal environments are littered with slides spilling across light tables, articles and books heaped and strewn about, pencils and paper everywhere, this new resource tool may offer hope for restoring order. The AAT will not automatically straighten up your work environment, but it will provide you with a consistent and reliable vocabulary for organizing information. With the ubiquity of computers in the design environment, either during the actual design process or when providing organizational and management support for design, controlled subject vocabularies take on a critical importance for all individuals who work in design-related fields.

If your information needs are limited to the names of your last five projects, then you probably do not need the AAT. But if you want access to design motifs, urban-design features, building components, the names of garden structures, product literature, and other information, the AAT will provide you with a structured, almost-ready-to-use vocabulary for information storage and retrieval. The vocabulary is also useful for organizing samples files, photography and slide collections, architectural drawings, indexing journal articles, and writing project proposals.

All too often, dictionaries, encyclopedias, and other reference books with both art and architecture in their titles focus more on art than on architecture. This is not the

case with the *Art & Architecture Thesaurus*, so do not be misled by its title: 80 percent of its contents currently contains architecture, landscape architecture, city planning, and design terms. The fine arts components are being added and will be available in the second edition, due out in 1994.

The AAT is a marvel of a project, a well-designed book, and, in its software version, is reasonably priced. So, what exactly is it, how did it come to be, and who, besides librarians, should actually buy and use it?

The AAT is so monumental in scope and execution that it defies easy description. In 1978 an architectural historian was so frustrated trying to assemble her slide lectures that she gathered together a group of information specialists in an attempt to standardize architectural terminology. After several meetings, the idea of the AAT was born with Dora Crouch of Rensselaer Polytechnic Institute, Pat Moholt, who was also at Rensselaer but is now at Columbia University, and Toni Petersen, then executive editor of the *International Repertory of the Literature of Art (RILA)* and now director of the AAT. Their idea was to establish a definitive, controlled vocabulary for art and architecture. Henry Millon, dean of the Center for the Advanced Study of the Visual Arts (CASVA), made two suggestions that have become guiding principles for the AAT: the vocabulary should "be arranged hierarchically, so that it collapses within itself, to make a nest of terms"; and it should

"take real collaboration among architectural historians," or at least the vocabulary should be reviewed and approved by scholars in the field. Wending its way through granting agencies such as the Council on Library Resources and the National Endowment for the Humanities, the AAT was adopted by the J. Paul Getty Trust in 1983, where it is now an ongoing Art History Information Program (AHIP) project. The first edition of three volumes was released in 1990, as was an ASCII-format tape version. Supplement I has just been released, along with the first PC version, labeled with the rather high-blown acronym of ART, for *Authority Reference Tool*.

Both versions of the AAT have the following organizational and informational features. The vocabulary, currently about 15,000 main terms with 25,000 synonyms or lead-in terms, is organized into seven facets or classes (see table below).

The first edition contains twenty-three of the planned thirty-two hierarchies. The hierarchies are subclasses or chapters within the classes. The core of the vocabulary centers around the Objects facet. Depending on your professional orientation, you might find certain hierarchies more interesting and useful than others. Architects and landscape architects will favor the five hierarchies composing the Built Environment (Settlements, Systems and Landscapes; Built Complexes and Districts; Single Built Works and Open Spaces; Building Divisions and Site Ele-

Facet	Hierarchy Types	Sample Terms
Associate Concepts	abstract concepts, qualities, phenomena	illusionism, beauty, culture
Physical Attributes	appearance, qualities of objects	shape, color, design
Styles & Periods	art & architectural styles and movements	Renaissance, Deconstructivist
Agents	persons & groups associated with roles, occupations	architects, designers
Activities	events, processes and techniques	performing arts, restoration, landscaping
Materials	substances, whether natural or manufactured	chalk, marble, adhesives
Objects	built environment	libraries, cathedrals
	furnishings & equipment	chairs, awls
	visual & verbal items	daguerreotype

ments; Built Works Components). Interior and industrial designers will favor the three hierarchies making up the Furnishings and Equipment group, while artists and curators might focus on the Visual and Verbal Communications group with its Drawings, Photographs, and Document Types. All the other facets and their hierarchies can be used alone or as modifiers to the objects. For example, "blue Victorian wood chairs" contains three modifiers and one object (chairs).

All the hierarchies are detailed and carefully constructed. Some contain terminology not available in any other thesaurus, such as occupations, genres, building types, building components, styles and periods, and ethnic arts. Any one of these hierarchies alone is worth the purchase price of the entire set. You can rely on these terms to be complete and authoritative. In addition, since the AAT was created with the intention of establishing a standard, AAT spellings and definitions are increasingly accepted as the standard authority. This solidifying of a common architecture vocabulary is confirmed by the regular use of the AAT by the *Avery Index to Periodical Literature* and other indexing and bibliographic services, libraries, museums, and archives.

Both the well-written "Guide to Use" and the "Application Protocol and Indexer's Guide" permit users to decide exactly how they want to apply the vocabulary. The hierarchical structure allows you to decide how specific you want to be (e.g., houses, country houses, or *dachas*), and application choices permit you a range of indexing complexity. At the very simplest level is the application of a single descriptor, such as "chair." More common and much more valuable is the ability to apply multiple, single descriptors—"chair, molded, walnut, American." This seems to be the current practice in slide libraries. Rearranging the multiple single descriptors into a natural language order is relatively simple by following the order of the hierarchies. This produces "molded American walnut chair," although some users might prefer the mate-

dachas

RK.291

ALT dacha

SN Country houses, summer houses, or villas in Russia. (W)

**CN V.RK.AFU.ALO.ALO.AXC.ALO.
AXC.AFU.AFU.AFU.ALO**

Figure 1. The term dachas as shown in the alphabetical listing. This is a relatively simple term in that it has a scope note but no synonyms or UF's (use for's). (From the Art & Architecture Thesaurus.)

rial to precede the style and period, resulting in "molded walnut American chair." Whether "walnut" precedes or follows "American" does not change the fact that there is only one noun (chair), or focus term, in the modified phrase. In both these cases, the singular "chair" is an accepted alternate form of the plural descriptor, chairs. Strings, or complex syntactic configurations with two or more focus terms (for example, "Renaissance oil paintings—restoration") are the most complex groupings of the AAT vocabulary. Strings are currently in use in only a few book libraries and archives.

Each term can have, but is not required to have, all of these features: an alternate form, synonyms, broader terms, scope notes (definitions), historical notes for changes and deletions, and a source code in case you are interested in literary warrant (where the term has been used before adoption by the AAT). Major sources of terms include the *Library of Congress Subject Headings* (LCSH, or "the big red book"), *RIBA Architectural Periodicals Index*, *Avery Index*, *Chenhall's Revised Nomenclature for Museum Cataloging*, and *RILA*. A complete list of sources consulted in establishing literary warrant runs seventy-six pages and contains over sixteen hundred citations. A relatively simple alphabetical listing for *dachas* appears as figure 1. The unwieldy classification notation, or CN, is useful only in automated systems, and will not appear in the printed second edition.

What doesn't the AAT include? As wonderfully useful as the scope notes are, not every term has a scope note. Because the scope notes have assumed an unanticipated importance, all new terms being added to

the AAT have scope notes. After the publication of the second edition in 1994, a three-year transition period will begin in which every term will be defined. Not intended for coverage in the vocabulary are iconographic terms (saints, dragons, madonnas, and the like). The AAT is based on American English, but foreign terms that have no American counterparts also appear in this

reference tool (*yalis*, *muqarnas*, *cololche*). Nonetheless, the current focus of the AAT is on Western art and architecture, with African and Asian to be considered as a further development. Also under consideration for development are French, Spanish, German, Italian, and British English translations. Not yet available in the vocabulary, but awaiting publication of the second edition, are nine hierarchies covering sound, recreation, costume, transportation, and communications.

Also not yet included in the AAT are brand-new terms. Every vocabulary, to remain useful and alive, grows and changes: new words come into use, and old ones fade away. As AAT users discover terms they need, the terms are submitted as candidates for inclusion in the AAT and are subject to rigorous editorial evaluation. Candidate terms are submitted by vocabulary users at the rate of about seventy-five terms per month. Obviously, the AAT is an ongoing and vital vocabulary. Because new terms are continually added or revised, Supplement I updates the three-volume main set.

The most important issue for such an endeavor is to establish a well-crafted vocabulary, and in this sense, the AAT has clearly succeeded. But it is also important to have a well-crafted object. The three-volume set of the AAT has been carefully and inexpensively crafted, nicely balancing ease of use with a reasonable publication price. If you elect to purchase the book edition, you will be constantly referring to a three-volume set comprising over seventeen hundred pages. The volumes are both sewn and glued, and are designed to hold up under considerable use. The pages lie flat; the books stay open. Printed thumb-indexes along the fore edge,

not dictionary cut-out thumb tabs, are used to differentiate the various hierarchies. While these are essential and were used to reduce costs, some users are hoping for actual thumb cuts in the second edition, rumored to be eight volumes! The hierarchy volumes are nicely laid-out, with alternating gray columns to facilitate reading the hierarchies (see figure 2). Tiny numerals at the bottom of each gray column would have helped keep readers' fingers running up and down the columns consistently. The hierarchy volumes intelligently use headers and footers. Running headers across the top provide easy reference for your place in the hierarchy, so you do not have to look back through the pages. The footers change hierarchy by hierarchy (for example: Baroque + churches; Japanese + enameling in Styles and Periods; upholstered + chairs in Processes and Techniques). The layout of the pages, especially the alphabetical listings, which contain much complicated information, are clean and easy to read. Readability, however, could have been enhanced by printing main terms in bold. The headers and footers of the hierarchy sections are so clear that it is a wonder why more attention wasn't paid to the headers and footers in the alphabetical section. Three-letter page headers are sometimes insufficient where four are needed ("Traf-Tran" is more precise than "Tra-Tra"). And running footers showing the full hierarchy names and hierarchy codes would have been useful, as in Styles and Periods (FL). And in both sections, the gutters are too narrow, making photocopying difficult.

While the three-volume set with its accompanying supplement can provide any designer or information specialist with a consistent and sufficiently complex vocabulary, it is the PC version, *ART*, that will enable architecture, landscape architecture, and design firms to more readily adopt the vocabulary for everyday usage. *ART* provides seamless search capabilities and easier handling than the four print volumes. A Macintosh version is currently in production, and will be followed by a Windows version.

RK.271	<houses by form: roof orientation>
RK.272	gable-front houses
RK.273	<houses by function>
RK.274	decorators' show houses
RK.275	model houses
RK.276	seasonal dwellings
RK.277	summer houses
RK.278	yalis
RK.279	vacation houses
RK.280	tourist cabins
RK.281	second homes
RK.282	<houses by designer or builder>
RK.283	architect-designed houses
RK.284	builder-designed houses
RK.285	owner-built houses
RK.286	<houses by location or context>
RK.287	<houses by location: settlement area>
RK.288	<rural houses>
RK.289	country houses
RK.290	châteaux
RK.291	dachas
RK.292	villas
RK.293	villae rusticae

Figure 2. The term *dachas* as shown in the hierarchic listing (from the Single Built Works and Open Spaces hierarchy). Headers and footers do not appear in this photograph. (From the *Art & Architecture Thesaurus*.)

The rather highfalutin acronym *ART* actually refers to its search format, *Authority Reference Tool*, which the Getty is considering using for other authority lists, such as the as yet unpublished "Union List of Artist Names" and "GeoName" (previously the "Thesaurus of Art Historical Place Names"). It is an easy-to-use format that comes with its own user manual, although one can probably figure out *ART* independently without risk of ruining the data. *ART* is available on either 3.5-inch or 5.25-inch diskettes, and requires 5 megabytes of hard-disk space and DOS 3.1 or higher.

ART allows users to navigate across the hierarchies and alphabetical sections transparently. It is designed for use with a variety of database and word-processing software. Once a term has been located in *ART*, it can be pasted into a document in one step using the "replace" feature. The "previous" function allows a user to see the previous ten searches performed on the *AAT* vocabulary. This means that the vocabulary can be used to bring publications, proposals, and other

documents into accord with scholarly, academic, and professional standards for spelling and terminology.

The *AAT* and its computer counterpart *ART* will continue to shape the access and retrieval of architectural and design information. At \$125, the *AAT* in its *ART* format is a valuable tool for design firms and scholars alike.

ART AND ARCHITECTURE THESAURUS, Toni Petersen, director, Oxford University Press, 1990, 1,745 pp., \$250.00 for three-volume set.

AAT SUPPLEMENT I, 216 pp., \$50.00.

AUTHORITY REFERENCE TOOL (electronic edition of *AAT*), \$125.00.

AAT (three volumes), Supplement I, and *ART*, \$425.00.

YEHUDA E. KALAY

Cadline: A Bibliographic Database of CAAD-Related Publications

The number of professionals who use computers as an aid in architectural design has been growing by leaps and bounds since the inception of computer-aided architectural design (CAAD) in the early 1960s. Recent estimates show that at least 70 percent of all architectural firms in the United States use CAAD in one form or another, and their number is expected to grow as new generations of architects are educated early on in the use of computers, and as new software systems become available that can better serve their needs.

The growth in number of CAAD users has been accompanied by a growth in CAAD research and education whose aim is to uncover the underlying principles of design and its computability, develop new CAAD tools, and educate students in their use.

The proliferation of publications and conferences attests to the vigor of the discipline. It also makes it frustratingly difficult for any single researcher, research group, or educator to keep abreast of all, or even a significant portion, of the new developments in the field. Consequences of the proverbial "blindness" are often grave: research proposals and scholarly publications are rejected on grounds that the authors are not familiar with the state of the art in their fields. The considerable effort invested in conceiving and writing these proposals and publications is wasted, as are the efforts to reinvent theories, methods, and techniques that were previously developed. Important cross-fertilization of ideas cannot occur.

The idea of setting up a bibliographic database that will include indexed and abstracted entries of publications that are relevant to CAAD research and pedagogy was born at State University of New York at Buffalo's CAD Research Center in 1987, out of widespread frustration due to the difficulties mentioned. Consequently, over the past five years we have attempted to estab-

lish a bibliographic database that would be based on the following premises:

- (1) It would include all, or at least the majority, of the publications relevant to CAAD research and education.
- (2) It would rely on a powerful bibliographic database software, which will allow cataloging of different kinds of publications in the most suitable format, and will support searches for all relevant publications in the most flexible and efficient manner.
- (3) It would be sustained by an ongoing commitment to update the database on a timely basis, so it will not become obsolete within a year, drawing on the broadest possible range of publications and interests.
- (4) It would be accessible to all researchers and educators in the field of CAAD, either through its physical dissemination or by providing a service that will act as an information brokerage.

The first attempt to establish the database used a UNIX-based bibliographic software (REFERR) running on a Digital Equipment Corporation multiuser VAX mini-computer. It relied on the efforts of a student research assistant who spent one

year indexing and entering part of our large collection of publications into that database. We found the software less than user-friendly, and inaccessible to users outside our own research group.

A second attempt to establish the database was made through developing our own personal computer-based bibliographic software, using dBase III Plus as the implementation environment. The resulting software was a compact, simple, and cheap system that provided many of the more important facilities required from a bibliographic database software. We found, however, that it was too slow for handling a professional-size database, and that it lacked the flexibility and report-generating capabilities expected from such software. We have also learned that setting up and maintaining a professional bibliographic database is a serious, well-established form of modern librarianship, with its own set of rules, conventions, and practices.

For the third (and current) approach we selected a professional, state-of-the-art PC-based bibliographic database software. We chose Pro-Cite[®], developed by Personal Bibliographic Software, Inc. (Ann Arbor, Michigan). Considered to be the leading software of its kind, it is available on both

A typical book-chapter record

Auth	Akin, Omer
Affl	Dept. of Architecture, Carnegie Mellon Univ. Pittsburgh, PA
Titl	How Do Architects Design?
CoPh	in
Titl	Artificial Intelligence and Pattern Recognition
PIPu	New York
Publ	North-Holland Publ. Co.
Date	1987
Loc	pp. 65-98
Note	Latombe, ed.
Abst	This study proposes a descriptive model of the design behavior of architects. In the first section a framework for the model is proposed. In the second section the framework is tested against empirical data. Information acquisition, problem interpretation, problem representation, solution generation, solution integration, solution evaluation, perception and sketching, are used in developing design solutions. The three remaining mechanisms, design "plans," transformation rules, and design-symbols represent the categories of apriori knowledge used in design. In the third section these knowledge mechanisms are explored in detail using the results of two additional experiments with designers.
Call	
Index	design; design methods; design behavior; design plans; architectural design; design research; problem solving

IBM-compatible personal computers and on Apple Macintosh computers, hence it enjoys a large installed base and wide availability. The decision to employ a PC-based bibliographic database software rather than a multiuser, mainframe-based software was driven by accessibility considerations (cost, availability, and convenience), and the projected eventual size of the database, estimated to comprise several thousands of records (multiuser, mainframe-based systems are designed to handle millions of records, and are, therefore, expensive to purchase and difficult to maintain).

We also hired a professional librarian who specializes in information management systems to oversee the implementation of the database, and attracted a graduate student assistant from the UB School of Library and Information Science. Together, they abstract, catalog, index, and, with the help of a secretary, enter records in the database.

This six-year, trial-and-error experiment has finally resulted in what we consider to be a professional bibliographic database named Cadline™ (similar to other professional databases, like Medline^R and Quakeline^R). At present it contains one thousand records (see samples). We expect it to eventually contain six or seven thousand indexed and abstracted records. By-products of the database itself include a thesaurus of key words and a list of authors in the field. Cadline™ has been supported so far by the University at Buffalo School of Architecture and Planning, and by resources made available through an Income Fund Reimbursable (IFR) account generated by other projects.

A typical record in the database refers to an article, a technical report, an audio-visual resource, or a book, and consists of information such as author, title, source, language, and additional bibliographic information conforming to the American Library Association's (ALA) most recent version of the Anglo-American Cataloging Rules (AACR-2). An abstract is included, along with indexed key-words. If relevant, a field indicating the location of the resource is also included (e.g., for audio-visual materials, master's and Ph.D. theses, and technical re-

A typical article record

Auth	Hubka V., and W.E. Eder
Titl	Design Knowledge: Theory in Support of Practice
Jrnl	Journal of Engineering Design Date 1990
VoId	1
IsId	1
Loc	pp. 97-108
Note	
Abst	The study of Specific Design Knowledge (SDK) is part of design science, and contains the knowledge of the specialist's domain, particularly the know-how of realizing a technical system. SDK, at present, is incomplete and does not possess a fully developed form, since it consists partially of personal, often unconscious knowledge of design experts. Finding the right content and form for presenting SDK is, nevertheless, crucial for the quality of the designed product, and for the efficiency and effectiveness of the design process. Beyond that consideration, computer-based expert systems depend fully on the kind of knowledge available in SDK, and its form of presentation. The aspects that are discussed in this paper include the character, types, forms, and ways of obtaining the available SDK.
Call	
Index	design practice; design knowledge; design theory; design science; expert systems; knowledge representation; design process

ports). The first sample illustrates a typical record type.

Pro-Cite[®], the software in which Cadline[™] has been implemented, was designed explicitly for managing bibliographic databases. Each Pro-Cite[®] database can contain up to 32,000 records (with an actual file capacity of 8.2 megabytes), which is more than enough to hold the projected ultimate size of the database.

Pro-Cite[®] offers extensive and flexible searching capabilities. Entries can be searched by author, key word, or any string of text that appears anywhere in the record (including the abstract). Boolean combinations of search keys are supported ("and," "or," "not," etc.), as are logical operators

(less-than, greater-than, etc.), parentheses, and truncation characters (to match characters that vary from record to record, e.g., “algorithm” versus “algorithms”). Reports can be generated in soft and hard formats (disk-based or printed forms), in any one of over twenty bibliographic formatting standards (e.g., ANSI, APA, MLA, Science, Turabian, UMI, Vancouver, etc.).

The hardware requirements for the IBM PC version include an IBM compatible computer, 320K RAM, DOS version 2.0 or higher, and a hard disk drive (recommended). For the Macintosh, hardware requirements include Macintosh 512e or better, 512K memory, System 4.1 or higher, and a hard disk (recommended).

Sample Bibliography

Calderaro, Valerio; Giangrande, Alexandro; Mirabeli, Paolo; Mortola, Elane (University of Rome). **Decision support system in computer aided architectural design**, in: *Proceeding of the European Conference on Teaching & Research Experience with CAAD* (4th: 1986: Rome, Italy): pp. 20-38: ill. Note: Includes bibliography.

A new procedure of design management and the results of its application to architectural design in an exercise developed in a didactic context (an exercise of architectural design developed by the students of a post-graduate course in CAAD recently instituted at the faculty of architecture of the university of Rome) is described. The new procedure requires the participation of all those involved in the design process and who contribute, directly or indirectly, to obtain the results. By generating and developing alternative design solutions, this procedure allows the exploration of the performance space which is generally more vast than that explored by the traditional designer.

The software is available in full form or in search-only form, which is adequate for users who wish to access the database for information retrieval only. Current list prices are \$395 for the full program, and \$195 for the search-only form. Dealers offer up to 40 percent discount of these prices. The wide availability of Pro-Cite[®] also means that most researchers and libraries already own a licensed copy of the program, further reducing the cost of accessing the bibliographic database.

Recently, we have also made Cadline[™] available in text form, a version that includes the same information as the database but which does not rely on Pro-Cite[®]. This version is searchable through any word processor, but does not have the field-specific search abilities the database version has.

To maintain the broadest coverage possible, professional competence, and accuracy, Cadline[™] relies on the input, advice, and guidance of an international editorial board comprised of noted experts in the field. Members of the editorial board represent twenty-six universities and research centers in twelve countries. Their expertise and distribution guarantee broad topical and geographical coverage of the publications relevant to design methods and CAAD research, including such issues as building economics, evaluation, civil engineering, construction management, design education, energy, design integration, human factors in design, knowledge-based design, solid modeling, visualization, and computer graphics.

CADLINE[®], Research Foundation of State University of New York (operations relocated to U.C. Berkeley), \$100.00 for database version (searchable through the Pro-Cite[®] bibliographic database management software) or text version (searchable through most word-processors). Available in IBM-PC and Macintosh formats.

PRO-CITE[®], Personal Bibliographic Software, Inc. (or available through the Research Foundation of SUNY), \$280.00 for full program, \$150 for search-only.

CADLINE[®] and PRO-CITE[®] package, \$395.00 through the Research Foundation of SUNY.

ALEXANDER KOUTAMANIS

The Architect's Brand-New Toolbox

Not so long ago every other paper presented at conferences on the computerization of architecture centered on yet another computer-based design or drafting program. It seemed that every school of architecture had a single ambition: to develop drawing software. But today a new mentality prevails. Research into the computerization of architecture has become more conscious of the technological and methodological tools available in computer science. Some efforts investigate the applications of advanced computer technology to architecture. Many others focus on the real theoretical problems involved in the computerization of processes and representations that architects use. All but a few architecture schools offer no-nonsense education on the use of standard computer tools, from drafting to spreadsheets.

This new mentality is clearly reflected in *The Electronic Design Studio*, appropriately subtitled *Architectural Knowledge and Media in the Computer Era*. It consists of revised papers from the CAAD (Computer-Aided Architectural Design) Futures '89 Conference held in Cambridge, Massachusetts, in July 1989. Most of the papers are excellent and the volume as a whole is representative of current trends in CAAD research and education.

The preface boldly states: "Design is the computation of shape information that is needed to guide fabrication or construction of artifacts." This obviously partial definition is open to controversy, as it does not do justice to the multifaceted problem-solving that designers are required to do. But rather than criticize the definition, perhaps the reader need simply accept it as the book's prevailing perspective on design. Handbooks of computerized drafting offer detailed views of the technology that is available today. *The Electronic Design Studio* addresses the extensions and implications of this technology: the new or expected technological advances and—more signifi-

cantly—the methodology and techniques of applying computer technology to architecture. The linking of general-purpose tools to domain knowledge and practice is probably the only chance for an application domain such as architecture to mold incoming influences. Given the state of computer proliferation in architectural education and practice, the kind of research presented in *The Electronic Design Studio* appears to be the primary determinant of things to come in CAAD in the following decade.

The reader should bear in mind that the book is the revised proceedings of an academic conference. It describes ongoing or fundamental research that might find its way into commercial CAAD systems in the near future but not necessarily exactly as presented in *The Electronic Design Studio*. The requirements and objectives of education and academic research are quite different from those of the profession. The CAAD industry reforms the experimental products or even the failures of the former to cater to the needs of the latter. The book should therefore be treated less as a precise description of future CAAD tools and more as an indication of the overall framework of these tools. As such it can still be invaluable to the inquiring reader: the size and subdivision of a toolbox often say quite a lot about the tools it holds.

The papers of *The Electronic Design Studio*, excluding the introduction and an afterword, are subdivided into four sections: "Theoretical Foundations," "Knowledge-Based Design Tools," "Information Delivery Systems for Design," and "Case Studies: Electronic Media in the Design Studio." This subdivision is somewhat confusing, even though the book constitutes a more or less steady progress from general to particular. The second section, for example, includes papers that have very little or nothing to do with knowledge systems. Also, the differences in subject and orientation between papers of the second and third and even some of the fourth section are often minimal. For example, papers on CAAD education and the teaching of design through CAAD are dispersed all over the four sections. A paper by Ömer Akin is placed in the fourth section, as a case study,

while the course the author refers to is just an example of an approach to CAAD in education, as in the paper by William J. Mitchell, Robin S. Liggett, and Milton Tan, which appears in the second section, or the contribution of Bharat Dave and Robert Woodbury in the first section.

The volume contains thirty-five papers in all; unfortunately, the space of a review limits my discussion to only some of the more interesting papers. In making the selection I paid less attention to what is representative of the book's quality and more to which papers addressed new issues and signified promising new approaches, following a belief that the primary contribution of *The Electronic Design Studio* is its coverage of a wider spectrum of computer applications in architecture than have been previously explored in other conferences or CAAD textbooks.

The book opens with the excellent "Introduction: A New Agenda for Computer-Aided Design" by Mitchell. The author builds on the structured nature of computer drawings to give a comprehensive account of design as the computation of shape information. The paper is a deep and knowledgeable review of existing tendencies and fruitful new directions and extensions to CAAD, from geometric modeling and its manipulation to design production systems and their control.

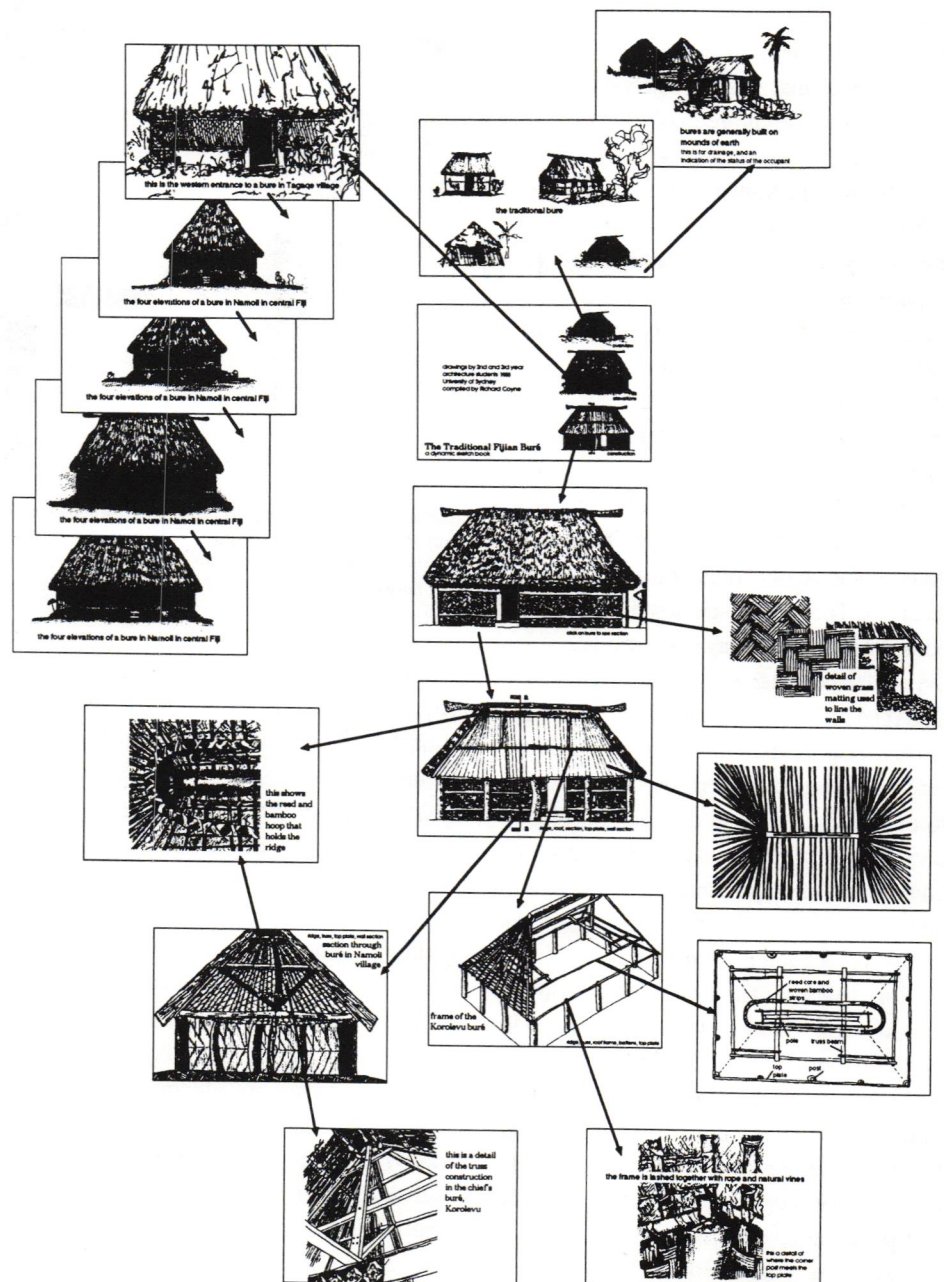
The introduction is followed by the equally stimulating paper, "What Designers Do That Computers Should" by George Stiny, the prime developer and motivator of "shape grammars" in architecture. Here Stiny presents probably the most comprehensible summary of formal shape generation in architecture. He starts from a point diametrically opposite to the one adopted by Mitchell in the previous paper, namely that "the uselessness of computer drawings is precisely their structured nature." In other words, the common complaint that the fixed character of design descriptions and description manipulations in CAAD impedes creative and inventive treatment of a design. The author argues that the appropriate descriptive structures and their formal expressions can be derived through analyses of

issues such as variability, flexibility, and multiplicity (much underrated in the CAAD community) in the conventional architectural drawings on paper. Such validation of traditional practices has a sobering effect that can be valuable to researchers and students of architecture.

"Tools for Exploring Associative Reasoning in Design" by Richard D. Coyne focuses on two specific types of computer systems: hypermedia and neural networks.

This informed introduction to associative mechanisms in computer science is a much-appreciated addition to CAAD bibliography at a time when new Hypercard stacks and similar software are appearing at a rapid rate. Dana J. Vanier complements Coyne's paper with a comprehensive introduction to the potential of hypermedia as design information systems in "Hypertext: A Computer Tool to Assist Building Design."

"Top-Down Knowledge-Based Design"



A Hypercard stack and links formed by associations between pictorial elements. (From *The Electronic Design Studio*.)

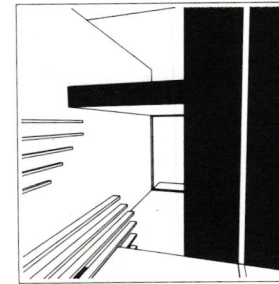
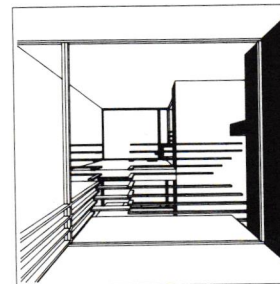
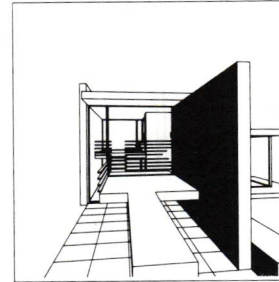
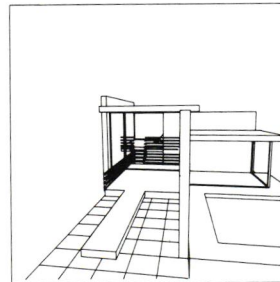
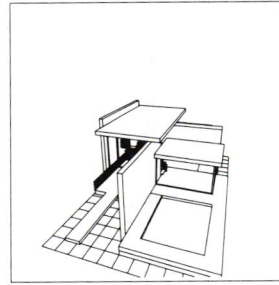
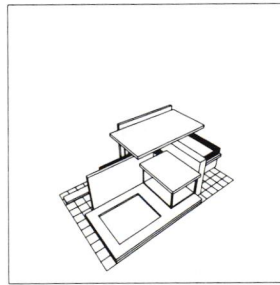
by Mitchell, Liggett, and Tan, presents a top-down design production approach that has been already made popular through *The Art of Computer Graphics Programming* by Mitchell, Liggett, and Thomas Kvan (New York: Van Nostrand Reinhold, 1977). Whether architectural design and drafting should proceed bottom-up (from a definition of the parts to a definition of the whole) or top-down (from the whole to an elaboration of the parts), the paper proposes a reasonable way of coordinating the elements that make up a design.

The paper that probably gives the most clues to the future evolution of the CAAD workstation is Patrick Purcell and Dan Applebaum's "Light Table: An Interface to Visual Information Systems." The combination of laser-disc, computer network, and interactive video technology it describes is an accurate picture of the state of the art and indicates the possibilities for integrating different information media.

"Computational Design Instruction: Toward a Pedagogy" by Ömer Akin should be of particular interest to teachers. The author stresses that the computer, even if it may never replace the human designer as originally assumed in CAAD circles, is not a mere addition to existing design capabilities but a significant force of change in the way we design. A way to exploit this force in design education is presented in an excellent account of a studio course that clearly identifies the problems and possibilities offered by the adoption of computer technology in design.

Earl Mark's "Case Studies in Movie-making and Computer-Aided Design" is one of the more stimulating in the volume. The comparison of different representations of the built environment, movies, and architectural drawings is exemplary of new directions for cognitive research into the computerization of architecture.

The book closes with another excellent contribution by Mitchell, entitled "Afterword: The Design Studio of the Future." It



Ulrich Flemming outlines a plan for teaching students architectural composition with computer assistance, such as software that would allow students to explore the effects of loosening the rules of engagement between panels. (From *The Electronic Design Studio*.)

reads like an updated summary of Mitchell's classic 1977 book, *Computer-Aided Architectural Design* (Van Nostrand Reinhold), complete with the history of the field, a learned and sober account of the state of the art, as well as the approaches and developments that seem likely to influence the future of computerization in architecture—a most appropriate conclusion to a varied collection of current trends.

In all the wealth of information in *The Electronic Design Studio*, however, something vital is missing: literature overviews and bibliographic references to earlier research. Many papers treat their subject as if it had never been discussed before. I am not implying that these papers necessarily constitute rediscoveries of the wheel—on the contrary, they may offer insightful solutions to real problems. I am simply stating my

amazement at some very obvious omissions, such as the conspicuous absence of any reference to the rich literature on shape recognition/transformation and computer-aided teaching in papers by Takehito Nagakura and Rob Van Zutphen. Some other papers, like one by Mark de Vries and Harry Wagter, fail to include any references to relevant literature whatsoever.

Does the absence of relevant literature denote ignorance of previous work in the field? I think that most of the papers are too advanced to accept such devastating criticism. An alternative explanation is that this absence represents a reaction to the established way of introducing new solutions to scientific problems through a concise evaluation of precedent research. It is undeniable that the merit and novelty of a solution should not be judged by the exhaustiveness of references to related and alternative approaches. Still, comprehensive overviews of precedent research are extremely useful in at least two ways. First, such an overview clarifies the innovations of the solution and its approach relative to similar attempts. It sets up a reference framework that is essential to the understanding of the exposition. Even experts appreciate a presentation of new ideas and products relative to known approaches and competing solutions. Second, an overview of precedent or related research can be invaluable to the reader as a guide to further in-depth reading. An essay of quality normally acts as a qualification for the literature it refers to. Many papers in *The Electronic Design Studio* missed these two points, consequently undermining readers' appreciation of their quality and making the credibility of their conclusions difficult to judge in the absence of relative measures of success.

THE ELECTRONIC DESIGN STUDIO: ARCHITECTURAL KNOWLEDGE AND MEDIA IN THE COMPUTER ERA, Malcolm McCullough, William J. Mitchell, and Patrick Purcell, editors, MIT Press, 1990, 505 pp., illus., \$19.95.

ANNABEL JANE WHARTON

Architecture and Ideology in Early Medieval Spain

Jerrilyn D. Dodds

Al-Andalus: The Art of Islamic Spain

Jerrilyn D. Dodds, editor

It is appropriate that these volumes be reviewed together. Jerrilyn D. Dodds is the author of one and the general editor of the other. The material and time frame covered in the two volumes are distinct but overlapping. *Al-Andalus: The Art of Islamic Spain* deals with the Islamic works produced in the Iberian Peninsula between the 8th and the 15th centuries, while *Architecture and Ideology in Medieval Spain* focuses on church construction from the early Christian period to the First Romanesque. The two works can be considered as complementary parts of a single project: the annexation of the previously peripheralized art of medieval Spain into the mainstream of western European cultural understanding. Despite these many coincidences, these two volumes were constructed on very different premises, which were imposed by their distinct genres: scholarly monograph and exhibition catalog.

In the *Architecture and Ideology in Early Medieval Spain* monograph, Dodds deals in a broadly chronological order with the Christian churches of Visigothic, Asturian, and Islamic Spain. Throughout the work, individual monuments are expressively described and effectively characterized in the best art historical tradition. The illustrative materials, plans, and photographs are well selected and well produced. Dodds' analyses of such churches as San Pedro de la Nave, San Julian de los Prados at Oviedo, and San Miguel de Escalada should make it difficult for art historians to continue to ig-

nore the contribution of Spain in their assessments of European architecture before the year 1000.

Further, Dodds' book may inspire some of those same art historians not only to add new monuments to their canon of research-worthy buildings, but, also, more generally to modify the questions they ask of their monuments. The author is unwilling to limit her consideration to the dates of buildings, their typologies and technologies. Each section of *Architecture and Ideology in Early Medieval Spain* raises issues in addition to those of chronology and form. The first chapter introduces the reader to the political and scholarly marginalization of the region as well as to the Christian architecture produced in an ethnically and religiously divided Visigothic Spain. Subsequent chapters explore the Christian reaction to Islamic power both on the edge of Al-Andalus and within it, particularly in terms of an architectural expression of Christian identity. In another chapter, Dodds traces the Islamic appropriation of Christianity's most effective spatial strategies.

Two aspects of Dodds' approach emerge from this summary of the contents of her book to distinguish *Architecture and Ideology in Early Medieval Spain* from conventional histories of medieval architecture. First, she considers in some detail the historiography that has modeled the interpretation of the monuments on which her work focuses. Though she does not provide a unitary account of her own assumptions, she

has interwoven in the text convincing assessments of the role of ideology in the construction of Spanish history. From the eulogistic presentation of Reccared's conversion from Arianism to Orthodoxy by Isidore, 7th-century bishop of Seville, to the nationalist debate of the 1940s and 1950s on the degree of Spain's cultural indebtedness to the Goths and Moslems, the peninsula's past has been written in the service of the author's present. Second, Dodds not only uses history to bring meaning to buildings, but also treats early medieval monuments as sources of historical understanding. For example, in her discussion of the Great Mosque of Cordova, she argues that the introduction of an elaborate entrance procession focused on a Koran-relic and the consequent modification of space in the mosque represented an ideologically complex exploitation of Christian liturgical practice as affective spectacle. Thus ritual and architecture give depth and texture to historical notions of Moslem/Christian cultural intersection; they are not flattened into a sterilizing scheme of "influence."

In all, Dodds' volume on the monuments of early medieval Spain is notable for its methodological sophistication as well as its archaeological and descriptive sensitivity. The work marks a significant advance in our knowledge of an understudied area of European architectural history. Just as significantly, this book also provides medieval architectural historians with a possible model for rethinking and rewriting the field.

An exhibition held in the Metropolitan Museum of Art in New York from July to September, 1992, provided the *raison d'être* as well as the title of *Al-Andalus: The Art of Islamic Spain*. As justly claimed in the volume's acknowledgments, this was "the largest and most comprehensive exhibition ever held of Spanish Islamic art." Over sixty collections worldwide lent a spectacular array of works displayed first in Granada and then in New York. In the book's last two hundred pages each of the objects included in either show (as well as a



San Miguel de Escalada, nave arcade; early 10th century. (From *Architecture and Ideology in Early Medieval Spain*.)



Patio de Comares at the Alhambra Palaces; completed 1370. (From *Al-Andalus: The Art of Islamic Spain*.)

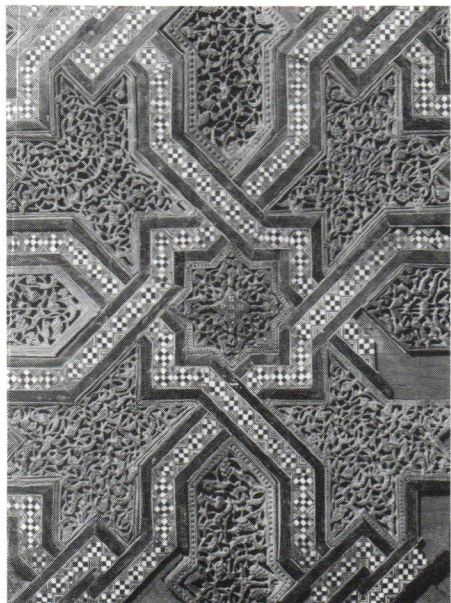
few that appeared in neither) is lavishly illustrated in at least one high-quality color plate, often reproduced at over-life-size scale. The form, history, and even, in many cases, the function of the piece is described by one of the twenty-four specialists representing five different countries invited to contribute to the volume. The objects are extraordinarily beautiful; the texts are useful. Presented are elaborately worked precious materials—ivory, gold, silver, and silk—as well as works of wood, marble, stucco, and bronze made precious through virtuosic elaboration.

Indeed, the criteria for the selection of

these ravishing artworks was their extraordinarily high level of craft. All the works displayed in the Metropolitan's exhibit were originally produced for royal patrons; here the elite culture of the past is re-presented to the elite culture of the present. *Al-Andalus* deals with this production of luxury in a noticeably schizophrenic manner. Although the second half of the text has the form of a conventional catalog, its first two hundred pages are occupied by a series of scholarly articles on different aspects of Hispano-Islamic art, history, and culture (though, oddly, there is no offering on literature). This first half is di-

vided into three parts, including two chronological sections, "The Emirate, Caliphate, and Taifa Period" and "The Almoravids and Almohads," and the third part treating one of the latest and best-known sites of Islamic Spain, the Alhambra palace (built during the 13th and 14th centuries). The contributions are mixed in their quality, reflecting the variation in the skills of the sizable team of scholars asked to participate in the project. Even if it were possible to read these offerings while viewing the objects (and it is not; carrying this four-hundred-page quarto—which weighs nearly six pounds even in paperback—through an extended viewing of the exhibition would be something of a feat), the lack of reference within the articles to the objects on display makes it difficult to construct their spatial or even their specific historical context. In consequence of its separation from its context, the artwork remains an object of contemplation, without the capacity to provide access to the past. The dyadic character of the *Al-Andalus* catalog does, however, reveal the developing rift between academics and museum professionals.

Admittedly, it is unfair to comment on what books do not accomplish. Nevertheless, the absence of two perspectives in both these volumes is regrettable. Little is heard from the third cultural contributor to the uniquely rich cultural mix of medieval Spain—the Jews. The exhibition entitled *Convivencia: Jews, Muslims, and Christians in Medieval Spain* and its weighty catalog (edited by Vivian B. Mann, Thomas F. Glick, and Jerrilynn D. Dodds, published by George Braziller and the Jewish Museum, 1992) helps compensate for this silence. Also unmentioned, presumably for political reasons, is the year of recent commemoration: 1492. The abundant cultural complexity in southern Spain constructed by Moslems, Jews, and Christians after the establishment of Arab control in A.D. 711 ended with the defeat of the last Nasrid sultan by the forces of Ferdinand and Isabella in 1492. It is, of course, appropriate to celebrate the luxurious production of eight centuries of a relatively tolerant Moslem rule on the 500th anniversary of the year



Detail from the side of a wood and ivory *minbar* (pulpit) from the Kutubiyya Mosque, Marrakesh; from Almoravid period, 1125–30. (From *Al-Andalus: The Art of Islamic Spain*.)

that marked the end of that culture and the beginning of Christian Spain's brutal suppression of the world's "others"—not only in the Americas, but in its European domains as well. It is unfortunate, however, that these circumstances go unmentioned, even with respect to the effects they have had on art in many parts of the world.

Both books attest to the richness, multiplicity, and historical significance of the art of medieval Spain. The appearance of these volumes, like the staging of major exhibitions of Spanish work at the Metropolitan and the summer Olympic games in Barcelona, and the high price of tourist travel in the country, suggest that Spain is now well within the compass of the first world. The Spanish sense of isolation and inferiority vis-à-vis other European countries, which is alluded to in both volumes, is soon to be itself only a subject of historiographical interest.

ARCHITECTURE AND IDEOLOGY IN EARLY MEDIEVAL SPAIN, Jerrilynn D. Dodds, Pennsylvania State University Press, 1990, 174 pp., illus., \$45.00.

AL-ANDALUS: THE ART OF ISLAMIC SPAIN, Jerrilynn D. Dodds, editor, Metropolitan Museum of Art and Harry N. Abrams, 1992, 432 pp., illus., \$75.00.

KATHLEEN JAMES

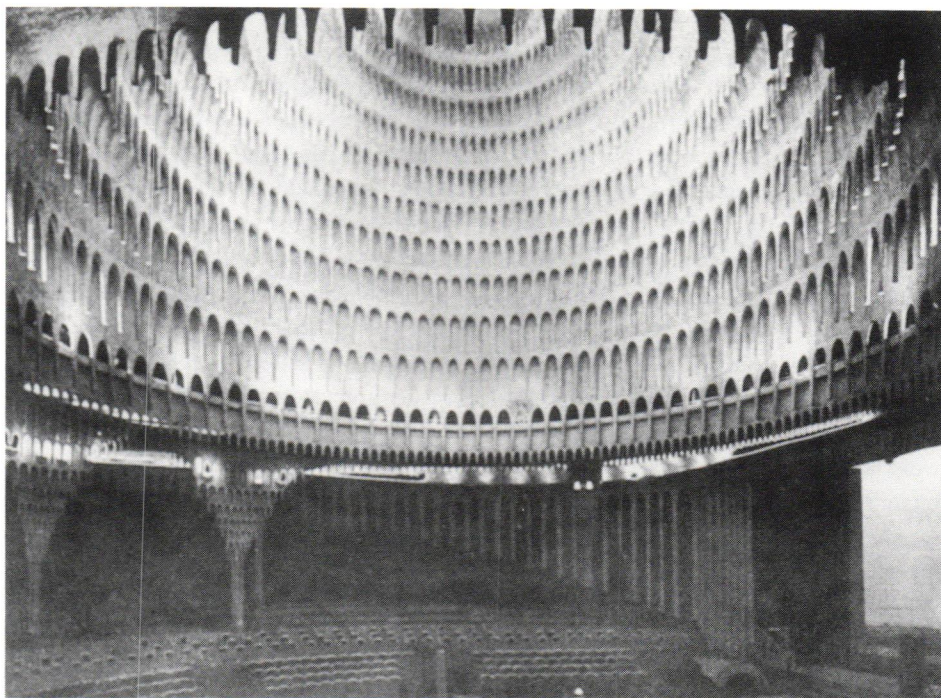
Hans Poelzig: Reflections on His Life and Work

Julius Posener

More than any other architect, Hans Poelzig's career perfectly captures the complicated transition from 19th-century eclecticism to the modern movement of the 1920s. This is true even though Poelzig, a German, did not participate in the best-known aspect of that transition: the brief turn-of-the-century flowering of Art Nouveau. Instead, he first attracted public attention in the last decade before the outbreak of World War I with a series of buildings in the eastern province of Silesia, now part of Poland. These early works defy easy categorization. Both then and in the postwar years, when he had become the elder statesman of the Germany's architectural community—a figure respected by all regardless of generation or political beliefs—he was ambivalent about history, the source his predecessors most cherished, and suspi-

cious of its 20th-century replacement: technology. Thus in 1921 he declared that he hated "history when it tries to restrict me and love[d] it when it arouses my artistic instincts," and he concluded a decade later that "there is . . . no point in trying to attach artistic significance to technical forms."

Throughout his career Poelzig mapped out a highly personal approach to design in which he combined vigorous massing (clay models were an essential phase of his design process) disciplined by extremely understated detailing. This method, an almost exact reversal of the attention lavished in the last third of the 19th century on ornament, proved particularly congenial during the brief period in which Expressionist architecture flourished in Germany immediately after World War I. Indeed, Poelzig's best-known building, the Grosses Schauspielhaus, opened in 1919. This transformation of Berlin's Schumann Circus into a 3,500-seat auditorium (for theater director and producer Max Reinhardt) was the most tangible realization during those years of Bruno Taut's utopian visions of community. Here experiments with indirect lighting uncharacteristically replaced structural integ-

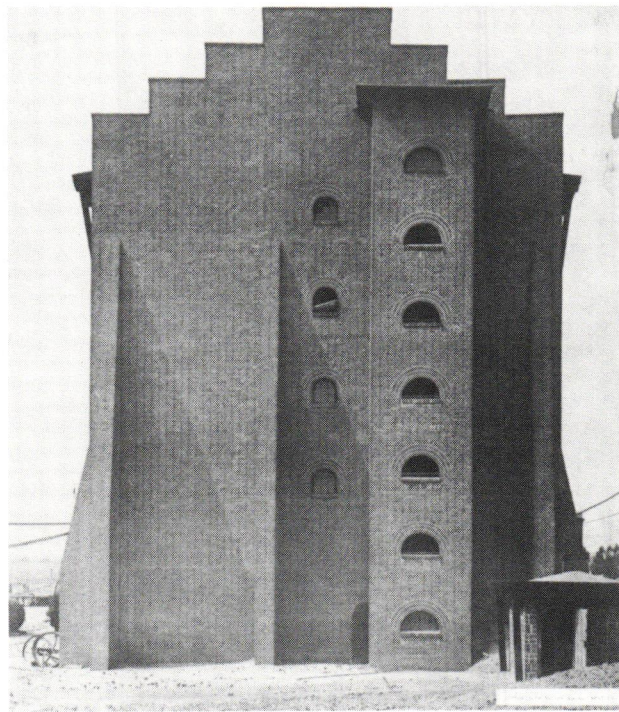


Grosses Schauspielhaus, with stalactitic "supports," Berlin, Germany; Hans Poelzig, 1919. (From *Hans Poelzig*.)

city as the focus of both the architect and his collaborator, his second wife, the sculptor Marlene Moe-schke. More typical are the chemical factory in Luban outside Posen in Germany (today's Lubon and Poznan in Poland) of 1911 and the I. G. Farben administration building in Frankfurt-am-Main, completed in 1930. The conventional stylistic labels "medieval" and "classical" are only marginally useful in describing these two ultimately ahistorical buildings in which the architect eschewed the opportunity to celebrate, or indeed even refer to, industry. Instead Poelzig's own claim, that "in most cases, today's steel or concrete building needs clothing," but that "this clothing must, however, allow the structure of the material that is actually carrying the load of the building to shine through," best captures the underlying respect for construction that unifies the pre- and post-Expressionist phases of his career.

Poelzig's reluctance to expose the structure of his buildings (a reinforced concrete commercial building in Breslau, completed in 1911, is an important exception) was not accompanied by any desire to escape the realities of modern life. Although he built very little housing, he forthrightly addressed most of the more public aspects of the modern urban environment: office buildings and shops, theaters and cinemas, and civic and industrial architecture. In both his completed buildings and his largely unrealized urban planning schemes, he balanced nuanced attention to site and scale with a fundamental clarity of organization. Thus his buildings are often imposing, but never overwhelming, and his respect for tradition remains quite distinct from those of his overtly antimodern colleagues who embraced national socialism.

Poelzig was also a distinguished teacher, first at the Royal Academy of Art and Applied Arts in Breslau (today Wrocław, Poland), which he directed from 1903 to 1916, and where the workshop method made famous by the Bauhaus was first imported into



The chemical factory at Luban, Germany (now Lubon in Poland); Hans Poelzig, 1911. (From *Hans Poelzig*.)

Germany from Britain, and later at several schools in Berlin after 1920. Here, Julius Posener, his pupil and author of *Hans Poelzig: Reflections on His Life and Work*, remembers him as singularly undogmatic. "He talked," Posener writes, "about the position of the dining room in relation to the kitchen, about comfortable and uncomfortable staircases, about the structure of roofs with large spans, about how different spaces with different functions could be made to relate to each other. He attached great importance to the basic facts of daily life and how one should build for them." Poelzig's studio, whose graduates included Egon Eiermann and Rudolf Schwarz, attracted the most modern-minded architecture students in Berlin, as well as those simply looking for more freedom of thought than was tolerated by his colleague, neoclassical architect Heinrich Tessenow. In many ways Posener's book is a final tribute to the "master" with whom the author studied between 1926 and 1929.

As Victoria Newhouse recounts in her foreword, Posener became an architectural historian late in life. Before returning to Berlin in 1961, he was a founding contributor to *L'Architecture d'Aujourd'hui* in Paris,

worked in the Jerusalem office of fellow Jewish emigré Erich Mendelsohn, and founded an architecture school in Kuala Lumpur. Now nearly ninety, he has been for the last three decades a prolific and insightful commentator on the history of modern German architecture, and has been especially successful at drawing attention to the varied Wilhelmine roots of what often appears as Weimar-era uniformity. Opinionated but broad-minded, he is today one of his native city's best-loved citizens, and counts among his friends even those such as Zaha Hadid, who departs most radically from his own architectural roots in the turn-of-the-century reforms of Hermann Muthesius. He has also been effective at offering to talented students much the same encouragement and guidance he himself received from Poelzig. This, the first monograph on

Poelzig in English, is Posener's second on his former professor.

Posener leaves to younger scholars such as Matthias Schnirren, the editor of *Hans Poelzig: Die Pläne und Zeichnungen aus dem ehemaligen Verkehrs- und Baumuseum in Berlin* (Cologne: Ernst & Sohn, 1989), the task of uncovering new information about the circumstances of individual commissions. Schnirren is responsible for an excellent catalog written in response to the discovery of more than 1,150 Poelzig drawings to which Posener devotes an approving postscript. Posener chooses instead to focus on what he is uniquely able to provide: a historically grounded meditation upon individual buildings and projects and the intellectual climate that inspired them, punctuated at times with his own often poignant memories and characterized above all by thoughtful analysis rooted in the lessons he learned from Poelzig himself. Thus, although he is not afraid to find fault, he operates much like an exceptionally unpolemical guest juror, judging the formal and theoretical clarity of the work on its own terms, at times tactfully reminding us that good intentions, no matter how excellent the theory

upon which they are based, are never a sufficient substitute for excellent design.

The book offers little new information to the specialist familiar with Posener's earlier writings, but for the larger audience unfamiliar with the German literature on Poelzig, it will serve as an excellent introduction to the central issues of architecture in the first third of the century. The author intersperses chapters devoted to specific buildings with more general analyses. He supplements the majority of his chapters with documentation sections, standard in contemporary German architectural history, in which he reprints key primary sources. The format leads to some repetitiveness, as both buildings and theoretical writings are often discussed twice, but Posener's unassuming, almost conversational tone, in which he places arguments before the reader—much as he would explain them to a student—encourages tolerance. And few of the documents, drawn largely from Posener's own *Hans Poelzig, Gesammelte Schriften und Werke* (Berlin: Gebr. Mann, 1970), have been previously published in English.

A subtle undercurrent that flows rather quietly through the book is Posener's belief, typical for a student of his generation, that Poelzig was a better architect than the more famous Peter Behrens, whose star had faded by the mid-1920s when much of his work was frankly derivative. Much of today's disparity between the reputations of the two colleagues can be credited to the iconic power of a single building, Behrens' AEG Turbine Factory in Berlin, but some is due to the fact that Behrens' buildings were much more accessible to Westerners after World War II than Poelzig's. The Federal Republic contained only two key Poelzig buildings, the I. G. Farben administration building and, in West Berlin, the Broadcasting House, both completed in 1930. I personally witnessed the demolition of the shell of the Grosses Schauspielhaus in East Berlin in 1985, and many of Poelzig's surviving buildings are situated on land that now belongs to Poland, where they are, of course, less valued than if they were considered part of that country's own national tradition. Poelzig himself commented in 1911, the year in which he de-

signed the chemical factory in Luban, that "probably every fifty years one factory building will make way for a new one." Just two years ago, the company's management—struggling to modernize the factory's clearly antiquated facilities in order to compete in newly open markets—demolished a large part of one of Poelzig's most widely published buildings. Local preservation authorities finally stopped the demolition, but not before the interior wooden framing, which was formerly invisible in the familiar views illustrated by Posener, was exposed. One may hope that a by-product of this book will be a greater appreciation of Poelzig's work by an international audience able to view the specifically German circumstances that produced Poelzig's architecture, and to view its significance within a larger European culture.

As well as raising issues of preservation, Poelzig's career offers lessons on the inte-

gration of past and present, lessons that will appeal to many of Posener's readers. In 1922 Poelzig declared, "Anyone who tries to steal only the formal aspects of tradition will be dazzled and dominated by it. On the other hand, anyone who admires tradition but approaches it critically and takes from it only those elements that are in organic harmony with our times will be richly rewarded by tradition; it will help him to lend his design something of eternal value." Whether or not we continue to believe in the possibility of timelessness, it was certainly this attempt that inspired the aspects of Poelzig's designs that remain most interesting today.

HANS POELZIG: REFLECTIONS ON HIS LIFE AND WORK, Julius Posener, edited by Kristin Feireiss, translated by Christine Charlesworth, The Architectural History Foundation (distributed by MIT Press), 1992, 287 pp., illus., \$50.00.



I. G. Farben administration building, Frankfurt-am-Main, Germany; Hans Poelzig, 1928–30. (From *Hans Poelzig*.)

PEGGY DEAMER

Surface (Schumacher on Terragni) and Symbol (Leet on Albini)

Thomas L. Schumacher's *Surface and Symbol: Giuseppe Terragni and the Architecture of Italian Rationalism* states that historiographically, the problem of Terragni (and Italian Rationalist architecture in general) is the problem of Italy: fascism. By this he means that architectural historians, elsewhere able to deal with modernism as a social and formal phenomena, in Italy have to deal with the unseemly politics as well. The dilemma for the historian/critic is this: to link the examination of the buildings to the disastrous, antidemocratic politics unnecessarily degrades good architecture; to not link them degrades the meaning, both intended and unintended, of the buildings. Schumacher is not only correct in pointing this out, but seemingly correct in his desire to do a revisionist text that will liberate Terragni from merely being seen as a sideline figure to the "purer" (stylistically and politically) modernists of northern Italy.

But if the problem of Terragni is the problem of Italian fascism, the problem of *Surface and Symbol* is the problem of architectural postmodernism. For while the desire to broaden the scope of inquiry beyond a modernist apologia (as Schumacher sees it) is admirable, the actual result is a trivialization of both the issue of modernism and the manner in which we understand Terragni.

This is not for lack of good intentions. Schumacher rightly sees the necessity of presenting Terragni in his own context; he sees the necessity of going beyond the merely formal evaluation of Terragni à la Peter Eisenman, and yet he also sees that formal analysis can help transcend dry historicism; he under-

stands the need to expand our knowledge of Terragni beyond the Casa del Fascio and one or two Milanese apartment buildings; and he rightly, I think, sees that, to do justice to the difficult issues of Terragni's relationship to fellow Italians and the relationship of Italians in general to their colleagues in the North, something other than a chronological/biographical outline needs to be developed.

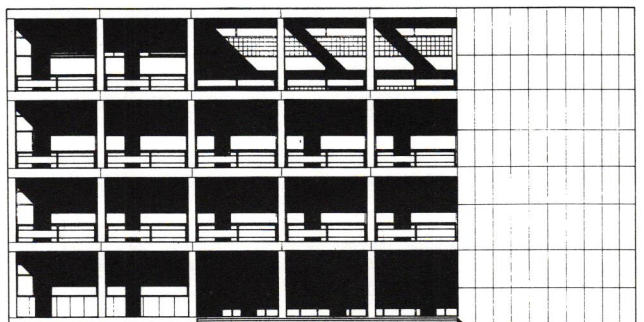
But the rejection of chronology requires another organizing principle, which this book never reveals. The sections are titled "Part I: Background," "Part II: The Evolution to Modernism," "Part III: Symbolism." The progression from Part I to II might seem chronological but is actually a distinction between a cultural background and a stylistic discussion; Part III deals with a typological category—the major public buildings of the thirties—and there is little clue as to the conceptual meaning of "symbolism." This methodological schizophrenia is a symptom of the book's missing soul. Such a misplacement can be seen, I suppose, as itself a postmodern condition, and were Schumacher interested in this sort of



Novocomum Apartments, Como, Italy; Giuseppe Terragni, 1927–29. (From *Surface and Symbol*.)

poststructuralist self-scrutiny, the book might in fact be interesting. Unfortunately, however, the postmodernist expression represented by this text is the most uninteresting pursuit of stylistic second-guessing. I think (and this is a guess, for the authorial voice is so vague) that Schumacher knew that his real interest—the manner in which Terragni learned his modernism and the chronology of stylistic adaptations—was not really going to address Terragni conceptually enough; hence he packed it into a text that aspires to be much more.

The problems with this approach aren't surprising given postmodernism's difficulty in dealing with politics and culture on the one hand and modernism (which it wants to reject but to which it is so intimately bound) on the other. In this particular instance, Schumacher's struggle with the cultural issue is indicated by the highly circumscribed and simplistic discussion on how modernism was viewed by Italy's cultural leaders. While he indicates that any black and white distinction between a "rear guard" holding up the value of tradi-



Meeting in front of the Casa del Fascio in 1936 (above); front facade (below) Como, Italy; Giuseppe Terragni, 1932–36. (From *Surface and Symbol*.)

tional forms and an “avant-garde” promoting new forms is impossible to maintain, he nevertheless glosses over the full complexity of the issue as it was debated. Schumacher does point out that the more traditional group—led by Pio Piacentini, based in Rome and represented by *Architettura*—was often supportive of modern architecture while the modern group—the Rationalists, based in Milan and Como and represented by *Casabella*—was intensely interested in traditional Italian architecture. But he ignores the far more interesting (because it goes to the heart of modernism’s claims to meaning) and culturally revealing tensions within the Rationalist group itself. The Milan-based group that gathered around Edoardo Persico and Giuseppe Pagano, the editors of *Casabella* in the 1930s, was committed to the idea that Rationalism’s gift to Italy lay in its social pragmatism—that is, functionalism, the repetition of forms, and the use of standardized, industrial materials. As a consequence, they had little tolerance for Terragni and his Como-based Gruppo 7 (which was supported by the magazine *Quadrante* and its editor Pietro Maria Bardi, from 1933 to 1936) who believed that Rationalism’s contribution to Italian architecture lay in its formal language—that is, the transparency of glass and the grid/frame structure to express the openness of fascist society; the rhetorical capacity of a modern “language” not bound by functionalism; and the interest in difficult, demanding construction that relied on local materials and building craft. For Persico and Pagano, Terragni’s formal “symbolism” was merely self-indulgent. Late in the text, Schumacher notes in passing that Pagano rarely supported Terragni or gave him exposure in *Casabella*, but without knowledge of Pagano’s or *Casabella*’s ideological point of view, we get the impression that there are merely some competitive personality problems.

By refusing to talk about such ideological debates head on, Schumacher not only denies himself the

opportunity to work the recontextualization of Terragni that he aspires to, but also prevents himself from achieving an even more profound recontextualization of modernism itself. Terragni’s (and the Rationalists’) situation in Italy exacerbated the enormous strain inherent in the issue of where, precisely, modernism’s social service lay. The tensions between an economic and a formal propaganda, as well as those between autocratic dictum and democratic choice were an aspect of modernism everywhere; they were simply more extreme in Italy. Instead Schumacher presents a stylistic reading of Rationalism, and of modernism as well, and as such, one that delivers an inert and unchallenged Terragni.

The second problem with treating Terragni and modernism as an issue of style is the inability to directly discuss of Terragni’s formalism. One might think that a stylistic reading would be, if short on cultural critique, long on formal analysis; in fact (and this is the double limitation of architectural postmodernism), a concern for style ultimately implies a suspicion of the authorial intention that usually motivates formal analysis. The most valuable part of Schumacher’s book (although one has no idea of what Schumacher intends with this piece) is the translation of Terragni’s own report on the Casa del Fascio, published in *Quadrante* 35–36, in which the architect so articulately links his passion for form-making with fascism. Terragni himself provides

what the rest of Schumacher’s book so sorely lacks—namely, an understanding of how form-making is necessarily a cultural and political act. As it is, the formal analyses that Schumacher provides are left unsubstantiated. While these analyses are interesting and perceptive—this is clearly a forte—the book gives the impression that Schumacher himself feels uncomfortable with the place these analyses might have in a text that is nominally historical and “revisionist.”

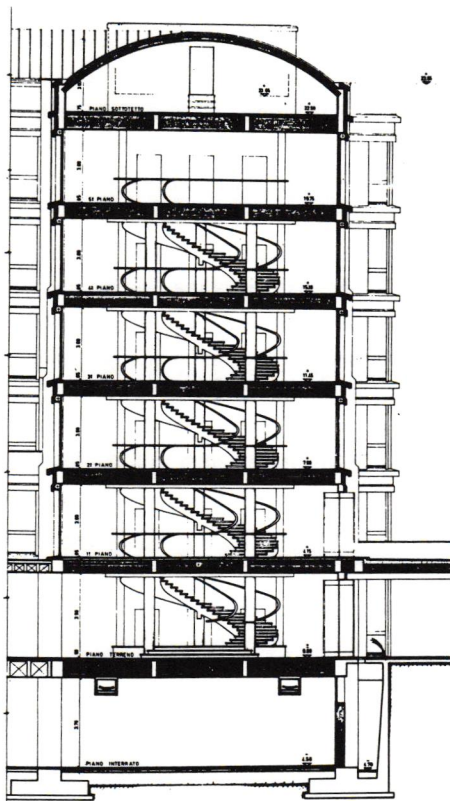
The irony is that the author’s lack of commitment to formal analyses ultimately distances the reader from Terragni, the man. While the written and visual analyses of someone like Peter Eisenman are equated with ahistorical, acultural object reification, Eisenman has amply demonstrated that the formal rigor, complexity, and conceptual layering of Terragni’s buildings are evidence of the passions of the man. Because Schumacher’s book is neither a convincing cultural history nor a committed architectural investigation, one loses sight of why Terragni matters to the author, let alone to the reader.

While the exhibition catalog *Franco Albini: Architecture and Design, 1934–1977* is very different in scope and nature from Schumacher’s book on Terragni, it provides in many ways an informative point of comparison. Although Albini’s major contribution to architecture is in the realm of exhibition design and his major commissions came after World War II, Albini, like Terragni, was an integral part of the Milan-based, *Casabella*-dominated debate on modern architecture. Thus the material covered in the three essays of this catalog—one by the book’s editor, Stephen Leet, who organized the traveling exhibition on which the book is based, one by Albini’s partner Franca Helg, and one by his colleague, Alberto Sartoris—is similar to that of Schumacher’s on Terragni.

The two contributions by Albini’s contemporaries give this book a clear advantage as they im-



Franco Albini's apartment, Milan; 1938–40. (From *Franco Albini*.)



Section and staircase, New Baths, "Luigi Zoja," Salsomaggiore, Italy; Franco Albini with Franca Helg, 1967–71. (From *Franco Albini*.)

part the flavor of the passion with which the issue of modernism as a social vehicle was embraced in Italy in both the periods between the wars and after World War II. Albini was greatly influenced by Persico and Pagano, so the whole issue of how standardization is or is not realized (or is or is not intrinsically "fascist") comes immediately to the fore (whereas it is completely missing in Schumacher's text). Especially in the devoted but clear essay by Helg, which presents a view of Albini, the man (who, we learn, is integrally bound with Albini, the architect), the reader senses immediately how the issues of form, function, and rationalism were seen as extensions of a philosophical, cultural, and political life.

It is perhaps unfair to draw a comparison between the two books, for the essays on Albini gain in fire what they need not maintain in objectivity. But even in the principal essay by Leet, which gives the more "historical" overview of the work, one recognizes the advantage of having and holding



an architectural opinion. Certainly Leet might be too close to his subject (he, too, is an exhibition designer who has clearly learned his lessons regarding the leanness and precision of potential solutions from Albini) as evidenced by the resonance of words such as "essence," "objectivity," "fact," used by both Leet and Helg-as-voice-for-Albini. But the affinity that Leet clearly shows for Albini's conceptual rigor and architectonic minimalism not only grabs the reader and demands a close look at the plentiful drawings and images, but also provides a platform from which to ask the broader questions of cultural debate. Together, the three essays, the photographs of the works, and the detail drawings make *Franco Albini* a pleasure to read, look at, and contemplate.

In the end, one feels badly for disparag-

ing the impressive, scholarly contributions that Schumacher has devoted to this complex, little understood, and rarely translated subject. But while author doubtless deserves thanks for his many contributions to Terragni scholarship, it remains unfortunate that pleasure was not among the book's textual by-products.

SURFACE AND SYMBOL: GIUSEPPE TERRAGNI AND THE ARCHITECTURE OF ITALIAN RATIONALISM, Thomas L. Schumacher, Princeton Architectural Press, 1991, 295 pp., illus., \$34.95 (cloth); \$24.95 (paper).

FRANCO ALBINI: ARCHITECTURE AND DESIGN, 1934–1977, Stephen Leet, Princeton Architectural Press, 1990, 138 pp., illus., \$14.95.

RIITTA NIKULA

Temptations of Nordic Architecture

We Finns are always delighted to see an international publisher devote a book to our culture. International grants allow foreign researchers to discover the subtleties of Finnish architecture and to write about it from fresh viewpoints. In addition to architecture, these researchers often also introduce their readers to Finnish scholarship, thereby inspiring a welcome international discussion on Nordic culture in general.

Last summer brought high spirits in Finland when the international publishing firm Rizzoli released Scott Poole's handsome book, *The New Finnish Architecture*. Rizzoli is renowned not only for the beauty of its books but also for the effectiveness of its marketing. The book would not remain a secret treasure in limited circles, but instead, would serve as a basic reference for some time.

Modern architecture has strongly marked Finland's national image. Eliel Saarinen and Alvar Aalto are subjects of national pride. Finnish architects and researchers, happy about the frequent visits of foreign colleagues, do their best to satisfy international curiosity by giving lectures and disseminating their writings.

The Museum of Finnish Architecture, the central source of international information on Finnish architecture since 1956, has organized more than three-hundred exhibition events all over the world and has published numerous books either independently or in collaboration with commercial publishers. Yet, unfortunately, the international distribution of these books is difficult, the production costs and cover prices are high, and the editions are small. So we Finns anxiously anticipated the arrival of Poole's book. Supported by Colin St. John Wilson's introduction, Poole reignites the myth of the uniqueness of Finnish architecture with almost stupefying pathos. The age-old symbols of "Finnishness" related to the mysti-

cism of nature, sauna, and Kalevala compose a warm background for the splendors of the newest Finnish architecture.

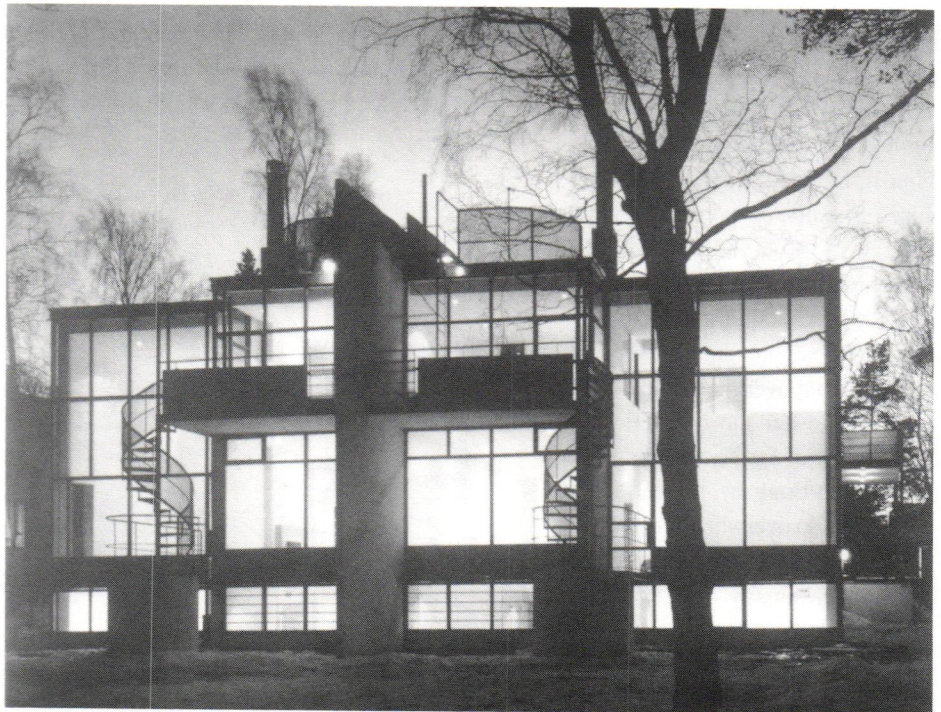
The critic, however, cannot help but ask: What is the vision of this elaborate book, and what, as a result, will be held as the "truth" of Finnish architecture?

The book begins with three introductory essays and a selection of Aulis Blomstedt's aphorisms, which serve to outline the background and create an atmosphere for the book. Next, the main section presents the work of thirteen architects or offices, emphasizing the 1980s. The book is clearly organized, its spacious layout accentuating its fundamental message: that Finnish architecture is unique in its clarity. The illustrations are abundant, and photographs and drawings are impressively juxtaposed. The result is a very elegant book.

In his introduction, Colin St. John Wilson surveys Finland's relation to the modernist tradition. According to Wilson, from the 1920s on, the architectural culture of Finland advanced at the same pace as the innovations of international creative modernism. In Finland, modernism encountered an exceptionally deep social resonance.

This was related to the development of Finnish society, in a country which first gained national independence in 1917. As expected, Wilson emphasizes Alvar Aalto's contributions. Describing Finland's synthesis of many influences, Wilson makes an important general point about the potential of a peripheral culture: "Neither England nor the United States provided any comparable engagement or contribution to the give-and-take of innovation and promotion, of practice and polemic, that we now identify as the great modernist adventure of the 1920s and 1930s. By comparison, the architectural culture in Finland (in which the constructivism of Russia was as active as the classicism of Sweden, and the purism of Paris as provocative as the new objectivity in Berlin) from the late 1920s onward grew contemporaneously with the original innovations."

When discussing the development of Aalto's municipal library of Viipuri, Wilson brings up the Stalinist plans for alterations drawn in the 1950s by Soviet designers. The "croquant classicistic" coating they proposed to place over the pure forms of Aalto's building is quite a shock. But it is a



Lyökkinieki, six semidetached houses, Westend, Espoo; Erkki Kairamo of Arkkitehdit KY, 1990. (From *The New Finnish Architecture*.)

pity that Wilson does not tell us who found these drawings in Viipuri's vast archives. Their existence was completely unknown until Sergej Kravchenko brought copies of them to the Museum of Finnish Architecture, which published them in Kravchenko's sensational article in the 1990 yearbook, *Acanthus*. To acknowledge a Russian colleague living far from the spotlight would not have diminished Wilson's importance.

Wilson continues the story, from Aulis Blomstedt, the rationalist, through Aarno Ruusuvuori, the minimalist, to today's trendsetters, those heroes Poole later presents. Poole is an American architect who has made extended visits to Finland, where he has traveled widely and formed friendships with many architects. He knows his subject well, and his many sources include material in the Finnish language.

Poole proposes to concentrate on the rationalistic trend of Finnish architecture: those architects who have sought structural clarity, simplicity, and purity. According to Poole, these elements, nurtured in Helsinki University of Technology, have been dominant in the theoretical discourse of Finnish architecture during the last thirty years, but have not been given adequate international attention.

Poole's introductory chapters survey the meanings of the new Finnish architecture from two premises. The first essay calls attention to Aalto's Villa Mairea via the French philosopher Gaston Bachelard, whose poetic approach was deeply influential on architectural discussion all over the world during the 1980s (after the translation of *The Poetics of Space*, written in the 1960s, into English). His influence on Poole is so overwhelming that literary quotations and free associations occasionally obscure the subject matter.

In another chapter, "The Construction of Silence," Poole echoes the writings of Juhani Pallasmaa. Continuing Wilson's introduction,

he traces the line of Finnish rationalism and the search for pure beauty in architecture, applied arts, and visual arts as a dynamic dream of a better, more beautiful, and more real life. The references to visual arts and applied arts, however, remain superficial.

Poole's writing becomes more natural when he discusses architecture. When design is the subject matter, his forced eloquence yields to tranquil pondering. The scale of the works presented varies, as does the number of works selected from each architect. Poole follows his thesis throughout, gently looking for clarity and harmony. He focuses on tradition, place, silence, and light—the living dimensions of architecture—with a markedly formal approach. Historical facts are inserted in the text in some special cases in order to clarify the function of the building. The author has entered his material carefully, evidently observed most of the buildings on site, and has read Finnish descriptions of them conscientiously.

All areas of design are included in the book, from Georg Grotenfelt's small sauna to Arto Sipinen's proposal for the center of Helsinki. Pallasmaa's buildings are accompanied by his industrial and graphic designs. Poole describes realized buildings such as Kristian Gullichsen's Poleeni cultural center in Pieksämäki, Kari Järvinen

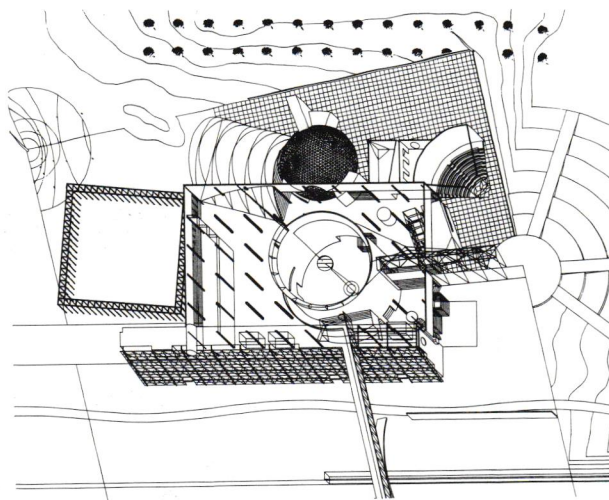
and Timo Airas's day nurseries, Mikko Heikkinen and Markku Komonen's Heureka science center and Rovaniemi Airport—all of which demonstrate the strength of Finnish building.

In addition to completed buildings, Poole also presents a number of important unbuilt projects that will, it is hoped, serve as a reminder to those who have power over the built image of Finland: When will Aarno Ruusuvuori's extension of the National Museum be constructed, or the joint extension of the Museum of Finnish Architecture and the Museum of Applied Arts, designed by Tuomo Siitonen? When will Juha Leiviskä's Art Museum be erected in Kajaani?

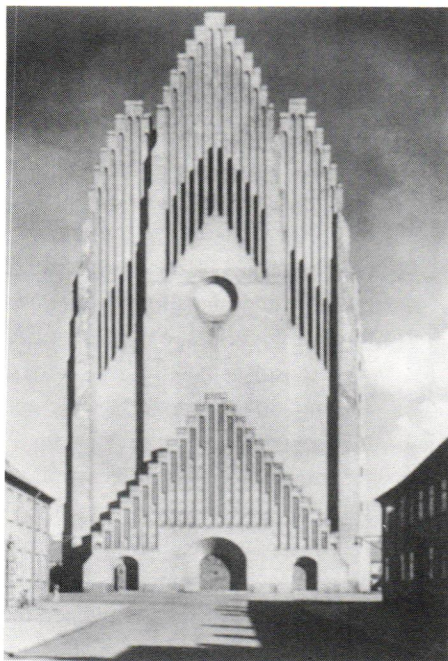
As sympathetic as Poole's depiction of Finnish architecture is, as marvelously as it tickles our national vanity, the book's contents and organization cannot fail to draw attention to an important issue of research ethics: What is this selection based on? Where does Poole's vision come from?

The architects presented in the book are virtually the same as those featured by the Museum of Finnish Architecture in its exhibitions and publications during the last few years. The museum's exhibition, "An Architectural Present—7 Approaches," first displayed in the summer of 1990, covers the major part of Poole's book. Only one architect in that exhibition was omitted in Poole's book. While it is reassuring to see that out of the more than two-thousand architects active in Finland, exhibition organizers Marja-Riitta Norri and Severi Blomstedt were able to make a selection that is unquestioningly accepted, it is a shame that the exhibition or the catalog related to it is not mentioned anywhere in Poole's book.

The "7 Approaches" exhibition is now on a successful international tour, currently in Japan. The exhibition catalog is almost sold out. The situation will be awkward when the exhibition comes to the United States in 1993, because it will look



Cutaway axonometric of Heureka, the Finnish Science Center, Helsinki, Finland; Mikko Heikkinen and Markku Komonen, 1988. (From *The New Finnish Architecture*.)



Grundtvig Church, Copenhagen, Denmark; P. V. Jensen-Klint, 1920–40. (From *Architecture in the Scandinavian Countries*.)

as if the exhibition was based on Poole's book, rather than vice-versa.

We Finns are very pleased with the sympathetic attitude of many foreigners toward our culture, but it is difficult for us to understand why such friends could not be more honorable in acknowledging their debt to Finnish exhibitions and publications. We make great efforts and spend a lot of money in order to express ourselves in foreign languages, most often in English. Why, then, are the international rules of research etiquette overlooked with respect to our writings?

Marian C. Donnelly's book *Architecture in the Scandinavian Countries* takes a totally different approach to the architecture and research of peripheral countries. With the courage of an outsider, she has taken on a massive subject, introducing readers to the building traditions of a huge geographical area from prehistoric times to the 1970s.

Donnelly's sympathetic attitude is that of a modest mediator. Without imposing her views, she openly admits the difficulty of her task: "An introduction of the kind offered here is necessarily highly selective. Readers familiar with the Scandinavian countries may well find some of their favorite build-

ings or favorite architects missing. Some of the author's favorites are missing as well. The effort here has been to achieve a reasonable balance among the accomplishments within the several nations, bearing in mind that the national boundaries have not always been what they are today."

Architecture in the Scandinavian Countries presents an enormous number of buildings in their general historical context. The author proceeds with such briskness that Nordic specialists will certainly find faults with her account. Admittedly, there are minor mistakes in the book, but specialists can be answered by asking them to produce a work as concise as Donnelly's. Not many could do it. Nor would many attempt to master such a mass of material. Scandinavian researchers tend to restrict themselves to relatively narrow fields, and to keep to them with criticality, often to the point of becoming arcane.

In Donnelly's book, the course of history weaves the culture of Scandinavian building into an interesting story that can easily be followed without prior knowledge of the subject. This is what makes the book so useful: it serves as a valuable introduction to a subject whose deeper issues, values, and meanings will unfold to readers in subsequent work, possibly with the help of Donnelly's respectfully ample bibliography.

THE NEW FINNISH ARCHITECTURE, Scott Poole, introduction by Colin St. John Wilson, Rizzoli, 1992, 224 pp., illus., \$50.00 (cloth); \$35.00 (paper).

ACANTHUS 1990: PAPER—ARCHITECTURE—RUINS, Marja-Riitta Norri and Maija Kärkkäinen, editors, Museum of Finnish Architecture, 87 pp., illus., \$25.00.

AN ARCHITECTURAL PRESENT—7 APPROACHES, Marja-Riitta Norri and Maija Kärkkäinen, editors, Museum of Finnish Architecture, 1990, 192 pp., illus., \$35.00.

ARCHITECTURE IN THE SCANDINAVIAN COUNTRIES; Marian C. Donnelly, MIT Press, 1992, 401 pp., illus., \$39.95.

GREG CASTILLO

Thermonuclear Family Values

The year was 1949, and participants at an American Institute of Architects convention in Houston were attempting to divine what the atomic age held in store for their profession. The likelihood of buildings being subjected to an atomic blast was thought to be, for some places, even greater than the threat of natural disasters like hurricanes or earthquakes. For a session on civil defense the speaker was Rear Admiral William S. Parsons of the Navy. He had just received a draft of a new handbook on the effects of atomic weapons, compiled by the scientists at Los Alamos, New Mexico. The prognosis was grim. Complete protection could only be achieved at the impossible expense of moving entire cities underground. Architects, urban planners, and their clients would simply have to accept the limited protection afforded by conventional bomb shelters. In light of this, the most important element of an atomic defense plan was attitude. To avert "a hysterical effort to buy absolute safety . . . we should make every effort to add atomic facts of life—subtle and obvious, pleasant and unpleasant—to our folklore."¹ In other words, rather than being physically constructed, our mode of survival was to be culturally construed. The tenuous foothold at the brink of nuclear war was to be normalized in a worldview that would desensitize its beneficiaries and allow them to get on with the business of postwar prosperity.

Forty years later, from a vantage point overlooking the dusk of the Cold War, Rear Admiral Parson's cultural prescription seems to have been instituted with mixed success. The Atomic Cab Company, Atomic Undergarment Company, and atomic motels, cafes, burgers, and cocktails are mostly gone, their memory bathed in the friendly neon glow of '50s kitsch. But "fallout" lives on as a term to describe, for example, the consequences of a political fiasco; the word "bikini" also sur-

vives, named after an atoll in the South Pacific rendered uninhabitable by thermonuclear testing (despite a fresh layer of uncontaminated topsoil shipped in from Nevada).

Parson's admonition to not attempt to buy survival through architectural innovation was by no means universally accepted. The spectrum of environmental responses, both visionary and realized, that attempted to blend the "atomic facts of life" into the landscape of daily life remains an unwritten chapter in the history of the postwar era.

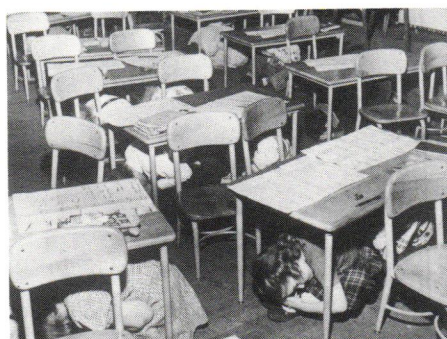
The self-effacing character of thermonuclear culture has permitted many of its architectural artifacts to slip quietly from view. Examination of some of these is strictly regulated or generally prohibited. Such is the case of the desert town known alternatively as "Survival City" or "Doomstown, U.S.A." Remnants of its tract homes, steel industrial sheds, parking structures, and experimental concrete domes and vaults stand in a ruinous ensemble on Nevada's inaccessible Yucca Flats test site, forty years after the atomic demolition that brought their moment of mass-media fame.² Other relics of an atomic age building culture are concealed by design—I am referring of course to the family bomb shelters that still lurk beneath suburban backyards across America, as well as the deluxe versions built to safeguard elected officials. An inventory of those would include the expansive facility secretly constructed beneath West Virginia's posh Greenbrier resort to serve the needs of a Congress-in-hiding; the "underground Pentagon" blasted into Raven Rock Mountain, six miles north of Camp David, Maryland; a similar refuge complete with a television studio for post-apocalypse addresses, intended for the president and Supreme Court justices, located beneath Mount Weather, Virginia; and numerous downscale models built by state govern-



U.S. Civil Defense advertisement, 1950s.

ments and agencies such as the Federal Reserve.

The design profession's contributions to a nuclear culture are buried as well—in libraries and archives. Journals of the period show crew-cut students proudly displaying the results of Pentagon-sponsored competi-



Second-grade schoolchildren are taught to take cover in the event of a sneak attack; New York City, 1951.

tions, such as Cornell's 1961 charrette for the design of an underground industrial community connected by a conveyor belt of chairs running through subterranean tunnels, or Rice University's proposals for a fallout-sheltered factory. Architectural magazines were graced by fanciful designs for tubular cast-in-place highrises, concrete houses with sensor-actuated steel shutters, and announcements of atomic age building materials like "flex-seal," the hinged, shatterproof window, and a blast-resistant curtain wall.

Urban planning's flirtation with doomsday was more methodical. When nuclear scientists pitched the notion of urban dispersal in the mid-1940s as an answer to the threat of atomic attack, highly placed members of the planning community were quick to jump on the bandwagon. Although their motives were altruistic, they came to the nation's aid with a hidden agenda. The dispersion lobby saw the defensive requirements of the atomic age as an opportunity to bring America into conformity with modernist urban ideals.

The play was one with a venerable past. It had been used in the 1930s by Ebenezer Howard's biographer, Dugald MacFayden, to push garden city planning. Recalling the sporadic zeppelin forays over London in World War I, he wrote: "If England is to be liable to air raids . . . then a Garden City where houses and factories are spread over a wide area with plenty of spare room is a much safer place than a great city—which offers a perfect target for a bomber in a raid."³ A similar argument was advanced by another 20th-century urban revisionist, Le Corbusier, in his treatise *La Ville Radieuse*. He depicts his towers-in-the-park under attack with most bombs falling harmlessly in the greensward, and an armored roof deck deflecting the few direct blasts. Lifting the slabs on *piloti* is commended for allowing clouds of poison gas to dissipate, instead of pooling in street channels. State-of-the-art

destruction was also invoked to sell CIAM (Congrès Internationaux d'Architecture Moderne) planning a decade later in Jose Luis Sert's *Can Our Cities Survive?* (Cambridge: Harvard University Press, 1944).

Postwar dispersion proponents assumed the task of simultaneously courting the public and a wealthy patron: this was to be a New Towns program backed by the rank and file but enacted by Pentagon mandate. The spirit of the movement was summed up in a call that appeared in the *Bulletin of the AIA*, "to sell this dispersion, not necessarily as defense against military threat, but as a better way of life."⁴ Most advocates, in fact, did both. Tracy Augur, ex-officio president of the American Association of Planners, informed his readers that American cities, with their bull's-eye pattern of a central business district, weren't just vulnerable but actually provoked attack. Dispersal would yield safe and pleasant garden cities, and would protect us from the internal threat of sabotage by removing slums and thus eliminating the subversive ideas festering there. Clarence Stein, promoter of decentralization through an American New Towns program, championed his earlier concept of the regional city as an ideal defensive strategy serving the purposes of dispersion with little or no modification. Ludwig Hilberseimer, the former urban design director at the Bauhaus who had newly settled in Chicago with Mies van der Rohe at Illinois Institute of Technology, claimed that a judicious program of demolition and reconstruction could turn America's ubiquitous grid-plan towns into a visionary low-density settlement pattern. Here, leafy greenbelt parks would serve double duty as barriers to the spread of a nuclear firestorm. "Decentralization," he insisted, "is less a problem of money than it is of will." The same methods used to finance an army could just as easily reconstruct America, and "the compelling necessity for the use of these techniques" was at hand.⁵

Urban planning's postwar assault on the traditional city was aided by articles in the



Le Corbusier's sketch of *La Ville Radieuse* under attack, from *Sur les 4 Routes*, 1941.

popular press that envisaged the spectacle of a nuclear burst over a major metropolitan center, gory details included. Richard Plunz, chronicler of New York City's housing, has called this "a national mass-media campaign, made with the complicity of the federal government, which shamelessly contributed to the destruction of whatever remained of credible, urban middle-class life."⁶

Although it wasn't the orderly pattern of greenbelt-insulated new towns envisaged by planners, urban dispersion occurred nonetheless, courtesy of the National System of Defense and Interstate Highways. High on its list of design priorities, as presented to Congress in 1955, was the provision of a means of escape from major urban areas in a civil defense crisis. According to the commissioner of public roads, the needs of commuters and commanders overlapped, as mass evacuation routes would also be "escape routes for all of us when we go home every night."⁷ The Interstate system, the largest public works project ever undertaken, is another veiled artifact of a nuclear culture, its civil-defense origins obscure and largely forgotten.

The built legacy of the atomic age remains unapparent because its artifacts have not yet been gathered into an identifying chronicle. This eclectic harvest, ranging from bomb shelters to freeways, and its disparate audiences—civil-defense officials, anti-nuclear activists, survivalists, and suburban commuters to name a few—negates any claim that might be made for the construction of a normative history. A seamless narrative based on the continuities of a shared postwar culture would be a willful distortion of its patchwork genesis and conflicting readings.⁸ Any intention to write such a history would

falter upon its first step: just assembling the relevant literature unwittingly documents contradiction as the norm. This fragmentation of purpose and perception is well represented in recent publications.

Nuclear Disasters and the Built Environment, a report to the Royal Institute of British Architects (RIBA) by its Nuclear Working

Group, was conceived as an impartial assessment of the likely effects of a military attack or reactor meltdown on the inhabited landscape. Typical urban buildings and a variety of bomb-shelter designs are appraised for their protective merits in the face of various disaster scenarios. An ironic treatment of the same issues is presented in *Quonset Huts on the River Styx: The Bomb Shelter Design Book*, prepared by Architects, Designers, and Planners for Social Responsibility. With irony and black humor, it catalogs entries in a hypothetical design competition for bomb shelters intended to protect officials of FEMA, the Federal Emergency Management Agency. Despite contradictory approaches, both publications share a basic tenet: that civil-defense strategies would provide marginal protection at best from nuclear catastrophe, and none from the ensuing social and ecological collapse.

Two books by members of America's survivalist subculture stand that premise on its ear. "For most Americans, survival is not only possible, it is almost unavoidable," asserts Bruce D. Clayton in *Life After Doomsday*. He proceeds to outline everything you need to know to survive Armageddon, including a detailed survey of bomb-shelter design. For those who would prefer to weather the worst in the comfort of familiar surroundings, there's *The Survival Home Manual* by custom-home designer Joel M. Skousen. He provides a complete course in the discreet maximum-security remodeling of your average suburban home, as well as a treatise on the necessary corresponding modifications demanded of your average suburban life. Both authors argue with missionary zeal for a survivalist consciousness

that accepts the inevitability of impending catastrophe, and that prepares for it now.

Photographers Peter Goin and Richard Misrach, on the other hand, present the case that the catastrophe has already happened. Their respective collections of color photographs and commentary, *Nuclear Landscapes* and *Bravo 20: The Bombing of the American West*, unveil a world that we live beside and yet cannot enter: the ravaged proving grounds of our Cold War prowess. Both photographers present pictorial evidence that a limited war using conventional and nuclear weapons has been waged over the past forty years against the environment, notably on secluded tracts of government land in the West.

Its vast space and sparse population have made the western landscape the main theater of operations not just for military spoliators, but for militant survivalists as well. The latter are a diversified bunch who range from adherents of mystical sects to heavily armed misanthropes. All share a vision of the impending apocalypse and a determination to survive at any cost. A suggestion of the breadth of this normally clandestine movement surfaced in March 1990, when a doomsday call by New Age oracle Elizabeth Claire Prophet sent as many as 3,500 believers off packing to prepaid spots in forty-five underground bunkers with names like "Shelter Invincible" and "Heart of the Inner Retreat," in the Montana hills.

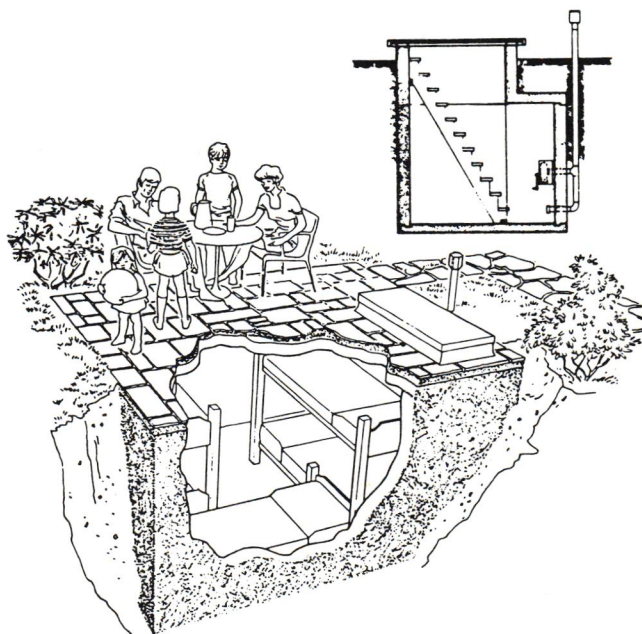
Today's survivalism movement is the wayward child of 1950s civil-defense preparedness. That federally sponsored blitz, exhorting families to stockpile rations, devise shelters and to "duck and cover," was quietly retired after the Cuban missile crisis threatened to plunge the nation into a hysteria. In the ensuing decades, not everyone found solace in a strategy of denial. Fundamental to survivalism, but not original to it, is the anticipation of an instantaneous, cataclysmic solution to social and political woes. Parallels have been cited in responses to the Great Chi-

cago Fire, which was embraced by a considerable number of citizens as a barely disguised blessing.⁹ Because the disciples of calamity, then as now, discern its underlying promise of purification, total annihilation becomes an unthinkable (not to mention counterproductive) outcome. "God will not permit the destruction of the world by nuclear exchange. It isn't in the plans," explains Joel Skousen in *The Survival Home Manual*. Bruce Clayton, who wields a Ph.D. in ecology from an institution that would probably prefer to remain unnamed, informs us in *Life After Doomsday* that "nuclear war will be the greatest social and biological catastrophe the world has ever known. It will be unprecedented, but it will not be difficult to survive it." Both authors ground these statements of faith on a war scenario in which bombing is strictly limited to strategic military targets and not civilian communities—World War II's register of urban destruction, which included innocents like Dresden and Hiroshima, notwithstanding.

Skousen and Clayton agree that the best ark for riding out their anticipated thermo-nuclear deluge is the standard radiation-shielding underground model. Clayton pulls his examples from civil-defense brochures

of the 1950s and reproduces them in all their banal, drafting-manual glory. He also touches on the fortified basement shelter, as well as a makeshift version that one can throw together at a moment's notice, since "a war might start while you are on vacation with relatives." Skousen's métier, on the other hand, is the top-of-the-line custom survival home. His designs represent the maturation of a building type proposed by many during the apogee of cold war tension, and realized by Texas contractor Jay Swayze in the Underground World Home prototype built for the New York World's Fair of 1964. The idea never caught on, and rightly so, says Skousen. The fully habitable bunker is extravagantly expensive and defeats its purpose by advertising its existence to the world through its weird architectural form.

The needs of survivalists are better met through paired domiciles: a true bomb shelter on a rural site, and a survival residence in the suburbs (or wherever paycheck access permits). For the latter structure, discretion is the watchword. The look should be completely conventional, "maintaining a suitable profile matching your surroundings." A built-in fallout shelter with a camouflaged entrance is mandatory. Clayton concurs, advising "no one but you and the contractor need to know about it." Other desirable custom features include a wood and metal shop, a chemical lab ("Few realize how dependent we have become on household chemical products"), a separate canning kitchen, expansive food storage facilities, a security-monitoring area with telephone scrambler and electronic detection equipment, and an indoor pistol/archery range ("Care must be taken in labeling these facilities on floor plans so as to avoid revealing their actual purpose"). Construction methods and materials are assessed with an eye toward durability in worst case scenarios ("In many homes, the roof is one of the weakest security links, especially with an intruder toting a chain saw").



Permanent exterior below-ground shelter; after the *Home Fallout Shelter* by the Office of Civil Defense, January 1969. (From *Life After Doomsday*.)

Clayton expands on this combination of homespun virtue and nascent brutality in a chapter devoted to firearms. We are told what arms to buy, in what order, and what tasks they are useful for ("For a nuclear war situation, I suggest hunting with a military assault rifle"), as well as how to turn a house into a fortified stronghold through the judicious placement of sandbags and hidden loopholes. Acquisition and rehearsal of these skills and the development of total commitment are paramount.

But preparedness has its price. If the triumph of survivalism is its capacity to envision a mode of inhabiting a hostile postnuclear landscape, its tragedy is that adherents are condemned to live out that scenario in the here and now. For example, Skousen admonishes true-blue survivalists to practice methods for coping with armed daytime intruders when answering the front door: "If in doubt, have a non-lethal chemical unit in your hand, ready for use." The possibility of mob invasion dictates that you "prepare your home with automatic tear gas injection canisters so that it can be made unlivable if a group attempts to occupy it in your absence." And, "if long-term persecution is expected, sell your home early and rent it back." It is a worldview of unbridled paranoia, easy to dismiss from an American mainland perspective, less so from mine as I write this review in Germany, at a short remove from the ongoing "ethnic cleansing" of Bosnia. Once we rule out denial as a coping strategy, the goals and methods of survivalism force us to weigh which is the more constructive: a solitary trek toward preparedness or a communal struggle for prevention.

Philip Steadman and Simon Hodgkinson, the authors of *Nuclear Disasters and the Built Environment*, opt strongly for the latter. Their report, carried out at the behest of the Royal Institute of British Architects, is modeled after the British Medical Association's 1983 report, *The Medical Effects of Nuclear War*. Both aim for an objective assessment of the likely outcome of a nuclear catastrophe, address a professional as well as a lay audience, and are intended



Bomb, Destroyed Vehicles, and Lone Rock; photograph by Richard Misrach. (From *Bravo 20: The Bombing of the American West*.)

to contribute to public awareness and action. Both studies are definitive summaries of their field, painstakingly pieced together through review and assembly of available research. However, in the seven years separating these publications, the term "nuclear disaster" has been redefined by the explosion and fire at Chernobyl. In response, fully half of the RIBA report is devoted to the effects of reactor accidents.

The difference between weapon and reactor disasters is conveyed by the responses of postcatastrophe eyewitnesses in Hiroshima and in Pripjat, Chernobyl's company town. What was shocking to Hiroshima's observers was that nothing was left where there had once been a city. By contrast, in the case of Pripjat it was that nothing seemed changed in a city that had been rendered uninhabitable virtually overnight. As a result, some residents simply refused to leave, hiding during the evacuation or returning home immediately afterward. For whatever reasons—perhaps because it is fresh in our memory, or because its ef-

fects will continue to be tabulated with an inexorable momentum—the account of the catastrophe and attempted cleanup at Chernobyl is the most arresting segment of the RIBA report.

The intangibility of the scale of disaster is only the first problem. Because reactor radioisotopes decay much more slowly than those from weapons detonations, contamination from the former must be measured in decades. Put more concretely, a year after the bombing of Hiroshima, a city began to reappear on the site. In contrast, none of the 135,000 evacuees from the danger zone around Chernobyl will be able to return safely to their homes within their lifetimes—this despite measures like stripping and replacing topsoil, bringing in conscript labor to vacuum, hose down, and scrub entire towns, and cropdusting the countryside with polymer compounds to trap radionuclides. These efforts were judged a failure and abandoned in 1988. They were replaced by a program of demolition: lacking upkeep, by the time these communities be-

den zone.¹⁰

tors, from which a severe “beyond design

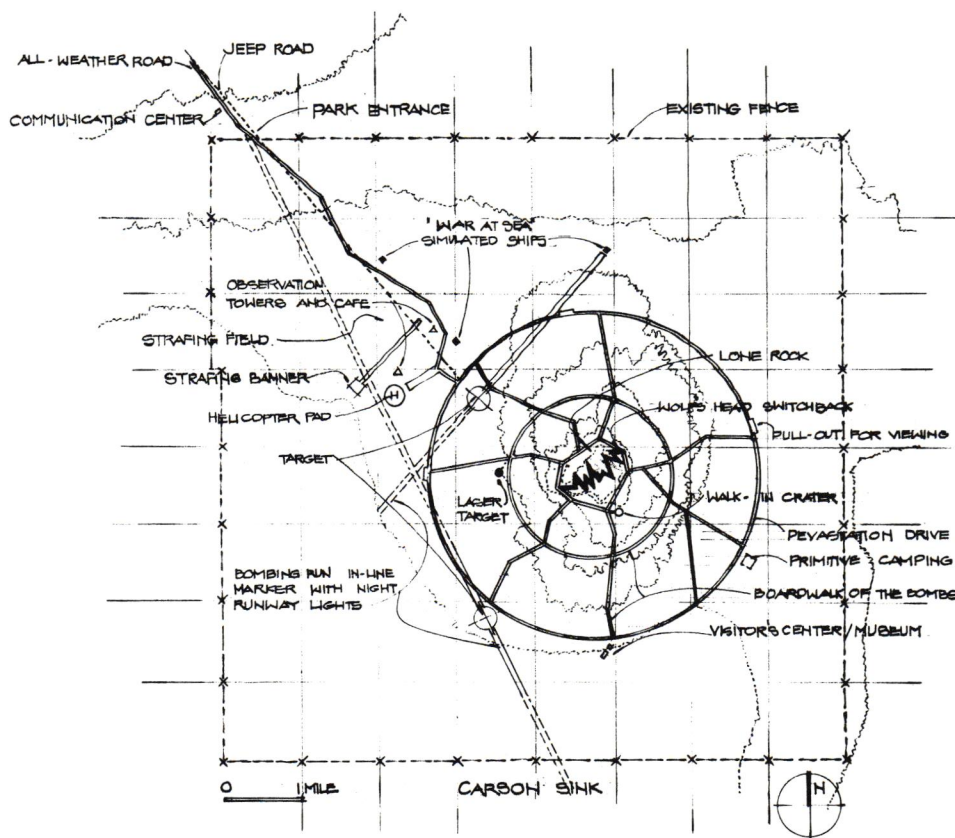
paper exercise.

sions. *Quonset Huts on the River Styx* cata-

simple.

landscapes.

dread windy days, which stir up radioactive



Site plan for the proposed Bravo 20 National Park. (From *Bravo 20: The Bombing of the American West*.)

particles, and the prospect of a "survey" (an intimate geiger-counter inspection of clothes and body); and to regard a bathing suit as a standard undergarment (to preserve modesty, should survey results demand a full body scrub by decontamination personnel). According to Goin, the lingering sense of foreboding, of being stalked by a vague but lethal presence, is the most compelling quality of the nuclear landscape. He explains the intention of his work as an attempt to photograph the invisible stigmata of radiation. In his shaping of a new landscape iconography, we are told that any resemblance to old-fashioned notions of beauty—and there are many—are purely accidental.

Such disclaimers are not for Richard Misrach, whose collection of large-format color photographs is the centerpiece of *Bravo 20: The Bombing of the American West*. He is one of a number of recent American landscape photographers who have found inspiration in the churned panoramas that signal our expulsion from Eden. To read his account of dawn on the Bravo 20 target site is to witness an epiphany in which the luminous transparency of a cool desert sunrise reveals the epicenter of "the most graphically ravaged environment" ever seen by the photographer. The resultant images convey this intoxicating blend of beauty and terror.

As Goin notes in the introduction to *Nuclear Landscapes*, purveyors of this updated version of the 18th-century *frisson* of the sublime must confront the implications of their visual celebration of ecological blight. Misrach sidesteps any misinterpretation of intentions by framing his images within a decidedly partisan context. *Bravo 20* opens with an detailed account of the history of the site and closes with a proposal to turn it into a national park. Written by journalist Myriam Weisang Misrach, the site history is a critical foil to her husband's photographs, anchoring them to a past characterized by a climax ecosystem and shaped by successive waves of human habitation. The narrative is also a legendary confrontation of two antithetical approaches to the

western frontier: the weather-beaten loner's appreciation of the solitude of open, unspoiled land, and the military's need to sequester wastelands as vast as the destructive capacity of its technology.

The remarkable conclusion of *Bravo 20*, a proposal to transform the bombing range into a national park, is, at first blush, preposterous. An environmental memorial with a bunkerlike visitors' center, boardwalks over bombfields, a diner, a gift shop, a campground? Misrach presents a design sketch as something to "spark the imagination." And the more the idea sinks in, the more sensible it becomes. The proposal belongs to a postmodern landscape tradition, more or less invented by earthworks artist Robert Smithson, that advocates reclaiming wasted landscapes without whitewashing the cause of their devastation, giving us a chance to comprehend these processes and to draw our own conclusions. Does the \$9 million budget proposed for the Bravo 20 National Park seem too much to pay for an opportunity to take the family on an outing into a demolished panorama in search of insights to our passage through the atomic age? Before judging, one might consider the \$60 billion it will cost to transform the Hanford Reservation's toxic wasteland into what will look like just another sagebrush plain, its contaminated soils fused into twenty-foot-thick vitreous discs buried just beneath the surface; or the improbability that such sums will ever be spent on comparable areas in the former Soviet Union—sites believed to be the most contaminated on the face of the earth. With the Cold War over, perhaps the most appropriate monument to those years in which our fate hung in the balance would indeed be a memento mori of the landscapes that suffered the apocalyptic future that, for most of us, defied imagination.

NOTES

1. William S. Parsons, "Problems of Passive Defense," *Journal of the American Institute of Architects*, vol. II, no. 5, (May 1949): 207–10.
2. See Carol Ahlgren and Frank Edgerton Martin,

"From Dante to Domsday: How a City Without People Survived a Nuclear Blast," *Design Book Review*, Issue 17, (Winter 1989): 26–28.

3. Dugald MacFayden, *Sir Ebenezer Howard and the Town Planning Movement* (Cambridge: MIT Press, 1933), p. 100.

4. William E. Burk, Jr., "Defense by Dispersion," *Bulletin of the American Institute of Architects* (Nov.–Dec. 1954): 177–8.

5. Ludwig Hilberseimer, *The Nature of Cities* (Chicago: Paul Theobald & Co., 1955), p. 284.

6. Richard Plunz, *A History of Housing in New York City: Dwelling Type and Social Change in the American Metropolis* (New York: Columbia University Press, 1990), pp. 277–79.

7. United States Senate, "Hearings before a subcommittee of the Committee on Public Works: Eighty-fourth Congress" (1955), p. 43.

8. This proposition is advanced in the larger context of environmental design by Dell Upton in "Architectural History or Landscape History?" *Journal of Architectural Education*, vol. 44, no. 4 (August 1991): 195–99.

9. Ross Miller, *American Apocalypse: The Great Fire and the Myth of Chicago* (Chicago: University of Chicago Press, 1990).

10. As reported in *Der Spiegel*, vol. 46, no. 42 (12 October 1992): 247–50.

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QUONSET HUTS ON THE RIVER STYX: THE BOMB SHELTER DESIGN BOOK, Architects, Designers, and Planners for Social Responsibility, North Atlantic Books, 1987, 72 pp., illus., \$12.95.

LIFE AFTER DOOMSDAY, Bruce D. Clayton, The Dial Press, 1980, 185 pp., illus., \$14.95.

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NUCLEAR LANDSCAPES, Peter Goin, Johns Hopkins University Press, 1991, 151 pp., illus., \$29.95.

BRavo 20: THE BOMBING OF THE AMERICAN WEST, Richard Misrach with Myriam Weisang Misrach, Johns Hopkins University Press, 1990, 133 pp., illus., \$29.95.

PETER NEAL

The Making of the Urban Landscape

J. W. R. Whitehand

Urban environments are never solely the result of satisfying the basic needs of their inhabitants; they also embody the endeavors of past societies as cultural and educational resources of inestimable value. Although much energy is exerted in developing and maintaining these environments, rarely are the people and forces responsible for shaping ordinary town and city landscapes systematically investigated.

The Making of the Urban Landscape, a social geographic study, is a product of such a systematic investigation. With the urban landscape returning to the research agenda in the 1980s, urban morphology has recently enjoyed a renaissance. This new publication is a sequel to Whitehand's *The Changing Face of Cities* (Oxford: Blackwell, 1987) in which he explores the cyclical process of urban change, land value, economic fluctuations, and the adoption of innovations within a central theoretical framework that stresses the economics of land use. From this springboard attention is now turned to the individuals and organizations responsible for this cyclical process of urban landscape development—property owners, developers, builders, architects, and planners, to name a few. These agents of change have, until recently, been slighted in favor of more quantitative social and economic data.

Using a wealth of published research on several British towns and cities, Whitehand uses building applications, planning applications, interviews, correspondence, and minutes of meetings from public and institutional agencies to illustrate his work. From such groundwork, this book promises to clarify the agents of change, as well as the attitudes toward the identities of ur-

ban landscapes, the relationship between planning and outcome, and the ways in which these matters vary over time.

The urban landscape is divided into three subgroups: commercial cores, institutional/public areas and residential areas. Whitehand does not provide comprehensive coverage (for example, industrial landscapes and their associated housing receive little attention); instead, he directs analysis to a few environmental types to ensure the depth of the investigations.

The retail districts of many British cities retain a structure that dates back to preindustrial times. A walk through London's inner city adjacent to St Paul's Cathedral reveals a street layout that remains true to its medieval origins. Even in the late 18th century, most buildings in commercial cores were dwellings in which shopfronts had been inserted. The erosion of this domestic scale began in the early 19th century as small sections of Britain's larger cities started to redevelop in response to the growing pace of economic and industrial expansion.

In Huddersfield, in central England, for example, there is evidence of changes to the physical fabric throughout the Victorian era—primarily undertaken by local individuals and organizations. Changes in the urban fabric were small in scale and, through the

employment of local architects and builders, development remained true to the local vernacular. With the turn of the century, property owners from outside the city began to exert influence. These property owners were generally large finance and insurance institutions, which hired nonlocal architects to execute their redevelopment proposals. Such external influences introduced marked changes in the architectural style and scale of the commercial center of the city along with an increasing use of nonvernacular materials (as opposed to traditional local stone, for example) more appropriate to new developments in London than to those in its adjacent architectural contexts.

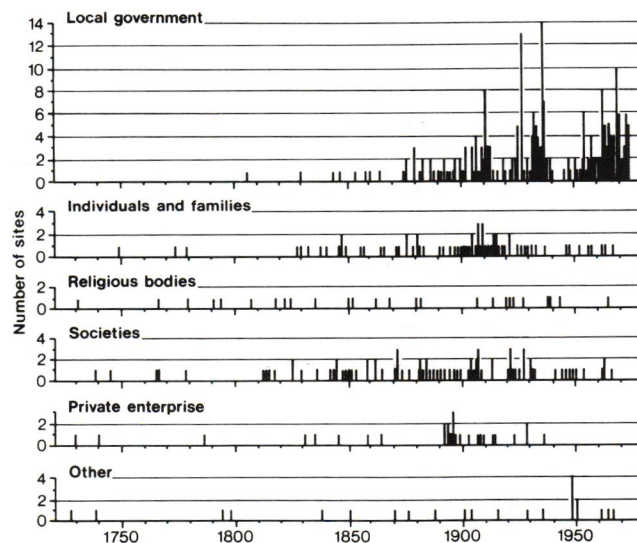
The period between the two world wars bought more evident influence from outside organizations, as national retail chains, such as F. W. Woolworth & Co., began to favor in-house styles and corporate images specifically designed to create alternative identities that contrasted with their surrounding context.

Economic downturn in the mid-1950s created a credit squeeze on all but the largest institutions, limiting new building to the financially secure. Most notable of these were the life assurance companies who began pursuing property development beyond personal needs into the speculative market,

anticipating potential clients rather than building to a specific brief generated by an identifiable user.

Similar scenarios were played out in most British urban centers, and Whitehand draws additional detail from personal research of comparable centers in Watford and Northampton, and refers to examples such as Newcastle-under-Lyme, Liverpool, Edinburgh, and London.

Unlike commercial cores that have traditionally been heavily influenced by market forces, institutional land (or land set aside for public use) has responded to a different set of stimuli. In medieval times such communal areas were commonly used for traditional games, festivals, and



In an analysis of the development of institutional and public sites in Birmingham between 1730 and 1973, R. F. Broaderwick recorded the endeavors of religious, political, social, personal, and altruistic motives. (From *The Making of the Urban Landscape*.)



A simplified pseudo-vernacular was the dominant style for speculatively built houses in the interwar years which saw the emergence of large developers and building firms. Clockwise from top left: neo-Georgian cottage-style; semi-detached house; detached Tudor; Anglo-Scandinavian style. (From *The Making of the Urban Landscape*.)

military training; the largest and most numerous community buildings were either churches or buildings for religious orders. In the 16th century secular public buildings and spaces began to appear as a major feature of the urban fabric.

In 1839 the publication of the findings of the British government's Select Committee on Public Walks provided a catalyst for the public-park movement that swept through many fast-expanding industrial cities and led to the creation or protection of large public open spaces. Although credit can be given to the government for passing legislation, much of the park movement was generated by the efforts and generosity of individual philanthropists, religious organizations, and public bodies that raised money through private donation and public sponsorship. But not all fund-raising comprised acts of selfless giving; in some cases land donations for the creation of public parks were specifically designed to boost adjoining land values.

In an analysis of the development of institutional and public land uses in Birmingham between 1730 and 1973, R. F. Broaderwick (in his unpublished Ph.D. the-

sis, 1981) recorded the endeavors of a mix of religious, political, social, personal, and altruistic motives in the generation of public lands. The Cadbury family, for example, motivated by strong Quaker principles, wielded considerable influence in the creation of several parks, hospitals, and educational institutions at the beginning of the 20th century. Additionally, the influence of local government on the urban landscape was also seen to relate directly to the composition (and constituencies) of its members. When Birmingham's city council was largely composed of small-scale businessmen, as in the Birmingham of the 1850s, it had little inclination toward large-scale activity. Only in the early 1900s when the city council included more members accustomed to running big business did the large-scale municipal activity begin.

Residential development provides us with the shortest history, for it is only since the 18th century that most British towns have undergone any substantial postmedieval residential expansion. Here landowners, developers, and builders primarily influenced by economic motives have traditionally instigated development. Only with

the emergence of the large municipal authorities in the early 1900s do we find development with a more varied agenda.

The rise of the garden city movement heralded new recommendations concerning style, density, and environment. Private-house building was reserved largely for the middle-class owner-occupier and was undertaken by firms acting as both developer and builder. Planning for the layout of roads and plots was now in the same hands as those who oversaw the construction of houses. The interwar years saw the emergence of large developers and building firms that increased the scale and unity of developments considerably. Following the second world war, with growing concern about the rapid change occurring in most urban centers, the central government passed the Town and Country Planning Act (1947). Although hailed as a savior to the integrity of urban landscapes, its critics claim that it merely pushed the building boom beyond the greenbelts around existing urban cores into the greenfield sites of new towns.

Whitehand devotes the rest of the text to scrutinizing the work of Local Planning Authorities, created to manage the urban landscape under the Town and Country Planning Act. Case studies undertaken in southern England question the planning authority's ability to manage, rather than to purely react to, pressures from other parties. Rarely were the Local Planning Authorities able to look beyond measurements of building density and the geometry of highways to more significant factors of the *genius loci* in new development proposals. Seldom were the original intentions of property owners and developers realized in the final built product. The resulting urban landscape appears to be a mere by-product of the conflicts between Local Planning Authorities and applicants. What remains is a system that seems to provide little encouragement for small developers seeking small-scale local change, for it appears that only larger organizations with financial resources and expertise are able to carry proposals through its exhaustive bureaucracy.

As an urban morphologist Whitehand attempts to understand rather than to change urban environments. In acknowledging the book's value as a methodological and research resource, it should be noted that this work will have less value outside the geographic discipline of urban morphology. Moreover, as the book was written under the auspices of the Institute of British Geographers, it draws on research undertaken only in Great Britain, which may limit its appeal to foreign readers.

"The Making of the Urban Fabric" might have been a more appropriate title, as Whitehand fails to provide a clear definition of "landscape." At times the research boundaries are blurred, with too much attention paid to architectural style and design.

Seeking fresh insight into the noneconomic motives of the agents involved in urban change is a valuable endeavor. Such a pursuit certainly needs the benefit of further illumination from a wider discipline base. In time I hope that this research will move beyond the makers of change to address the issues of individuals and organizations impacted by dynamic urban landscapes.

MARC A. WEISS

Downtown, Inc.: How America Rebuilds Cities

*Bernard J. Frieden
and Lynne B. Sagalyn*

Downtown, Inc. is a well-written and engaging book that focuses on "public-private partnerships" of the 1980s that led to the development of new retail centers in the central business districts of several American cities. The book is organized around a series of case studies of five relatively successful urban revitalization efforts: Faneuil Hall Marketplace in Boston, Horton Plaza in San Diego, Town Square in St. Paul, Pike Place Market in Seattle, and Plaza Pasadena in Pasadena. Rather than present a chapter on each development, the authors intersperse their material around thematic chapters and use stories and examples from the

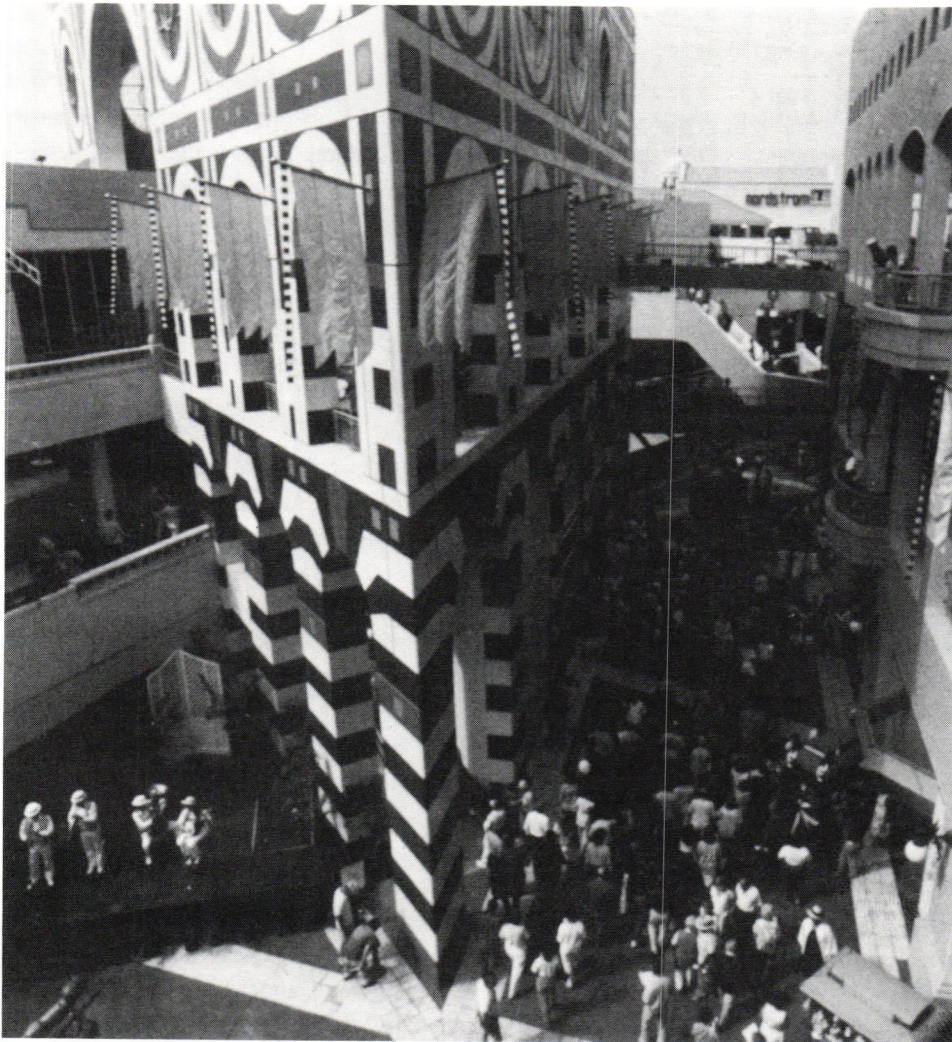
five cases to illustrate their arguments. For example, they discuss the importance of innovative entrepreneurs from both the private and public sectors, and make their point by profiling developers James Rouse (Faneuil Hall) and Ernest Hahn (Horton Plaza and Plaza Pasadena) and government officials George Latimer (St. Paul), John Clise (Seattle), and Gerald Trimble (Pasadena and San Diego).

While the retail projects include both new construction and rehabilitation, the common element is that in each of the six cities, public subsidy and private redevelopment of a shopping center became the vehicle for urban revitalization. Bernard Frieden is often critical of big government and excessive public intervention, a viewpoint he argues in his previous book, *The Environmental Protection Hustle* (Cambridge: MIT Press, 1979). He and colleague Lynne Sagalyn initiated the research project that led to *Downtown, Inc.* with the goal of demonstrating that market-oriented public



The precedent to the modern-day shopping mall, Milan Galleria; late-1800s. (From *Downtown, Inc.*)

THE MAKING OF THE URBAN LANDSCAPE, J. W. R. Whitehand, Institute of British Geographers Special Publications Series—Number 26, Basil Blackwell Limited, 1992, 239 pp., illus., \$49.95.



Borrowed images from Siena and Venice mix with contemporary architecture at Horton Plaza, San Diego, California; Jon A. Jerde, 1985. (From *Downtown, Inc.*)

partnerships with private retail developers can be more effective in promoting central city growth than the 1960s-style urban renewal land-clearance guided by government planners. The historical review of urban renewal and five city studies presented by Frieden and Sagalyn make a persuasive case. However, there are numerous

instances where efforts to create downtown festival marketplaces in smaller cities such as Toledo, Ohio, or Richmond, Virginia, have failed to attract sufficient credit-worthy shoppers and to economically revitalize their surrounding districts.

The five cases in *Downtown, Inc.* are all from the early to middle 1980s, a period of

rising economic growth, real estate booms, and very favorable demographics for retail-market activity. Today even some of the apparent success stories like Faneuil Hall and Horton Plaza are experiencing some financial difficulty due to the declining fortunes of real estate values, office space use, retail sales volume, and the general economic recession. Many other downtown shopping malls are also suffering from shrinking demand. More importantly, there have not been any successful new, central-city retail malls developed in America in the last five years. Thus we do not yet know if the urban revitalization strategy outlined in *Downtown, Inc.* represents a good long-term solution or a 1980s phenomenon whose time has already passed. Frieden and Sagalyn, in strongly advocating their idea, emphasize its benefits much more than they consider its costs or the community activist critique of this type of public-private development partnership.

Despite these problems, *Downtown, Inc.* is an extremely important and skillfully written book. Frieden and Sagalyn discuss design issues of interest to architects and urban planners. Further, their book gives an excellent picture of the relationship between private developers and government policymakers. While *Downtown, Inc.* may not be the "hot" new prescription for the 1990s, it certainly gives a vital portrait of a key trend of the 1980s.

DOWNTOWN, INC.; HOW AMERICA RE-BUILDS CITIES, Bernard J. Frieden and Lynne B. Sagalyn, MIT Press, 1990, 382 pp., illus., \$24.95.

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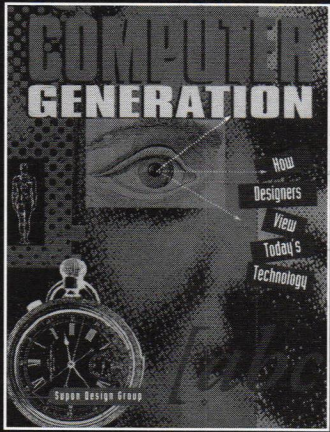
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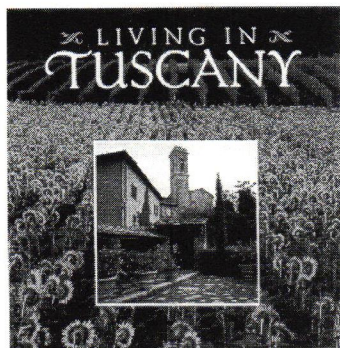
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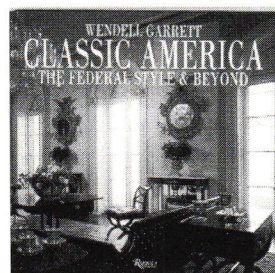
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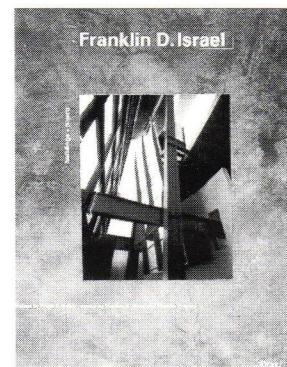
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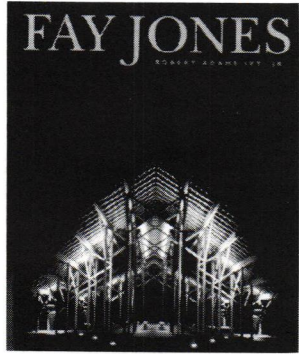


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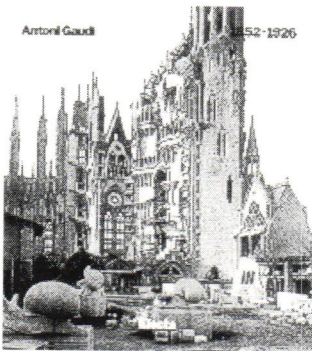
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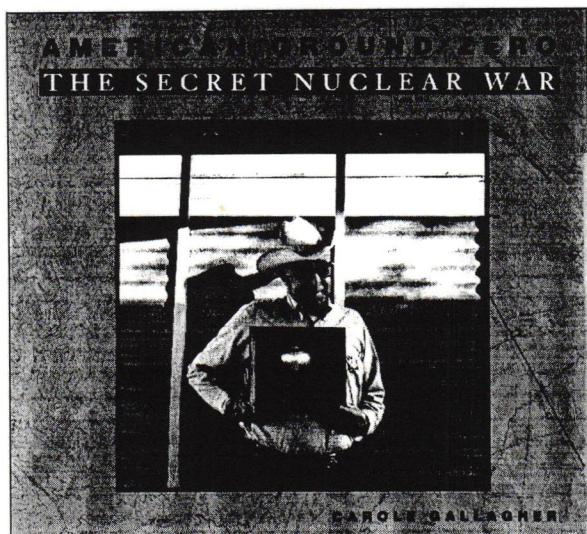
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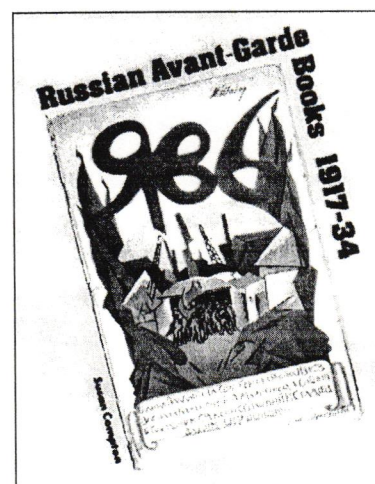
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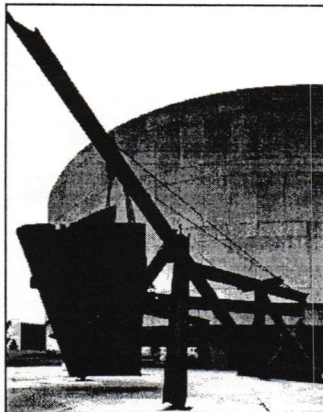
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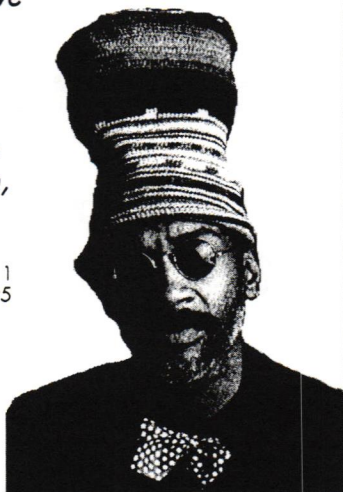
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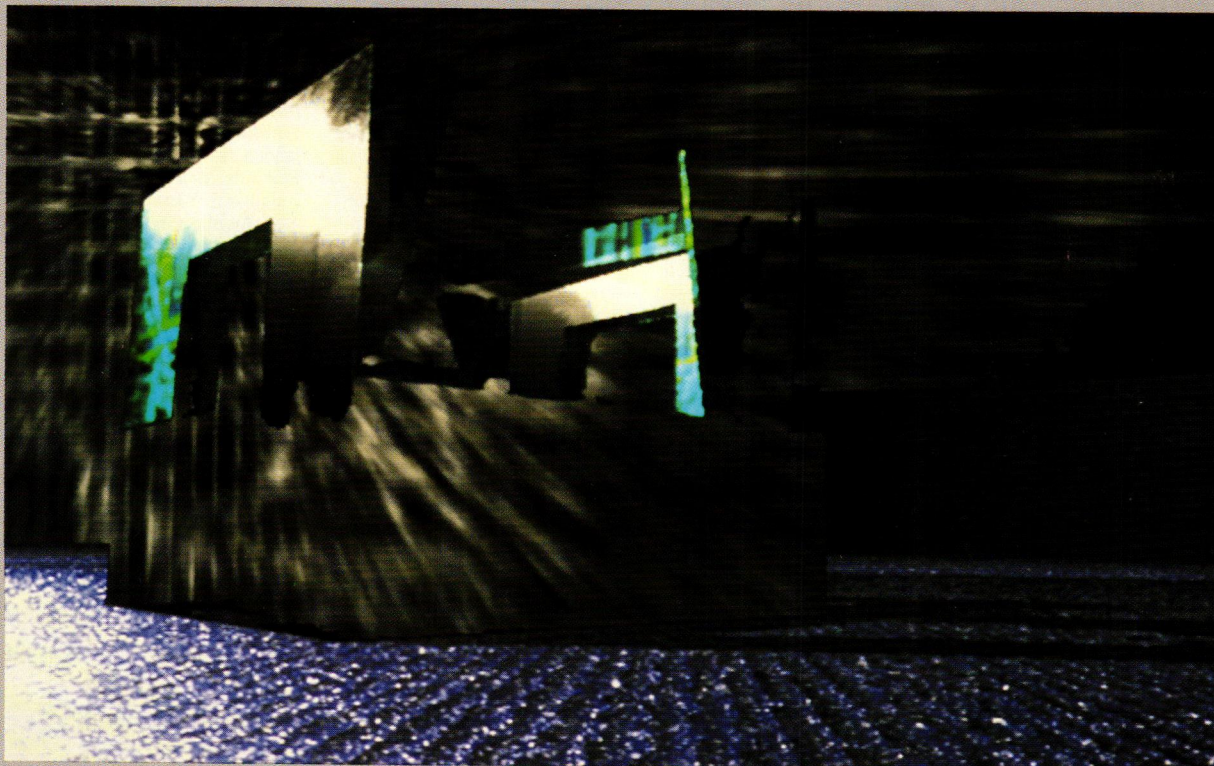
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