stan allen

essays

practice

architecture, technique and representation

commentary

diana agrest

CRITICAL VOICES IN ART, THEORY AND CULTURE

Architect, educator and theorist **Diana Agrest** was among the first to examine the impact of structuralism and semiotics in architectural theory. She contributes an essay that places Allen's speculations in the wider context of architecture's constant interplay with changing paradigm's of representation.

Stan Allen is an architect working in New York, Associate Professor of Architecture and Director of Advanced Architectural Design at Columbia University. His projects and built works have been extensively published and exhibited, both in the US and abroad. A book of urban projects and theories entitled **Points + Lines** appeared in 1999.

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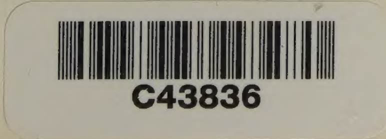

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introduction to the series

CRITICAL VOICES IN ART, THEORY AND Culture is a response to the changing perspectives that have resulted from the continuing application of structural and poststructural methodologies and interpretations to the cultural sphere. From the ongoing processes of deconstruction and reorganization of the traditional canon, new forms of speculative, intellectual inquiry and academic practices have emerged that are premised on the realization that insights into differing aspects of the disciplines that make up this realm are best provided by an interdisciplinary approach that follows a discursive, rather than a dialectic, model.

In recognition of these changes, and of the view that the histories and practices that form our present circumstances are in turn transformed by the social, economic, and political requirements of our lives, this series will publish not only those authors who already are prominent in their field—or those who are now emerging—but also those writers who had previously been acknowledged, then passed over, only now to become relevant once more. This multigenerational approach will give many writers an opportunity to analyze and reevaluate the position of those thinkers who have influenced

their own practices, or to present responses to the themes and writings that are significant to their own research.

In emphasizing dialogue, self-reflective critiques, and exegesis, the Critical Voices series not only acknowledges the deterritorialized nature of our present intellectual environment, but also extends the challenge to the traditional supremacy of the authorial voice by literally relocating it within a discursive network. This approach to text breaks with the current practice of speaking of multiplicity, while continuing to construct a singularly linear vision of discourse that retains the characteristics of dialectics. In an age when subjects are conceived of as acting upon one another, each within the context of its own history and without contradiction, the ideal of a totalizing system does not seem to suffice. I have come to realize that the near collapse of the endeavor to produce homogeneous terms, practices, and histories—once thought to be an essential aspect of defining the practices of art, theory, and culture—reopened each of these subjects to new interpretations and methods.

My intent as editor of Critical Voices in Art, Theory and Culture is to make available to our readers heterogeneous texts that provide a view that looks ahead to new and differing approaches, and back toward those views that make the dialogues and debates developing within the areas of cultural studies, art history, and critical theory possible and necessary. In this manner we hope to contribute to the expanding map not only of the borderlands of modernism, but also of those newly opened territories now identified with postmodernism.

Saul Ostrow

acknowledgments

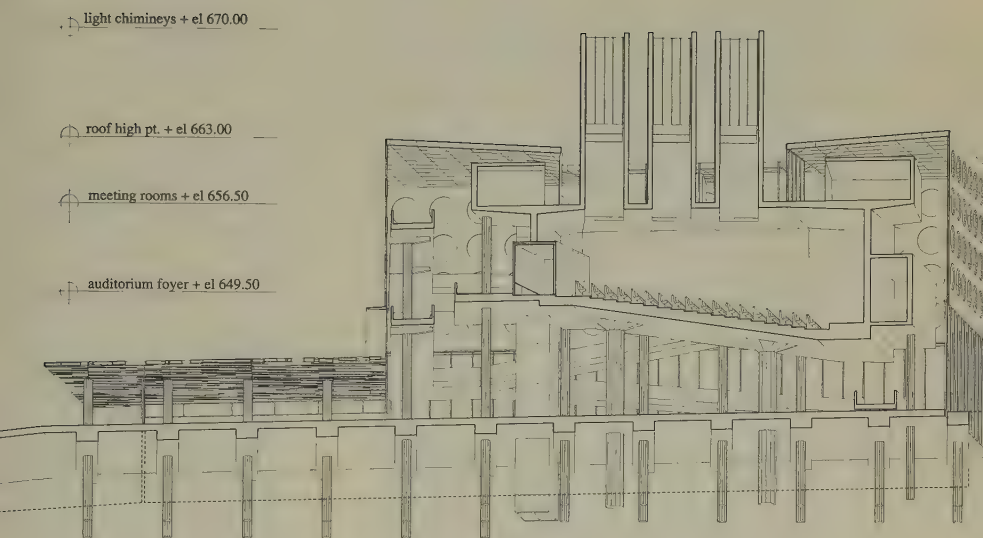
THE ESSAYS COLLECTED HERE WERE written between 1989 and 1997, and extensively reworked in 1997 and 1998. I first want to thank Saul Ostrow for the suggestion to publish a selection of essays in the Critical Voices series. Initially I was skeptical, thinking that my writing had been too circumstantial to form a coherent collection—the incidental speculations of a working architect, and not the focused research of a scholar or theorist. On reviewing the material two persistent themes appeared. First, an idea of architecture as technique: that is to say, a conviction that the materials and procedures of architecture itself constitute a rich cultural matrix, capable of sustaining dense intellectual argument without recourse to concepts and language borrowed from other fields. As Viktor Shklovsky has noted, "... in trying to understand a motor one must look at the drive belt as a detail in a machine—from the mechanic's point of view—and not from the point of view of a vegetarian." And if there was one specific aspect of these design procedures that had concerned me, it was the problem of representation. Hence the second

unifying theme is a preoccupation with the mediated techniques of representation with which architects conceive and realize their work.

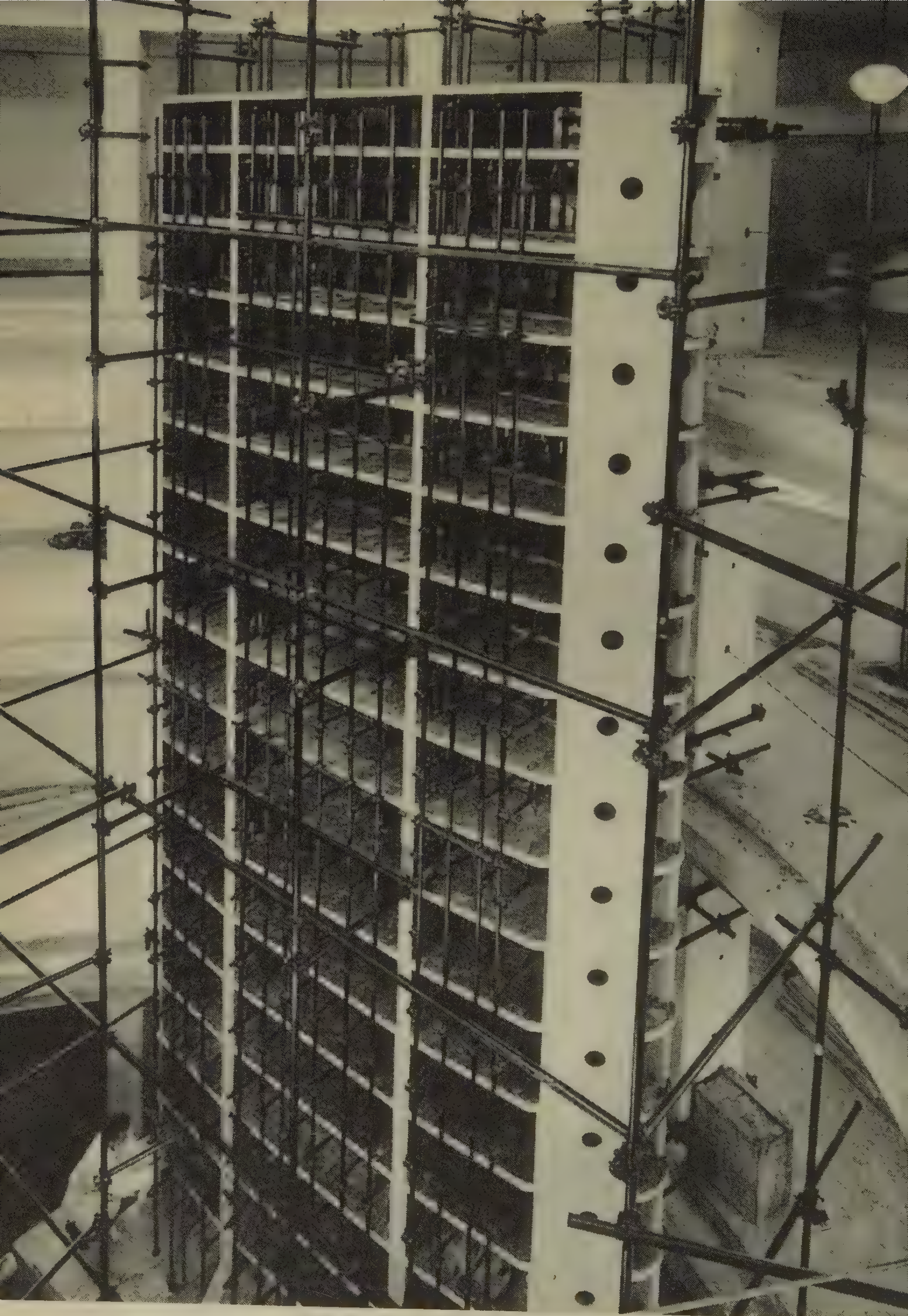
The earliest essays (on notation and projection), reflect the influence of Diana Agrest and Mario Gandelsonas, and the debates around questions of representation that characterized my first exposure to architecture theory at the Institute for Architecture and Urban Studies in New York in the late 1970s. This curiosity about drawing practice and its profound impact on architectural production was further cultivated by contact with John Hejduk during my education at The Cooper Union. During the period of my practical apprenticeship, Rafael Moneo taught me that individual works are always more interesting than pre-existing categories. On returning to graduate school at Princeton in the middle 1980s, seminars with K. Michael Hays, Beatriz Colomina and Mark Wigley helped put my own emerging ideas in the context of the shifting theoretical debates of that time. When I began teaching and writing independently, I found encouragement among colleagues, notably Greg Lynn and R.E. Somol, who were at that time directing architect's attention toward the work of Deleuze and Guattari. My work as Projects Editor for the journal Assemblage—and the constant support of K. Michael Hays—was decisive in developing many of the ideas elaborated here. I had the pleasure of a brief acquaintance with Robin Evans before his early death, and his influence on these essays is far greater than indicated by the specific citations. Michael Speaks was responsible for the careful editing of a number of these pieces at the time of original publication, and subsequent discussions with him have confirmed the shift toward pragmatic realism evident in the later essays. Finally, Dean Bernard Tschumi and Columbia University Graduate School of Architecture, Planning and Preservation have provided a supportive context for these practical and intellectual speculations.

As this eclectic list would indicate, all of the no doubt numerous errors, omissions and mis-readings are my own, the mark of a speculative intelligence more concerned with putting concepts into play than with academic correctness. Thanks to Skúta Helgason of Pollen Design for careful attention to layout and design work, and as always to Polly Apfelbaum for patience, insight and support.

Stan Allen



Stan Allen Architect. *Section Projection: Auditorium and Entry, Extension of the Museo Del Prado, Madrid.* Competition Project, 1995-98.



Gio Ponti: *Eleven meter structural test model, Pirelli Tower,* Milan 1956.

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introduction

practice vs. project

> I must say that what interests me more is to focus on what the Greeks called *techne*, that is to say, a practical rationality governed by a conscious goal . . . if one wanted to do a history of architecture, I think that it should be much more along the lines of that general history of the *techne*, rather than the histories of either the exact sciences or the inexact ones.
>
> —Michel Foucault

> Art and architecture are practices, not sciences. The constructions of science aspire to universal application. Pictures and buildings need only work where they are.
>
> —Dave Hickey

contingencies

Architecture is a discipline of circumstance and situation, subject not only to material constraints (limits of form and medium that change only incrementally over time) but also to functional imperatives that differ radically from building to building. These variables are governed by complex political, social, and historical dynamics, and open to continual revision. Almost unique among creative disciplines, architecture's objective is given from outside. Even in the most ideal of careers, the decisive limits to building programs will be determined by agencies beyond the control of the individual architect. Moreover, architects today practice far from home, and each new site presents unfamiliar conditions. As creative subjects, architects react to these demands, inventing in response to the occasion of the commission, specifying and particularizing a given set of abstract variables. The practice of architecture tends to be messy and inconsistent precisely because it has to negotiate a reality that is itself messy and inconsistent.

This lack of consistency is only partially offset by the tendency of conventional practice to repeat known solutions. Too often, contemporary practice oscillates between mechanical repetition and shallow novelty. Against this landscape of contingency, architectural theory has been called upon to serve a unifying function. Without a larger ideological framework, it is argued, the architect runs the risk of reacting passively to the multiple and often contradictory demands of context, clients, regulating agencies, media, or economics. Architecture apparently needs a grand narrative in order not to be entirely consumed by these small narratives of opportunity and constraint.

In order to legitimate its repetitive procedures, practice appeals to a *project*: an overarching theoretical construct, defined from someplace else, and expressed in a language other than practice's everyday discourse. Situated at a distance from the operational sites of technique, theory stakes a claim on a world of concepts uncontaminated by real world contingencies. The appearance of the architectural treatise in the Renaissance, for example, where normative codes were for the first time in the postclassical era set down in written form, marked a shift from the "ambulant science" of the medieval builder to the regulated culture of the "royal sciences."[1] A place for abstract thought about architecture, governed by the codes and conventions of discourse, was delineated apart from the building site. More recently, theories of typology, tectonics, or historical precedent have been proposed as a means to regulate architecture's

prolific heterogeneity. Theory's promise is to make up for what practice lacks: to confer unity on the disparate procedures of design and construction.

The invention of theory and the codification of architecture as a discipline went hand in hand. For a Renaissance theorist such as Leon Battista Alberti, the production of theory had a concrete political end: to incorporate architecture into the circumscribed body of the liberal arts. This could only be accomplished by differentiating architecture from journeyman craft, extending the domain of the royal sciences to architecture. For this codification to be effective, it was necessary to institute an opposition between the speculative and practical aspects of the arts. As Michel de Certeau has observed: "Art is thus a kind of knowledge that operates outside the enlightened discourse it lacks."[2] The need for something called theory arises from the desire to think the discipline in more abstract terms. A separate space for theory is defined, in order to reflect on the nature of the discipline at a distance, while the possibility of cumulative or incremental change from within is held in check. Theory and practice are, under this formulation, equally rule-bound: theory devoted to the production of rules, practice relegated to the implementation of those same rules. What the royal sciences provide to the arts are "constructed, regulated and thus 'writable'" systems: organized from without on the basis of that which they themselves lack.[3] The enlightened discourse of theory (scientific, and generalizable) is contrasted to the mechanical techniques of practice. Today this view persists in the form of a mandate for *critical* practices that would hold the individual instances of practice accountable to ideological criteria.

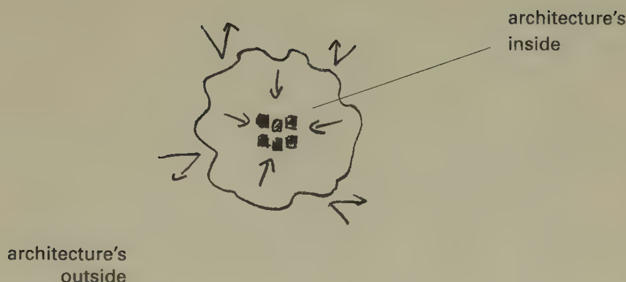
Today's conventional view (prevalent, for example, in schools of architecture) understands theory as an abstraction: a set of ideas and concepts independent of any particular material instance. Practice, in turn is understood as the *object* of theory. In this view, theory tends to envelope and protect practice, while practice excuses theory from the obligation to engage reality. Design is reduced to the implementation of rules set down elsewhere. Ironically, the separation that results is not dissimilar from the very structure of conventional practice supposedly challenged by theory. Conventional practice renounces theory, but in so doing, it simply reiterates unstated theoretical assumptions. It works according to a series of enabling codes, which have been defined without reference to individual practice. These codes are modified in response to circumstance, but never challenged in practice. Theory imposes regulated ideological criteria over the undisciplined heterogeneity of the real, while the

DUMB PRACTICE:
building as a subset/resultant of professional codes and conventions, which are continually deformed to accommodate contingency: a closed figure.

unstated assumptions of conventional practice enforce known solutions and safe repetitions. In both cases, small differences accumulate, but they never add up to make a difference.

But the abstraction of theory from practice is a fiction that can never be sustained. Neither practice nor theory can be reduced to a thing. Theories and practices are both produced in definable spaces, by active, conscious subjects. Theory itself is a practice: that is to say, a set of activities and procedures with a specific language and a known set of protocols. Its terms of discourse are defined by its own history and in relation to other practices through intertextual exchange. Theory's medium is language, its primary activity writing, and its preferred site the academy.

Against this prevailing current, the revision proposed here is double. Practice needs to become more structured, and at the same time more tractable. If conventional practice and theoretically driven critical practices are similarly structured, it cannot be a question of going beyond theory or of leaving theory behind. What is proposed instead is a notion of practice flexible enough to engage the complexity of the real, yet sufficiently secure in its own technical and conceptual bases to go beyond the simple reflection of the real as given. Not a static reflection of concepts defined elsewhere—either the codes of professional practice or the dictates of ideologically driven theory—but a rigorous forward movement, capable of producing new concepts out of the hard logic of architecture's working procedures. Practice needs to find a realistic conceptual basis



DUMB THEORY:
building as a subset/resultant of the codes and conventions of theory, which turn inward to protect building from contingency: a closed figure.

from which to cultivate meaningful differences. Ironically, practice (usually assumed to be unproblematically identified with reality) will discover new uses for theory only as it moves closer to the complex and problematic character of the real itself.

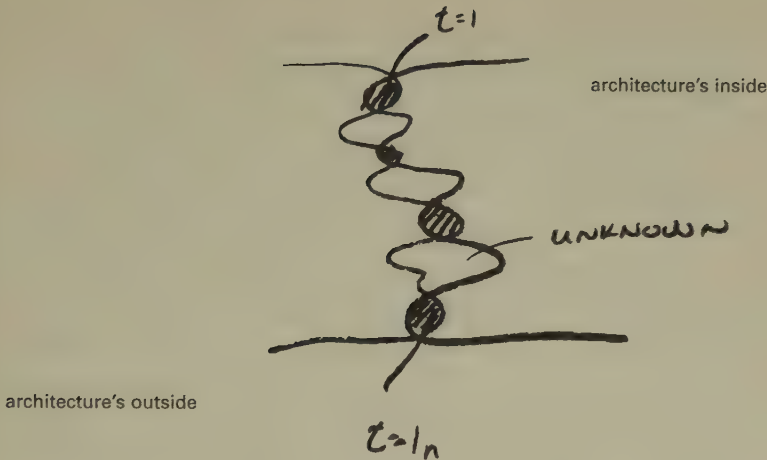
Hence it is of little use to see theory and practice as competing abstractions, and to argue for one over the other. Intelligent, creative practices—the writing of theory included—are always more than the habitual exercise of rules defined elsewhere. More significantly, practice is not a static construct, but is defined precisely by its movements and trajectories. *There is no theory, there is no practice.* There are only *practices,* which consist in action and agency. They unfold in time, and their repetitions are never identical. It is for this reason that the "know-how" of practice (whether of writing or design) is a continual source of innovation and change. Tactical improvisations accumulate over time to produce new models for operation. But these new patterns of operation produced in practice are always conditional. Inasmuch as they derive from experience, they are always open to revision on the basis of new experiences, or new data. Deliberately executed, architecture's procedures are capable of producing systematic thought: serial, precise and clinical; something that resembles theory but will always be marked by the constructive/creative criteria of practice.

Rather than the conventional theory/practice distinction, it might be more useful to distinguish broadly between practices that are primarily *hermeneutic*—that is, devoted to interpretation and the analysis of representations (law,

history, criticism, psychoanalysis, etc.), and *material* practices—activities that transform reality by producing new objects or new organizations of matter: engineering, urbanism, ecology, fashion, gardening or architecture. The vector of analysis in hermeneutic practices always points toward the past, whereas material practices analyze the present in order to project transformations into the future. Writing is the primary medium of hermeneutic practices. Material practices, on the other hand, often involve operations of the translation, transposition or transcoding of multiple media. Although they work to transform matter, material practices necessarily work through the intermediary of abstract codes such as projection, notation or calculation. Constantly mixing media in this way, material practices produce new concepts out of the materials and procedures of work itself, and not as a regulating code grafted onto the work from outside. Conceived as a material practice, architecture achieves a practical (and therefore provisional) unity *inferred* on the basis of its ensemble of procedures, rather than a theoretical unity *conferred* from without by ideology or discourse.

This is a more uncertain, but also more optimistic, program. The accumulated catalog of architecture's rules and procedures suggests that a partial unity is given at the level of the discipline itself. And yet, unlike the conservative project that would see the structure of the discipline as a limit, historically defined, the pragmatic know-how of technique does not necessarily respect precedent.[4] The criterion of productivity simply bypasses outmoded working strategies, leaving the discipline open to new techniques that may in turn be incorporated into the catalog of architecture's procedures.

Such a notion of practice maintains a deep respect for history, and for architecture's past. Material practices unfold in time, confident in the logical structure of the discipline as a starting point, but never satisfied to simply repeat, or to execute a system of rules defined elsewhere. Architecture's limits are understood pragmatically—as a resource and an opportunity—and not a defining boundary. The practitioner looks for performative multiplicities in the interplay between an open catalog of procedures and a stubbornly indifferent reality. On the other hand, material practices cannot be arbitrary or capricious. They are governed by the hard logic of matter and forces, which behave according to verifiable rules, but without regard for consistency or the conventions of rational expression. Under the pragmatics of practice, the fixed structure of the discipline is neither rejected nor affirmed. It is subject not to critical "interrogations" but to an "erotics of doubt."[5] Refusing the safety of theory's disembodied distance,



PRAGMATIC REALISM:
practice as the intersection of architecture's inside and its outside: two open sets overlap to form an indeterminate figure.

practice is not defined by reference to the secure perimeter of a fixed discipline, but is instead marked by the uncertainty of an ever shifting reference in the world itself. This is not a Cartesian doubt that works by process of elimination to arrive at a core of unshakable propositions. Rather, it is tactic for dealing with an imperfect reality with a catalog of tools that is itself always imperfect, or inadequate.

techniques: architecture as material practice

> There can be no difference which doesn't make a difference—no difference in abstract truth which does not express itself in a difference of concrete fact, and of conduct consequent upon the fact, imposed on somebody, somehow, somewhere, and somewhen.
>
> —William James

When speaking of techniques of construction, it is important to remember that the architect is not the builder, but the specifier of construction technique.

Architects work with a knowledge of the methods and materials of construction in both design and implementation, but the impact of this knowledge is indirect. What is more significant is the way in which the variables of construction are factored into the calculus of architecture's procedures. This leads away from a theory of "truth to materials" toward an examination of their consequences and experiential effects. The claim, for example, that Le Corbusier, in his Carpenter Center for the Visual Arts (ch. 6) is able to achieve a sense of mobility and lightness with a material that is not in itself intrinsically lightweight turns on a detailed discussion of some of the technical aspects of the building's reinforced concrete construction.

The design history of the Guggenheim Museum is significant in this regard, and was crucial for me in defining the notion of practice outlined here. In 1991, I wrote that Frank Lloyd Wright could "deploy multiple structural principles with effective operational freedom precisely because he was committed to structural rationality as *practice*, not as *project*" (ch. 5). What I meant was something like this: early models showed the spiral ramp of the museum propped up on thin columns, a solution clearly at odds with the organic continuity Wright desired. In time, Wright devised an integrated structural solution that did not distinguish between supporting structure and enclosing envelope. While architecturally compelling, this solution proved impractical from a constructional point of view. Wright in the end accepted a solution that, while literally inconsistent with the conceptual unity originally proposed, was itself logical and efficient. What is revealing, and speaks as much to Wright's tactical flexibility as to his intimate knowledge of building technique, is that, while literally segmented, the experience of the building is still one of integrated structure and smooth flow. In practice, the desired continuity is in no way compromised by the apparent structural expedient.

The difference between practice and project is therefore marked by the pragmatic idea of "differences that make a difference." It appeals to concrete differences of performance and behavior and not to abstract relations between ideas and discourses. For Wright, as for most of the architects that interest me, buildings are always more than individual components of a larger project. They are not examples of principles enunciated elsewhere, cases to be tested against the rule of theory's law. Particular instances are met with particular solutions. Consistency and rationality are guaranteed by the hard logic of structure, and by the indifferent behavior of materials themselves. In the case of Wright, the rational behavior

of structure is not an absolute fact to be given material expression, but an opportunity and a resource—a point of provisional stability to be freely handled.[6] The measure of Wright's "mastery" of the terms of building is as much his knowledge of where and when to compromise, as in any mythic appeal to integrity and the "truth of materials." This is a way of working that assumes that the ability of architecture to generate perceivable experiences and sensations in the world—practical consequences and effects—is more important than its conformance or nonconformance with some abstract set of theoretical criteria.

To claim that architecture is a material practice, working in and among the world of things—an instrumental practice capable of transforming reality[7]—is not to lose sight of architecture's complicated compromise with techniques of representation. Inasmuch as architects work at a distance from the material reality of their discipline, they necessarily work through the mediation of systems of representation. Architecture itself is marked by this promiscuous mixture of the real and the abstract: at once a collection of activities characterized by a high degree of abstraction, and at the same time directed toward the production of materials and products that are undeniably real. The techniques of representation are never neutral, and architecture's abstract means of imagining and realizing form leave their traces on the work. To understand representation as technique (in Foucault's broader sense of *techne*) is therefore to pay attention to the paradoxical character of a discipline that operates to organize and transform material reality, but must do so at a distance, and through highly abstract means. To concentrate on the instrumentality of drawing is to pay attention to the complex process of what Robin Evans has called "translations" between drawing and building. It is to understand the way in which the traffic between geometry and construction is fundamental to the integration of drawing practice into design work.

The characterization of architecture as a material practice deserves one final qualification. These translations between drawing and building today take place within a larger flow of images that circulate in complex and uncontrollable ways. Architecture's culture of instrumental representations cannot help but be affected by its intersection with this dominant image culture. Architecture has always maintained a mechanism of explanation, promotion and normative description alongside material production: treatises, catalogs, journals, conferences and articles. In the past this was related to pedagogy and the dissemination of professional information. Today there is an accelerated, spiraling motion

whereby materials from outside architecture (most notably, the immaterial effects of film, media, or graphic design) have been cycled back through the discipline to enlarge architecture's catalog of available techniques. This image culture belongs to the new ways of thinking and seeing that have emerged with modernity: shifting mental schemas that mark our uncertain position in the modern world, and force us to see how the practice of architecture has been constantly revised by the complex currents of twentieth-century thought.[8] If I maintain a provisional distinction between the instrumental consequences of representation within the culture of architecture, and architecture's complex interplay with social and semantic representations, it is not to ignore the moments of intersection and overlap. I propose a close attention to the material effects and worldly consequences of *all* of architecture's matter—material or immaterial, semantic or otherwise—while maintaining a strict indifference as to the origin of those effects.

trajectories

> And indeed, it is easier to walk with music than without it. Of course, it is just as easy to walk while talking up a storm, when the act of walking disappears from our consciousness.
>
> —Viktor Shklovsky

Michel de Certeau employs the figure of the walker in the city to describe the errant trajectories of everyday practices among the systematic space of the proper. For de Certeau, "the geometrical space of urbanists and architects seems to have the status of a 'proper meaning' constructed by the grammarians and linguists in order to have a normal and normative level to which they can compare the drifting of 'figurative' language." Within his schema, the wandering course of the pedestrian is compared to the enunciative function in language: "The act of walking is to the urban system what the speech act is to language or to statements uttered."[9] This free movement that de Certeau describes ("a Brownian variability of directions," in Deleuze and Guattari[10]) is guaranteed by the tactical improvisations of multiple individuals. De Certeau understood that there can never be a perfect correspondence between the regulated geometrical structure of the planned city and the unruly practices it supports. The city's inhabitants are always ready to take advantage of this mismatch between

structure and performance. This in turn suggests that the control exercised by any disciplinary regime can never be total. Resistance will find other pathways around (or under, or through) the constraints imposed from outside: pathways that lead away from transgression, catastrophic overthrow, withdrawal or retreat.[11] De Certeau describes a series of "tricky and stubborn procedures that elude discipline without being outside the field in which it is exercised."[12] He has confidence that there will always exist fissures and cracks that provide openings for tactical reworkings. Making opportunistic use of these footholds, the creativity of everyday practices can often outwit the rigid structures of imposed order, or out-maneuver the weighty apparatus of institutional control: "The long poem of walking manipulates spatial organizations, no matter how panoptic they may be: it is neither foreign to them (it can only take place within them) nor in conformity with them (it does not receive its identity from them). It creates shadows and ambiguities within them."[13]

What is not immediately obvious in de Certeau's writings is a subtext that appears to align the geometrical space of the planned city with the systematic constructs of theory. A concept of theory as regulated space (oblivious to the complex babble of enunciative practices taking place around it) precedes and undergirds his description of the regulated space of the planned city, indifferent to the multiple trajectories unfolding in its spaces. The idealized constructions of theory mirror the panoptic spaces of geometrical urban planning: "Within this ensemble," de Certeau writes, "I shall try and locate the practices that are foreign to the 'geometrical' or 'geographic' space of visual, panoptic or theoretical constructions."[14] And so, by analogy, just as the active citizen might manipulate and refigure the space of the city—which is given to her from without—so too creative intellectual operators can put into play the rigid codes of inherited ideological systems.

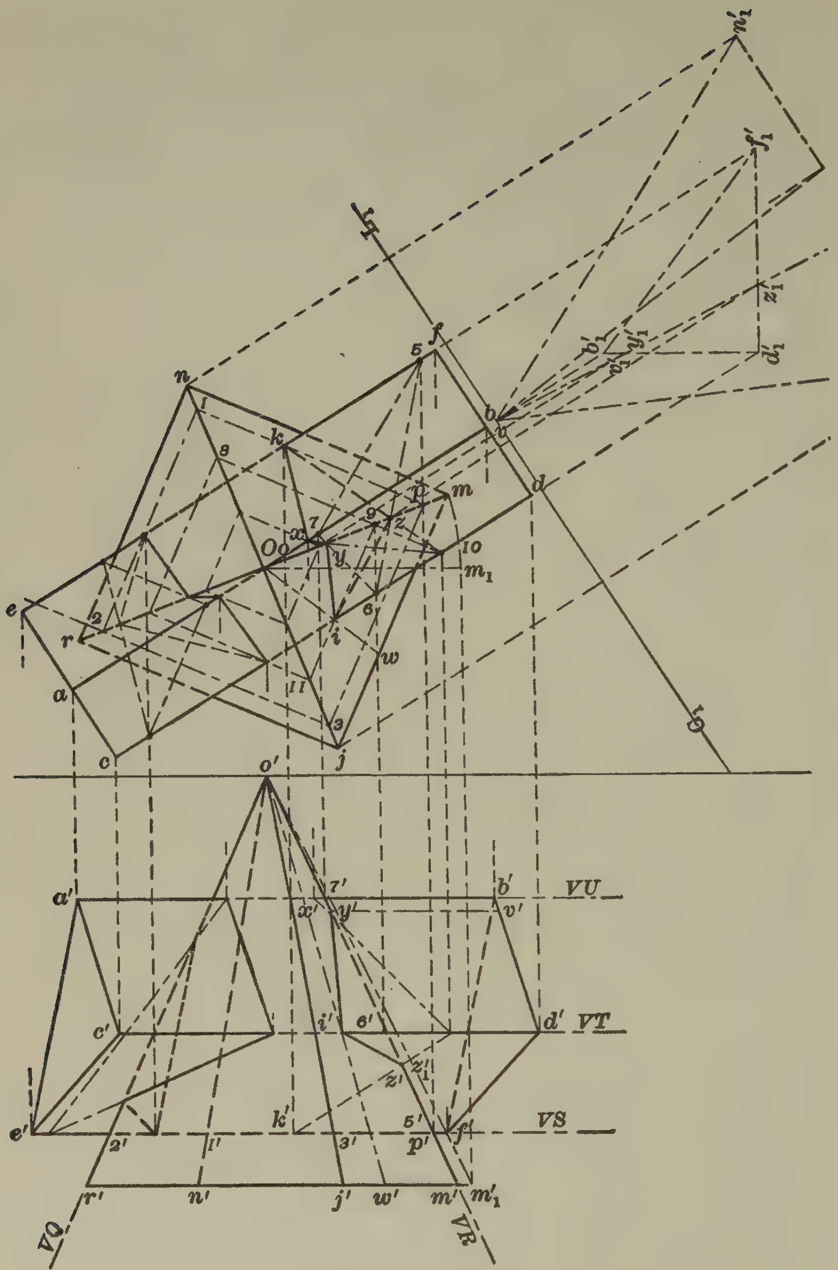
Two important senses of the word *practice* intersect here: practice designating the collective and peripatetic improvisations of multiple inhabitants in the city connects to *practice* as the creative exercise of an intellectual discipline by an individual. De Certeau's cunning optimism suggests a notion of *performative practice*, capable of continually reworking the limits of a discipline from within. He offers a way out of the false opposition between the pessimistic vision of practice as mechanical repetition (agent of institutional authority), and the neo-avant-garde position of transgression. His view affirms that practices always unfold in time, moving on multiple and undisciplined trajectories.

At the same time it is a realistic vision, recognizing that it is impossible to effectively operate outside of any discipline's "field of operations." Just as the walker in the city produces scandalous figures out of the geometric space of the city, there exist tactical practices—nomad practices of writing, thinking or acting—that are capable of manipulating and reforming theory's proscriptive spaces. When de Certeau speaks, in this context of an "opaque and blind mobility" inserted into the "clear text of the planned and readable city," I would suggest that it could also be read as a way to practice theory, a call for mobile and improper reworkings of the "clear text" of given theoretical formulations. The moment of dislocation—the itinerant path of the walker in the city, or the nomad thinker in theory—is precisely that which resists systematization.[15] It cannot be factored, it cannot be regulated. It makes room for the tactical improvisations of practices.

The essays in this volume were written following the pathways unfolded in the course of working.[16] I wanted to trace the emergence of ideas in and through the materials and procedures of the architectural work itself, and not as a legitimation from outside, in the form of written codes. Architecture, in my view, is not usefully understood as "built discourse." Instead, as a material practice, it is capable of producing ideas and effects through the volatile medium of artifacts and images rather than exclusively through the mediation of language. It works by means of a necessarily mixed assemblage of procedures, and requires multiple tactics of exposition. Hence the purpose of writing is not so much to explain, or to justify a particular work or working method (situating writing prior to, or above drawing or building, as activities proper to architecture) as it is a continual process of clarification. The activity of writing for me is part of the practice of architecture: something that happens alongside drawing, building, or teaching.

But the writing of an architect differs in significant ways from the writing of a historian or a scholar. In part, it is marked by the technical and instrumental concerns of a working architect, a kind of "shop talk": comparing notes and testing techniques, finding out what works and what doesn't work, constantly on the look-out for the next advance. To define these essays as part of an architectural practice is to recognize and accept the mixed character of architecture's procedures. To conceive this work as a practice is to work from examples, and not principles. It necessitates a continual reference to specific instances of buildings, drawings, or texts. But more significantly, it also means

resisting the temptation to generalize the results in the form of a *project.* Theory needs a project: a static construct, a persistent template of beliefs against which individual actions are compared, and tested for *conformance.* In contrast, practices imply a shift to *performance*, paying attention to consequences and effects. Not what a building, a text or a drawing means, but what it can do: how it operates in—and on—the world.



Projection of a pyramid and Prism, *Elements of Descriptive Geometry*, Blessing and Darling, 1913.

1

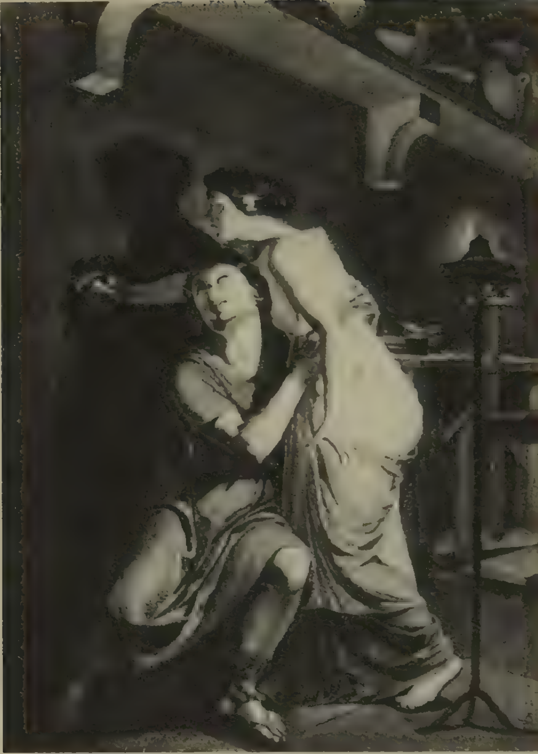
constructing with lines
on projection

hunting the shadow

It is quite possible to project whole forms in the mind without recourse to the material, by designating and determining a fixed orientation and conjunction for the various lines and angles.

—Leon Battista Alberti

Architecture is often defined as the art—or science—of building. Yet architects, when they build, influence construction only indirectly, at a distance. As Robin Evans has succinctly put it, "architects do not make buildings, they make drawings for buildings." In Alberti's treatise, a privileged place is assigned to the abstract, intellectual work of lineaments—linear constructs projected "in the mind," as opposed to material constructions in the world.[1] But to see the working constructions of the architect—drawings, models, notations, or projections—as simply opposed to the concrete physical reality of building is to miss what is specific to architectural representation. Projection, in particular,



Devlamynck. The Invention of Drawing, after a painting by Joseph Suvée, 1791.

implies an active, transitive condition. By the translation of measure and proportion across scale, architectural projections work to effect transformations of reality at a distance from the author. Projections are the architect's means to negotiate the gap between ideas and material: a series of evasions, subterfuges and ruses through which the architect manages to transform reality by necessarily indirect means.[2]

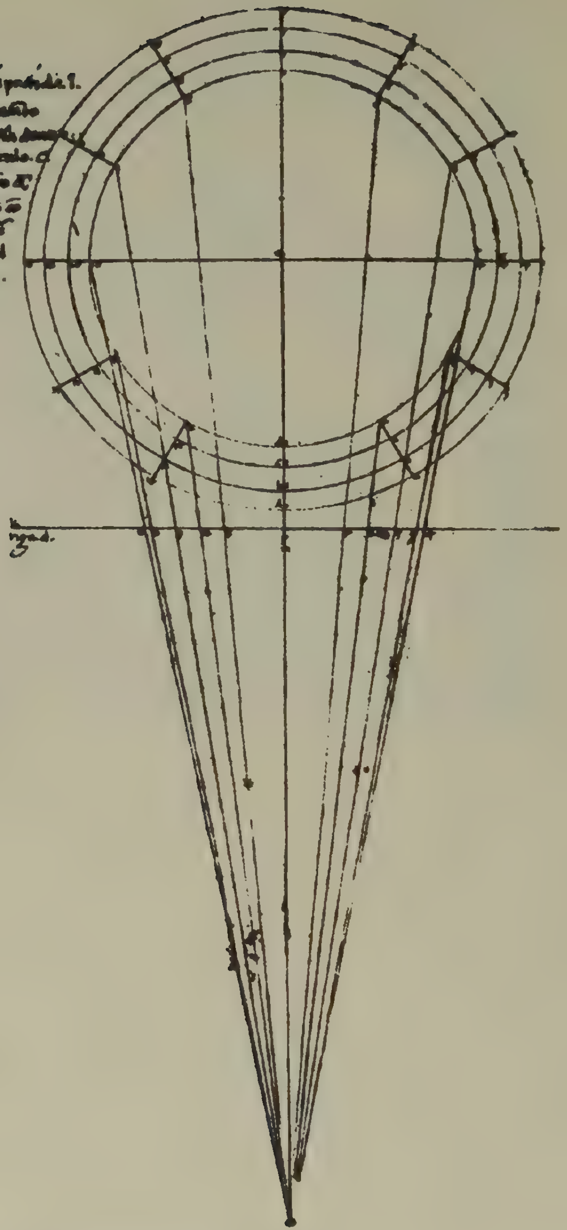
Many discussions of drawing begin with the classical legend of the origin of drawing.[3] As narrated by Pliny the Elder in his *Natural History*, the story is marked by themes of absence and desire. Diboutades, daughter of a Corinthian potter, traces with charcoal the outline of the shadow cast by the head of her departing lover. To point out that projection is fundamental to this story is obvious. Diboutades traces not from the body of her lover but from his shadow—an abstract projection cast on the surface of the wall by the soon-to-be-absent body. At the moment of tracing, Diboutades turns away from her lover and toward his shadow. Information is always lost in projection: the fullness and physicality of the body is reduced to a two-dimensional linear abstraction. The

Karl Friedrich Schinkel. *The Invention of Drawing*, 1830.

tracing works as a substitute, an incomplete image to recall something lost. The presence of the drawing marks the absence of the lover.

The legend of Diboutades stages a relationship between a body (the lover) and its representation, mediated by a form of projection (the tracing of the shadow on the wall). The drawing records something that already exists in abstracted form. It will act as a token to recall the memory of the lover when he is no longer present. The legend enacts classical theories of mimesis—art imitates nature, nature exists before art. In classical thought, the representation can be more or less accurate, but it will always be secondary, a shadowy simulation of reality.

Representation in architecture works differently. In "Translations from Drawing to Building," Robin Evans contrasts the typical product of the academic history painter to a version of the Diboutades story painted by Karl Friedrich Schinkel.[4] Two significant differences emerge. In the version from the academic tradition, the light is from a candle and the scene is an intimate interior setting. Schinkel's version is set out-of-doors, and the rays of the sun



Piero della Francesca. ***De Prospectiva Pingendi,*** **c. 1482.**

provide the source of light. The sun's rays, for all intents and purposes considered parallel, produce an orthographic projection, while the radiating vectors of the candlelight, effect a type of projection more closely related to single

point perspective. The architect's version employs the abstract projection of the mechanical draftsman—measurable and precise, capable of transmitting information—while the painter's version employs a more pictorial projection, producing an iconographic image.

Second, and more significant, is the scene of the drawing itself. In Schinkel's painting, the tracing is executed by a young shepherd, under the command of a woman who directs the act of drawing while steadying the head of the model. The painting depicts not an intimate interior setting, sheltered by an already fully formed architecture, but a pastoral scene, and a complex social exchange. Instead of a dressed plaster wall, the shadow is traced on the more or less even surface of a stone ledge in the landscape. As Evans points out, for Schinkel—the neoclassical architect—drawing necessarily *precedes* building and its subsequent codification of the norms of social behavior and civilization. Without drawing there is no architecture (or at least no architecture as Schinkel would have understood it—a classical architecture of regulated proportions and integrated formal orders). Drawing is identified with abstract speculation and geometry, and in turn, with social formation. Despite his portrayal of drawing as a more complex social scene, Schinkel has depicted the act of tracing (perhaps ironically?) at exactly the moment when the stylus rests on the shadow of the eye, as if to indicate the naturalness of vision.

Schinkel's painting suggests that classical theories of imitation fall short of explaining the workings of architectural drawing. In architecture there is no preexisting object to imitate: no body to cast a shadow.[5] Once codified, architecture tends to imitate preexisting architectures; but what does it originally imitate? Alberti, for example, states that architecture imitates nature by subscribing to the same set of abstract ordering principles. Architecture imitates nature, then, through harmony, number and proportion. In enlightenment architectural theory, the construct of the primitive hut is introduced; architecture imitates nature by finding its origins in the most basic and "natural" of architectural forms. But if classical architecture imitates nature in the form of the primitive hut, it does so only through a highly abstract and idealized geometrical mediation. Even later attempts to link architecture more closely to a mimetic idea of nature—E. E. Viollet-le-Duc's idea that the logics of structure imitate nature, or Gottfried Semper's woven walls—do so through conventionalized (and abstract) means. Each of these stories of origin returns to an void space. The desire for stable origins always turns up empty.

As in the legend of Diboutades, architectural drawing is marked by the sign of absence. But unlike classical theories of imitation, its object is not prior, but immanent; not something that once was and is no longer present, but something *not yet* present. Buildings are both imagined and constructed from accumulated partial representations. The drawing as object, like the musical score in performance, disappears at the moment of construction. But how is this transformation accomplished? It is difference, rather than a system of correspondences, that makes possible the translations between drawing and building. The capacities and logics of drawing are necessarily distinct from the potentials of construction. If drawings are disembodied indexes of absence, construction seems to be characterized by fullness and presence. But practice disrupts the easy characterization of drawing as the realm of absence and building as the realm of presence. In what follows, I examine the interplay between the abstract constructions of drawing, and architecture's specific capacity to transform reality by looking closely at specific practices of projection: perspective, anamorphosis, and axonometric projection in their historical and theoretical contexts.

To foreground techniques of representation in this way is not to locate the activity of the architect exclusively in the abstract realm of geometry and representation. In fact, by calling attention to the active character of projection, I want to unpack the received view that would see representation as a detached, abstract realm that stands in contrast to unmediated contact with the physical fabric of architecture. I propose instead to pay close attention to the *transactions* between the culture of drawing and discipline of building, and to suggest that, difficult as it may be, the architect must simultaneously inhabit both worlds. Instead of establishing fixed categories, what seems important today is to recognize the interplay of thought *and* reality, imagination *and* realization, theory *and* practice.

In his treatise on architecture Vitruvius had already pointed out that "architects who have aimed at acquiring manual skill without scholarship have never been able to reach a position of authority to correspond to their pains, while those who relied upon theories and scholarship were obviously *hunting the shadow, not the substance*."[6] Architecture proposes a transformation of reality carried out by abstract means. But the means of representation are never without their own shadows.[7] In the case of architecture, it is the ephemeral shadow of geometry cast on the obstinate ground of reality that marks the work of architecture as such.

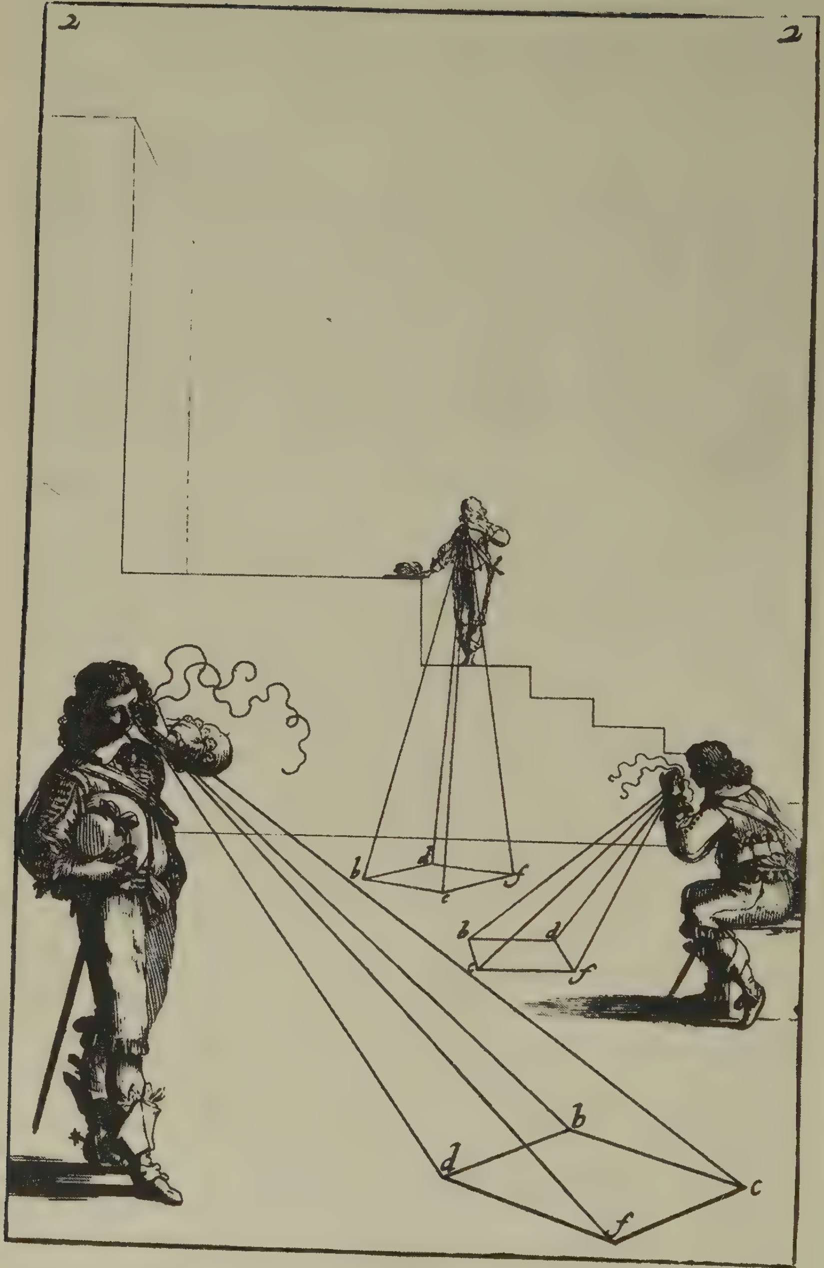
Vision and Perspective

> A dream is, among other things, a projection: an externalization of an internal process.
>
> —Sigmund Freud

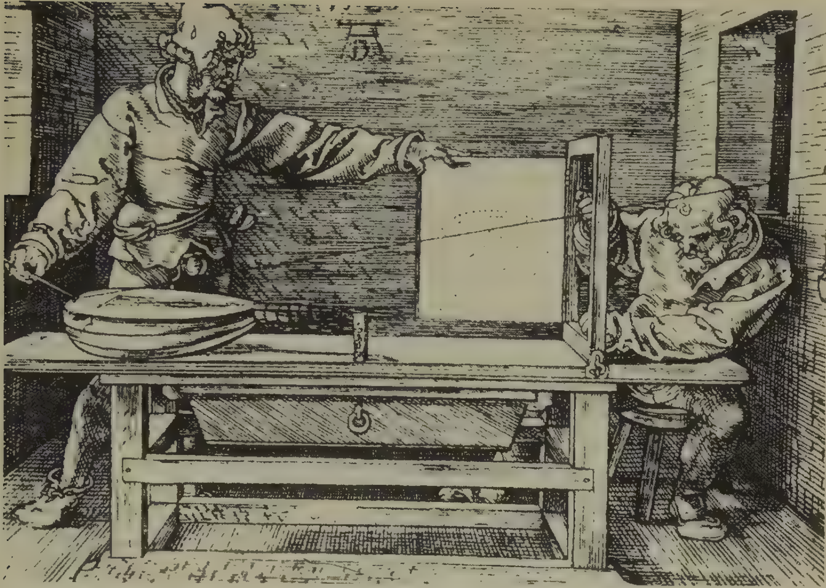
In order for classical architecture to identify itself with the exact sciences, architecture had to establish its foundations in mathematical reasoning. Architecture could be scientific only to the extent that it was mathematical.[8] In classical theory, perspective offered a geometrical means to order the constructed world in accord with nature. Perspective linked the perception of the world to ideas about the world through the vehicle of mathematical reason. But perspective also functioned as a concept of time: ordering, surveying and re-creating the past from the privileged viewpoint of the present. Just as the distant Roman past was rediscovered/reinvented on the basis of ruins and fragments, so the viewing subject could reconstruct the narrative space of painting by means of perspectival projection. Space is read in depth—locating the spectator in front of and in the present, from which the distance/past is entered and traversed. Perspective establishes a temporal field that supports narrative history.

The mathematical calibration of the visual world allowed other correspondences. The analogies between musical and visual harmonics were established on the basis of their common foundation in geometry. Cosmological, religious, and philosophical consonances were played out on the basis of the geometry of space and its relation to an idealized body. Even emerging sciences of ballistics and fortifications could be given a metaphysical overtone by contact with geometry. Seeing was understood as a natural function of the eye; the paradigms of Renaissance painting naturalized an idealized concept of vision. As Erwin Panofsky has pointed out, perception and concept were unified in Renaissance perspective practices: "... 'aesthetic space' and 'theoretical space' recast perceptual space in the guise of one and the same sensation: in the one case that sensation is visually symbolized, in the other it appears in logical form."[9] In architecture, the smooth space of mathematical reason allowed the architect to reverse perspective's temporal vector and project precisely imagined constructions into the future.

The constructions of perspectival geometry then, appear to enforce the privilege of the perceiving spectator. But Norman Bryson, elaborating on the speculations of Jacques Lacan concerning optics, has pointed out that the pres-



Abraham Bosse. Plate from *Maniere universelle de M. Desargues*, 1648.



Albrecht Dürer. *Artist Drawing a Lute*. 1525.

ence of the viewing subject implies a corresponding absence: "The moment the viewer appears and takes up position at the viewpoint, he or she comes face to face with another term that is the negative counterpart to the viewing position: the vanishing point. . . . The viewpoint and the vanishing point are inseparable."[10] If, as Renaissance theory wants to suggest, the proper perspectival construction contains within it an ideal viewing distance which fixes the position of the spectator, the spectator is at this moment also effaced. The viewer, in facing the vanishing point, is confronted with a ". . . black hole of otherness placed at the horizon in a decentering that destroys the subject's unitary self possession."[11] The very possibility of the subject's being in the picture is inextricably linked to its displacement from the picture.

In Albrecht Dürer's 1525 lithograph *Artist Drawing a Lute*, the paradox of the viewing point, and its decentering effect, is underlined. Laid out perpendicular to the viewer's line of sight, a lute sits on a table to which a wooden frame has been attached. A hinged panel holds the drawing that is being produced. It has been rotated ninety degrees from the frame, which turns it toward the viewer, who can observe a series of points forming the outline of the instrument. A string attached to a counterweight is threaded through a metal eyelet on the wall behind the artist, while his assistant holds a stylus attached to the other end of the string.[12] The assistant aligns the stylus to a series of points on the edge of

the lute. By adjusting a pair of cross bars to mark the intersection of the string with the plane of the wooden frame, the artist transfers the series of points to their foreshortened location on the drawing surface. Through the repetition of this process, the three-dimensional form of the instrument is converted into a two-dimensional projection. In this diagram, the viewpoint is represented by the mechanical eyelet attached to the wall. Leaving aside the difficulty of replacing binocular vision of the human eyes with a single point, it is clear that in this construction, the viewpoint is an abstract location that can never be physically occupied. It is a geometric point, an imaginary construction without dimension.

Yet there is another interesting aspect to this diagram. The construction of the drawing is depicted as a mechanical activity. The gaze of the artist, for example, is directed not at the lute itself, and not from the imaginary viewpoint, but toward the point where the lines of projection and the picture plane intersect. That is to say, his attention is given over to the device itself and the mechanics of making the drawing. He pays little attention to its subject (the lute), and the viewpoint is actually behind his head. He moves around and over the scene of representation, but never occupies a place within it. Dürer has depicted these artists manipulating a physical framework, producing the drawing practically without relying upon their own visual perception. The physicality of this framework has led Jacques Lacan to remark, "The geometral space of vision—even if we include those imaginary parts in the virtual space of the mirror . . . is perfectly reconstructible, imaginable, by a blind man."[13] There is nothing in Dürer's diagram to contradict this. Every operation shown in the diagram could be carried out by a blind man.

Lacan's observation suggests that in codifying vision, the theorists of the Renaissance actually overlooked vision entirely. Dürer's lithograph, as a diagram of perspective theory, confirms Lacan's assertion that "perspectival construction allows that which concerns vision to escape totally."[14] The agency of the viewing subject is short-circuited in the capture of the represented object. The act of representation is depicted as an objective, scientific activity—the recording of already established relations and facts. Perspective belongs to visuality (that is to say, the codes and conventions of the visual), and not to vision. Light and shadow, reflection and transparency, binocular and peripheral vision all drop away as the object is converted into a linear abstraction.[15] Yet, as could be abundantly demonstrated, the practice of painting in the Renaissance, while dependent on the theoretical scaffold of perspective theory, always exceeds its limitations. Moreover, in perception, perspective is more robust

than its critics would have it. Pictures do not collapse, for example, when the viewer moves off the axis of viewing. The conventions of Renaissance painting are conventions and not "natural" transcriptions of vision, and they collaborate with the viewer's perception—which is itself a product of cultural formation—to form intelligible pictures.

To point this out is not so much to contradict Lacan, but rather to underline the role of the subject's agency in the formation of the picture. That is to say, the picture is not objectively given in its construction, but is instead formed in a complex interaction with the subject—both the perceiving subject and the creating subject. To suggest that *any* geometrical construction, no matter how complex, could be capable of mapping the fluidities of vision is always to artificially reduce the complexity of vision. "Perception eclipses structure," notes Lacan commentator Jacques-Alain Miller.[16] Perspective apparently only indirectly concerns the visual. Yet, considered from its functional aspect—as an instrument to manipulate space, which is not a tangible body but an abstract set of relationships— this may not be a liability. To what degree, for example, is musical notation concerned with the audible? Instead, like what Lacan calls "the geometral space of vision," it is an abstract and to some degree arbitrary series of notations that concern the internal structure of the work.

For Panofsky, it is precisely the ability to represent abstract space that distinguishes Renaissance art—("a perfectly unified world . . . where bodies and the gaps between them were only differentations and modifications of a continuum of a higher order")—from the world of classical antiquity that "recognized as artistic reality only what was tangible as well as visible."[17] Instead of tangible objects floating in measureless space, space itself can be measured and precisely represented. Renaissance perspective implied a geometric order common to both bodies and space. Although early theories of perspective are elaborated by architects such as Filippo Brunelleschi and Leon Battista Alberti, perspectival projection is not directly utilized in the construction of architectural space. It is rather that perspective as a *conceptual* schema underlines Renaissance architectural theories of perception and of proportion.[18] Renaissance practice confirms that design is not visualization (empirically "testing" successive versions) but rather the manipulation of a series of highly abstract devices—primarily the orthographic projections of plan and section—that serve to describe and construct the space. In Brunelleschi's famous demonstration of perspective, the view of the baptistery as a freestanding object is represented by a drawing in perspective, but the sky—and

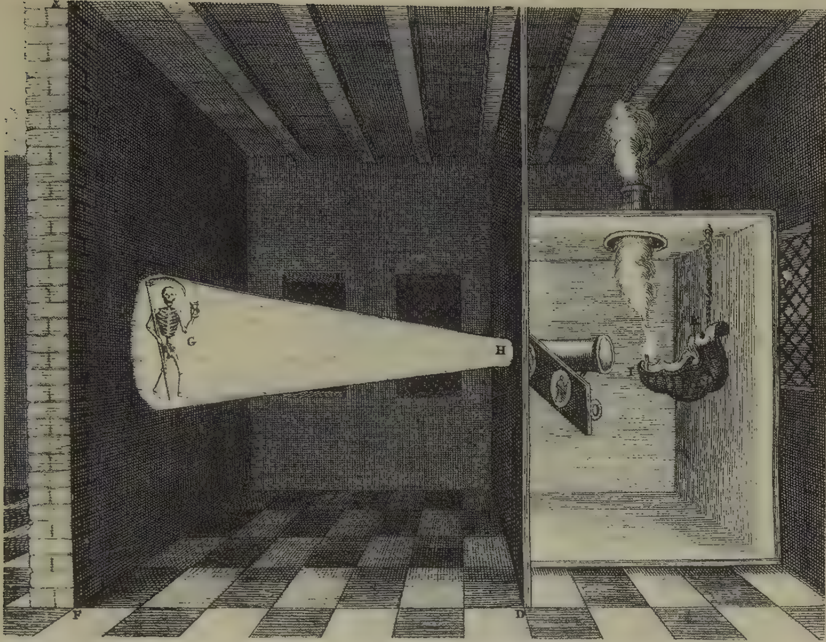
by extension, the space that the object occupies—is brought into the picture by means of an illusion, a mirror that reflects the actual sky beyond the observer.

Could it be that that which a practicing architect might reasonably ask for in a theory of representation is not a perfect match between the object and its representation, but rather to accept the *impossibility* of an accurate transcription of vision as a fundamental starting point? If geometry only incompletely maps perception, and if vision of necessity operates through the social, then the history of representation becomes a history of the forms of its mediation.[19] Such a history would map both the resistance of geometry itself as material and the subject's always-mediated and partial access to geometrical thinking. It would therefore come as no surprise that all representations are incomplete and fragmentary. The work of representation could therefore be understood as a series of provisional strategies—necessarily abstract and intangible—to negotiate difference and work within the gap between vision and visuality. It would be possible to evaluate specific representational strategies for their differing instrumental utilities (and for their ideological or social implications) without obligation to accept or reject the system as a whole on the basis of the illusive criterion of "faithfulness to perception." Projection is not a thing in itself, but a relationship between things. As such, its internal relations are not fixed, and can always be reconfigured. It follows that the exercise of representation in architecture always necessitates an active effort of geometrical imagination, a mental and intellectual projection, like the translation of musical notation, to synthesize these always multiple and always incomplete representations. (The complex process imperfectly referred to as "reading" drawings.)

anamorphosis: monsters and aberrations?

> Besides, there can be no doubt that the perception of space is a complex phenomenon: space is perceived and represented indissolubly.
>
> —Roger Callois

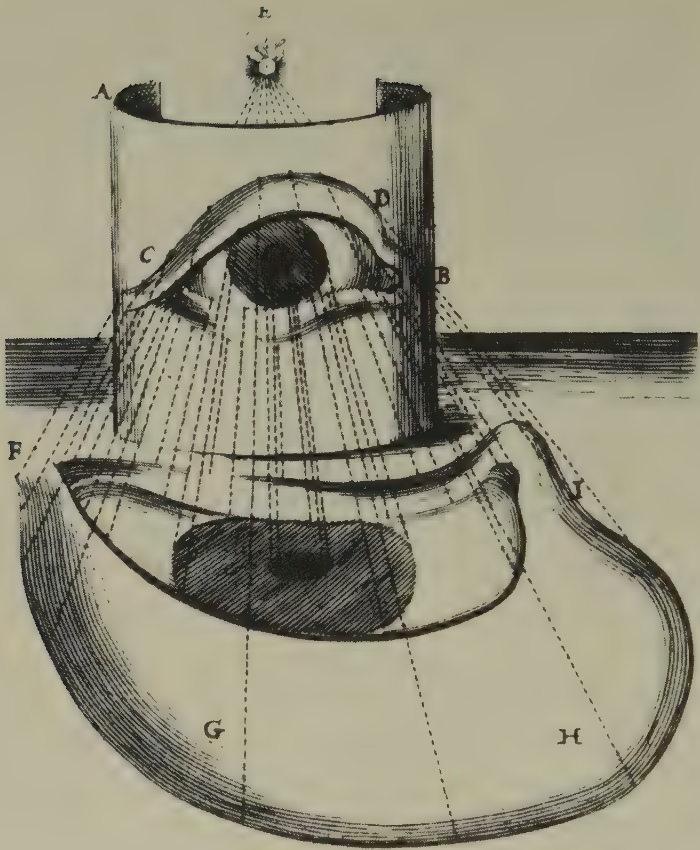
Perspective registers the distortion and foreshortening of a perceived object by tracing lines from its outline back to an imaginary viewpoint. The image is formed in the intersection of these lines and a picture plane—a screen perpendicular to the line of sight. But as a geometrical system, perspective construction



Athanasius Kircher. ***Application of the Magic Lantern*****, c. 1660.**

does not always depend on a preexisting object. The "impossible" perspectives of G.B. Piranesi's *Carceri*, (1760–1761) for example, show that perspective is not limited to recording the form of already existing spaces or bodies, but can be employed to imagine new spaces or objects. Further, within the logic of the system of perspectival projection, there exists the possibility of its reversal: the system diagrammed by Dürer to represent an object can be turned around to produce the illusion of the presence of an imaginary object. A century before Piranesi, Athanasius Kircher, in his engraving *Application of the Magic Lantern* (c. 1660) shows how the geometries of projection might work to create the illusion of the presence of an object. In Mario Bettini's *Reproduction of an Eye by Means of Catoptric Anamorphosis Upon a Cylindrical Surface* (1642), the representation of the eye is multiplied in a series of projections, all more or less distorted.

The appearance in the seventeenth century of these apparent aberrations within projective systems marks an important shift in the understanding of perspective. Perspective in these cases is not understood as a means to visually transcribe reality, but rather as a more or less coherent system that can be manipulated to produce various results. Perspective is not presented here as naturalized vision, but as artifice and the construction of illusion. These "artificial" uses of projection in turn coincide with the more secure mathematical and technical



Mario Bettini. ***Reproduction of an Eye by Means of Catoptric Anamorphosis Upon a Cylindrical Surface*****, 1642.**

bases for projection established in the late sixteenth and early seventeenth centuries. The codification of the principles of stereotomy by Philibert de l'Orme and the establishment of generalized principles of projective geometry by Girard Desargues demonstrate the interconnection of instrumental and scientific research on projection. The first systematic descriptions of axonometric, (or parallel) projection also occur in the late sixteenth century.[20] The emergence of calculus and analytic geometry in the seventeenth century made it possible to see graphic data not as a more or less accurate approximation of sight, but as a way of calculating and predicting abstract quantities or behaviors. The discoveries of

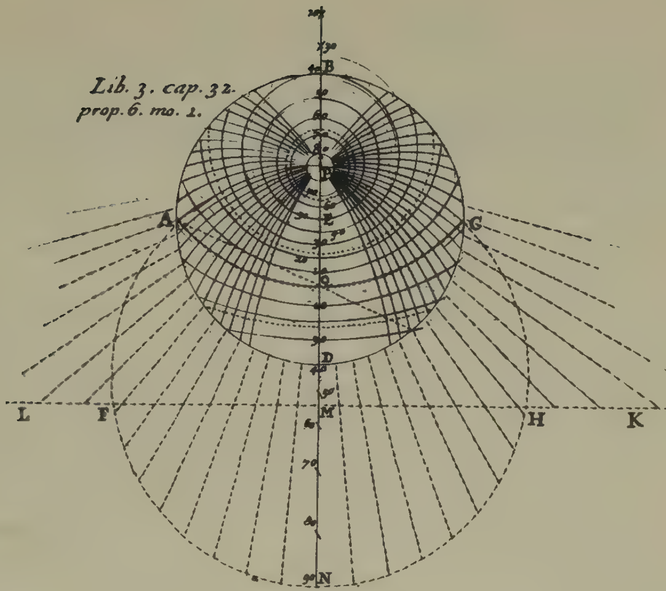
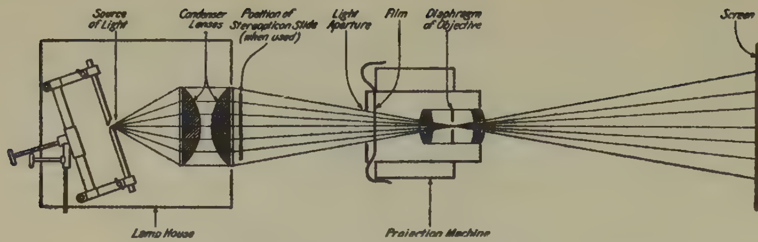


Diagram for the construction of the oblique stereographic projection, added by Richard Blome to his 1693 translation of Bernardus Varenius, *Geographia generalis*, Amsterdam, 1650.

projective geometry had applications in a wide variety of fields, such as astronomy, navigation and map-making not necessarily connected to the discourses of aesthetics or representation.[21] The aberrations of anamorphosis and the mathematical development of projective geometry, although apparently incompatible, represent different aspects of a generalized science of projection emerging in the seventeenth century. Once projection has been detached from its imperative to transcribe vision, it can be utilized as an instrumental technique equally capable of producing instrumental data or irrational effects.

But from the point of view of the techniques of drawing, the changes introduced are relatively minor. In anamorphic projection, for example, all of the essential elements of perspectival construction are still present: the object (imagined or real) the viewpoint, the screen, and the converging lines of projection are all present. A series of small technical adjustments produce a major disruption. Simply tilting or warping the screen of projection in Dürer's diagram, for example, would have the effect of introducing a similar distortion into the image. The exaggerated distortion of anamorphosis makes the viewer aware that all per-



Anonymous magazine illustration. ***Diagram of Cinematic Projection Apparatus.***

spectives depend upon distortion. The effect is to make the construction visible. The artifice is no longer hidden, and perspective can no longer be understood as the natural outcome of vision. The evidence of disorder (distortion, dissonance) is contained within the rational limits of the system itself.

I might even go so far as to propose that it is anamorphic projection that is the more general case, and that perspective could be understood as a special case of anamorphosis. In this sense it might be possible to speak of a generalized system of projection utilizing vanishing points, converging projectors and picture planes, which, when aligned, produce "correct" perspectives, but when placed in different relationships, produce "distorted" anamorphic effects. As such, anamorphosis functions to make visible the limits of the perspectival system and its arbitrariness. A legitimate exercise of the established rules of the system has the capacity to produce monsters and aberrations." Anamorphosis makes explicit the subject's agency in viewing. It confirms that viewing itself involves projection and participates in the construction of the illusion. Projection as active construct connects the history of representation forward in time to the apparatus of the cinematic camera and projector, which also operate to construct animated illusions by means of projection.

Like conventional perspectival construction, anamorphosis locates the viewer, but now in an oblique and decentered position. The image coalesces only in the moment of turning away from the painting. The geometric character of vision is used in order to capture the subject. Lacan calls anamorphosis a "trap for the gaze": in turning away, the viewer sees that which is hidden in the construction of the picture; at this moment, the contingency of the act of viewing, and the collaboration of the subject's desire, is underlined. The subject is always in the picture. For Lacan, the discussion of anamorphosis confirms that Euclidean geometry is inadequate to map the complexities of perception and

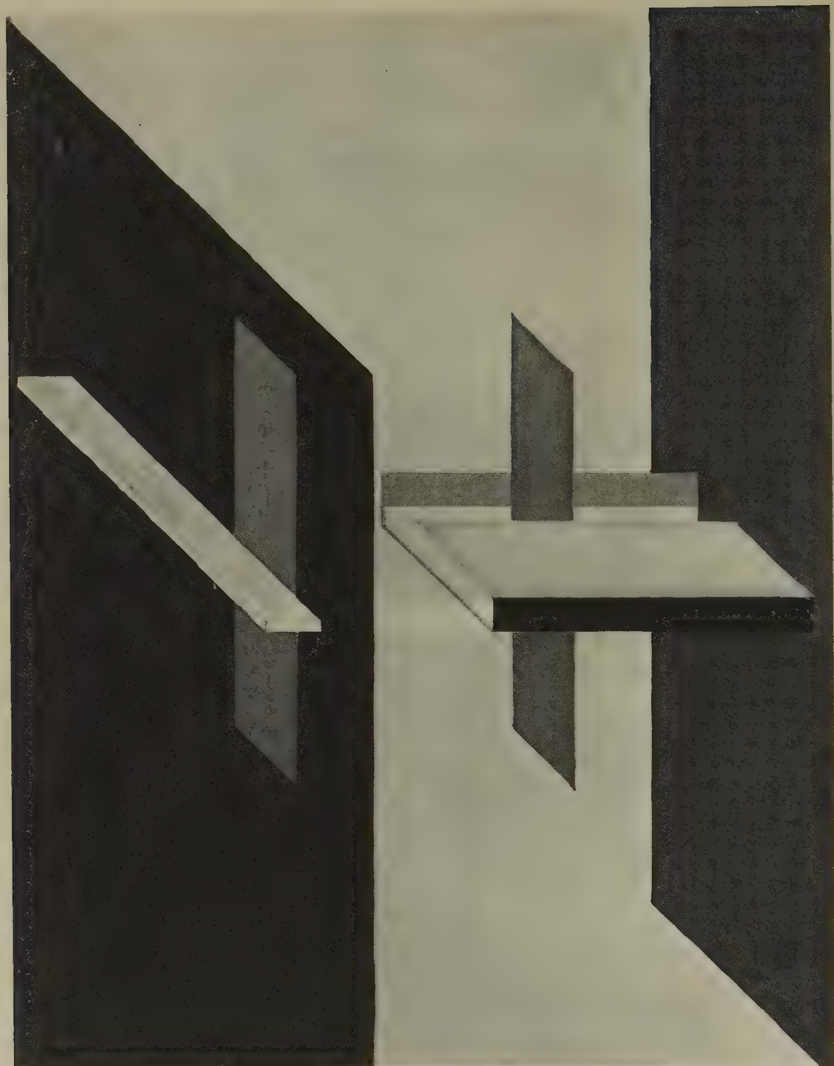
the fluidity of the gaze. The constructions of subjectivity always exceed their geometrical description. If projection is no longer understood as natural, scientific and objective, but as the product of active subjectivity and the construction of illusion through "irrational" means, what are the consequences for architectural practice?

axonometric projection: new geometries and old origins

> In fact no one can imagine or project anything modern. By definition there exists an essential contradiction between the terms "project" and "modern." To project literally means to throw forward. But in order to throw something forward both thrower and projectile must be behind. Every project is an emissary from the past.
>
> —José Quetglas

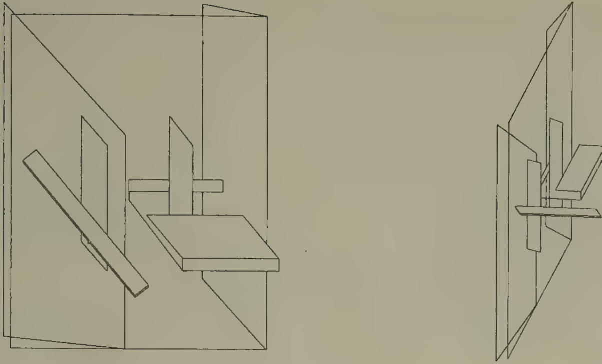
In 1925, El Lissitzky wrote: "In the period between 1918 and 1921 a lot of old rubbish was destroyed. In Russia too we have torn A. [art] from its holy pedestal 'while spitting on its altar.'" For the revolutionary artists of this time, the old forms of representation could no longer hold together under the pressure of sustained innovation. "Perspective," Lissitzky explained, "limits space; it has made it finite, closed." The world is put into a cubic box, which creates a static "facade view" of the world. "Suprematism" on the other hand, "has extended the apex of the finite visual cone of perspective into infinity. . . . It has broken through the blue lampshade of the heavens." In Lissitzky's "irrational" space, viewpoint and vanishing point are both located at infinity. The infinite extension in depth coincides with the suspension of the subject's privileges of self-location. The viewing subject and the object of representation both inhabit the same extended field. Projection operates to simultaneously prolong and collapse distance: "Suprematist space can be formed in front of the surface as well as in depth. . . . Suprematism has swept away the illusion of three-dimensional space on a plane, replacing it with the ultimate illusion of *irrational space* with attributes of infinite extensibility in depth and foreground."[22]

Perspective and anamorphosis, despite their nature as constructions, are still essentially pictorial, and work in the symbolic register. Perspective, while aspiring to be scientific and generalizable, was always linked to a fixed point of



El Lissitzky. *Proun*, c. 1923.

view. By extending the vanishing point to infinity, the constructions of perspective are rendered at one and the same time more flexible from an instrumental point of view, and more universal from a philosophic point of view. These revolutionary artists of the early twentieth century avant-garde wanted to go beyond art's traditional role of interpreting the world to imagine an art capable of constructing new worlds. Hence the attraction of axonometric projection. Axonometric, because it could transmit abstract information, and because it was measurable and precise, was the ideal tool to delineate the

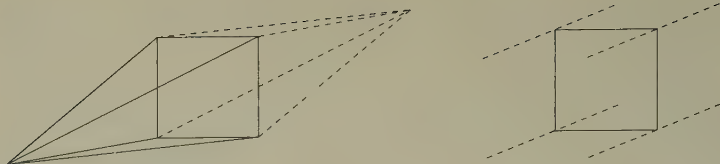


Frontal and Oblique Views of El Lissitzky's 1923 *Proun*, Computer reconstruction by Stan Allen, assisted by Nona Yehia, 1997.

avant-garde's vision of a new world.[23] Perspective records what already exists, whereas axonometric projection constructs that which does not yet exist.

Yet in the approach of Lissitzky, as in other early-twentieth-century abstract painters (or as they were sometimes referred to, "nonobjective" artists—Kasimir Malevich, Wassily Kandinsky, or Piet Mondrian for example) a curious contradiction emerges. On the one hand, Lissitzky wants the progress of the visual arts to be understood as a parallel to scientific and mathematical progress. The objectivity of science counters the traditional concept of the artist: the new artist constructs a new reality with scientific concepts, rather than representing existing reality with existing conventions. On the other hand, Lissitzky preserves for art its traditional capacity to make the infinite and the unmeasurable visible and concrete. Lissitzky accomplishes this "knight's move" by appropriating devices from the technical disciplines. Mechanical drawing, optics, and ballistics are attractive to Lissitzky for their objectivity and technical precision—that is to say, modern and progressive from a scientific point of view. But these instrumental techniques are given a new meaning in the context of avant-garde practice. For these artists, the *visual* abstraction of these techniques—the indeterminacy of the represented spatial field—becomes primary. Instrumentality may work against the symbolic, but a new metaphysics of infinite space works against the instrumental. A symbolic dimension is grafted onto these technical practices.[24]

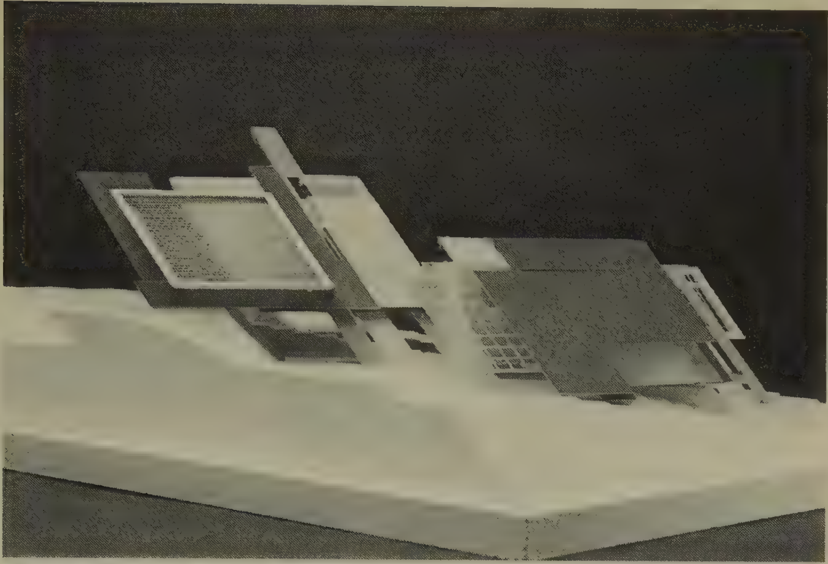
Axonometric has its origin in ancient visual practices, and Massimo Scolari has argued for a history of continuous development of parallel projection alongside that of perspectival projection.[25] Parallel projection appears whenever



El Lissitzky. Schema from *K. und pangeometrie*, 1925.

questions of measurability, prediction, and verifiability arise. Therefore it is not surprising that the earliest systematic description of axonometric projection occurs in a military context, where it was originally used to chart the three-dimensional trajectories of artillery projectiles. In the eighteenth and nineteenth centuries, axonometric drawing was taught in engineering schools and its development was closely related to mechanization and industrialization. The use of axonometric projection in architecture extended the scientific/mathematical basis for architectural representation already initiated with the widespread teaching and use of descriptive geometry. It is a history linked more closely to the *École Polytechnique* than to the *École des Beaux-arts.* For these architects or technical draftsmen, axonometric combined the immediacy of a perspectival view with the measurability and transmissibility of orthographic projection. Axonometric projection, originating in the abstract and instrumental world of the technical disciplines, does not pretend to map vision. It is concerned instead with construction and consistency of measurement.

The technical difference between perspective and axonometric is the absence of a vanishing point. The projectors do not converge but rather, as in the orthographic projections of plan and section, they are parallel. One way of describing this condition mathematically is to say that the vanishing point is located at infinity. And this was precisely what attracted abstract artists such as Lissitzky: the capacity to make the infinite visible in the context of a quasi-scientific construction. These nonobjective artists were not interested in distortion, but in ideal geometries and universal applicability. They were fascinated by the reversibility of the spatial field in axonometric, which seemed to render space more open, and extensive. Axonometric projection was an ideal device to represent universal geometries and infinite space. These artists suggested by implication that axonometric, although originally derived from the technical disciplines, might *after all* map a new condition of vision—a modern vision



Peter Eisenman. ***House X, Axonometric Model,*** **1978.**

marked by the fundamental abstractness of technology and the universal geometries of modern mathematics.

It was not only infinite space that was made visible in axonometric projection, but also new concepts of time. If perspective, dependent on a single point of view, seemed to freeze time and motion, the atopical space of axonometric suggested a continuous space in which elements are in constant motion. The same property that made axonometric such a useful tool in explaining the construction of complex machinery or spaces (which could be represented in "exploded" form, and reconstructed in the imagination by moving the elements on parallel projectors) could be exploited here to suggest the simultaneity of space and time. The reversibility of the spatial field allowed for the simultaneous presentation of multiple views. The suspension of the viewing subject shifts attention to the constitution of the object itself, suspended in time in an ambiguous spatial field. Distanced from the viewer (who, in axonometric projection is usually located not in front of, but above or below the object) the represented object can be freely rotated, dismantled or reconstructed. Axonometric and technical drawings lend themselves to the multiplication of views in an effort to describe the complex totality of the object.[26]

For these avant-garde artists, axonometric projection approached something like what philosopher Edmund Husserl identified as geometry's ideal objectivity: "The Pythagorean Theorem, indeed all of geometry, exists only

once, no matter how often or even in what language it may be expressed. It is identically the same in the 'original language' of Euclid and in all 'translations,' and within each language it is again the same, no matter how many times it has been sensibly uttered, from the original expression and writing down to the innumerable oral utterances, or written or other documentation."[27]

Writing in 1936, Husserl signaled the special capacity of geometric concepts to exist independent of any particular representation. Geometry's objects are ideal objects, given as concepts, and distinct from both scientific instrumentality and the vagaries of the individual subject. Geometry, for Husserl, exists prior to history, circumstance, or any particular instance of its expression. Husserl's project seen in the historical context of the 1930s is in some sense parallel to the theoretical project of those early modernists who also sought new paradigms of representation in order to renew contact with the "origin of geometry."

For Husserl, geometry is indifferent to translation. Its origin is always present and its ideal objectivity is unaffected by the particularity of utterance or the language of its expression. There is nothing lacking for translation to supplement, no difference to be put into play. This perfect transparency is not uncontested; Husserl is fully aware that it necessitates a bracketing of the contingencies of language and practice to achieve such ideal objectivity.[28] As opposed to the multiplication of languages and the splintering of signs (what he refers to as the "seduction of language"), Husserl looks for a notion of language grounded in universal geometries and ideal formations. He would use geometry as a model for language, not language as a model to describe geometry.[29] Husserl's dream is of a return to language in general, and a series of ideal formations capable of universal intelligibility: "geometrical existence is not physic existence; it does not exist as something personal in the personal sphere of consciousness: it is the existence of what is objectively there for 'everyone' (for actual and possible geometers, or those who understand geometry)."[30] He wants to rescue geometry, as something full of meaning, from the instrumentality that he sees in the unreflective employment of geometry in technical pursuits.

Hence, for Husserl, it is precisely the abstraction of geometry—its lack of specific meaning that makes it possible to be objectively available "out there" to everyone. But for Husserl—as for the nonobjective artists of the early twentieth century—abstraction does not signify a move away from meaning or a shift toward instrumentality, but rather a turn toward a deeper meaning. Husserl underlines the universality of geometrical practices: "Measuring belongs to

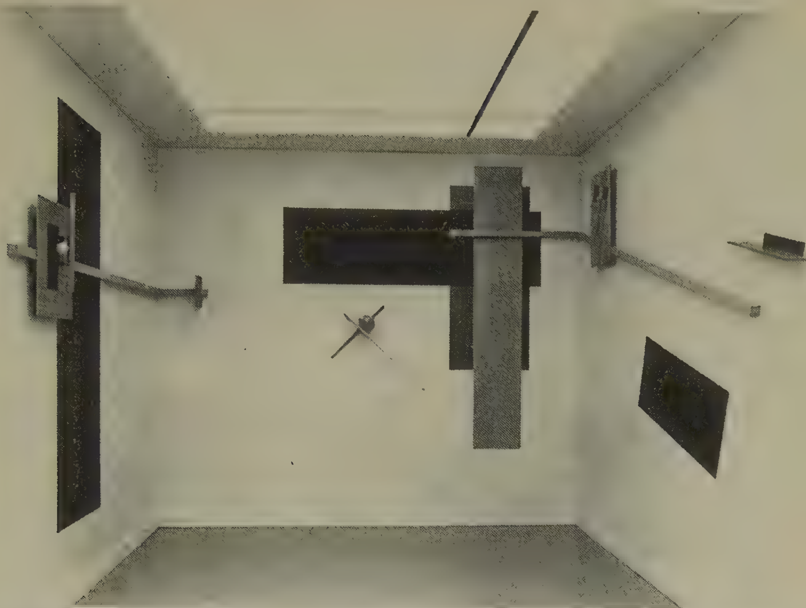
every culture," he claims, suggesting that geometrical thinking is beyond convention and cultural difference.[31] And there is a correspondence at the level of formal aesthetics as well; ideal objectivity favors regularity of expression: "straight lines are especially preferred, and among the surfaces the even surfaces. ... Thus the production of even surfaces and their perfection (polishing) always play a role in praxis."[32] The aesthetic vision that corresponds to Husserl's dream of a universal objectivity tends towards the elimination of imperfection and the smoothing out of difference.

Architecture tends, in theory, toward Husserl's ideal objectivity. Yet in practice this perfect smoothness proves unattainable. The abstraction of architectural drawing is as much a product of its instrumentality as a result of contact with the origins of geometry. Architectural representation makes use of Husserl's geometric transparency, and is indeed marked by it, yet its objectivity can never be uncontaminated. Architectural drawings always maintain some contact with instrumentality. Architecture as a pure mathematical construction remains a utopian dream. In most early modern architectural practice, axonometric maintains the linearity and objectivity—the measurability—of the architect's plans, and it is therefore attractive to architects such as Hannes Meyer or Walter Gropius not for its irrational or metaphysical qualities but for its objectivity. Transparency here implies not privileged contact with origins (Husserl), but a guarantee of technical performance. Axonometry as a useful means of explaining complex architectural objects needs to be distinguished from axonometry conceived as a privileged point of contact with universal geometric truths.

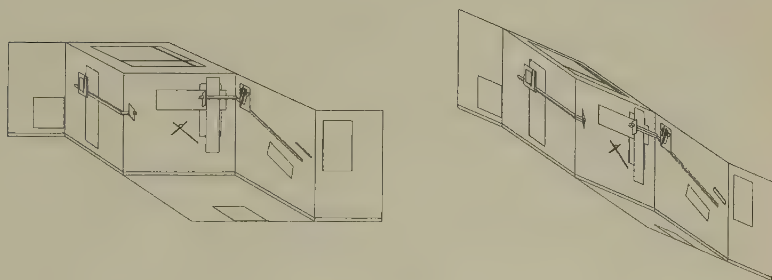
Even in the case of an abstract artist such as El Lissitzky, the smooth space of axonometric projection works against multiple resistances when translated into three dimensions. If we compare the implied space of the Proun drawings with the 1923 construction *Proun Space*, it becomes evident that the infinite extension of the visual field is more present as representation than as experience. The "metaphysics of infinity" can only be incompletely realized. Lissitzky maintains art's privilege of "ultimate illusion" in the three-dimensional space. The *Proun Space* is still a representational device, a construction suggesting something beyond itself. The spatial indeterminacies of the two dimensional Proun drawings are not put into play, releasing new dimensions, but rather reduced to a series of shallow sculptural reliefs set against the stable rectilinear frame of the room. Modifications have been introduced, but the basic framework of

Hannes Meyer and Hans Wittwer. Diagrams for *Petersschule*, Basel, 1927.

Euclidean geometry is untouched.[33] The classical symbolism of measurable figurative space is exchanged for a new symbolism of infinite abstract space. The appeal to mathematics as transcendental and foundational is not diminished. The stable coordinates of Cartesian space persist, now as a framework for viewing a fragmented object. The privilege of the viewing subject is maintained.



El Lissitzky. *Proun Space*, 1923; Reconstruction, Stedelijk Van Abbé Museum, Eindoven, The Netherlands, 1965.



Frontal and Oblique Views of El Lissitzky's Axonometric drawing for the 1923 Construction *Proun Space*, Computer reconstruction by Stan Allen, assisted by Nona Yehia, 1997.

The double metaphysics of early modernism—infinite space and simultaneous time—is available only as metaphor.[34]

Although complex spatial effects of ambiguity, transparency or reversal are evident in the experience of early modern buildings, these effects are not always directly anticipated in the form of drawings. The distance between Theo van Doesburg's axonometric projections and his realized constructions—

the decoration of the Café Aubette (1927), for example— rehearse the same difficulty of translation described in the case of Lissitzky. Neoplasticism wanted to identify the atopical space of axonometric projection with a new sense of an infinite spatial field. These artists and architects proposed a utopian aesthetic that could extend to all aspects of urban and everyday life. But it became increasingly difficult to reconcile that aesthetic vision with the experience of the spectator in concrete physical space. The reinterpretation of axonometric projection by avant-garde artists, as a vehicle for universal, abstract thinking was never fully integrated into architectural practice. As Yve-Alain Bois has pointed out,[35] it is only in more recent practice—the projections of Daniel Libeskind or the axonometric models of Peter Eisenman, for example, where an investigation of the means of representation takes precedence over realized buildings—that architects have fully exploited the implied reversibility of depth and foreground that characterizes axonometric projection. But in this case the representations can only refer to other representations. The work (even when constructed) remains locked within the limited compass of the discipline, without taking advantage of the instrumental capacity of architectural projection to transform reality and thereby, of necessity, to engage the social.

montage: construction with intervals

> I am kino-eye. I am a builder. I have placed you, whom I've created today, in an extraordinary room which did not exist until just now when I also created it. In this room there are twelve walls shot by me in various parts of the world. In bringing together shots of walls and details, I've managed to arrange them in an order that is pleasing and to construct with intervals, correctly, a film-phrase, which is the room.
>
> —Dziga Vertov

The experiments of early modern abstraction did not overturn Euclidean geometry or abandon the foundational appeal to geometry. The model of space in depth persists. Montage, on the other hand, works with surfaces and images. Its construction no longer tries to model depth, either the finite depth of perspective or the infinite depth of axonometric. Place is created out of fragments distant in time and space. Construction "with intervals" recognizes the discontinuities

that are now built into the fabric of time and space. Montage, unlike abstract painting, does not turn its back on the world, but instead immerses itself in the experiences and products of modernity: mass media images, the disjunctive experience of the city, the anonymity of the crowd, the impersonal products of the machine. The early modern metropolis produced a new subject: the montage eye, capable of constructing a new reality out of the barrage of fragmentary, contradictory, and obsolete information that characterizes the modern city.

Vertov's "kino-eye" is superimposed directly on the machine. It registers a faith in ability of the machine to assist in this construction of a new reality. The machine/eye makes difference visible. It registers the shattering of the panoptic viewpoint of the enlightenment. But the machine also threatens the unity of the subject. From now on, technology will extend and supplement the inadequacies of body:

> I am kino-eye. From one person I take the hands, the strongest and most dexterous; from another I take the legs, the swiftest and most shapely; from a third, the most beautiful and expressive head—and through montage I create a new, perfect man.

It is no accident that Vertov uses the language of the builder to describe the operations of montage. Montage is revealed construction. It utilizes instrumental procedures, but its products are not exclusively instrumental. The engineer-*monteur* is an architect who builds with images. Montage does not pretend to reproduce natural vision. It works on the surface, constructing new objects (and subjects) out of new relations of image to image:

> I am kino-eye, I create a man more perfect than Adam, I create thousands of different people in accordance with preliminary blueprints and diagrams of different kinds.

These montage practices challenge the conceptual and perceptual model of space in depth. Yet space does not disappear. On the contrary, these surfaces imply a new kind of space. Construction "with intervals" suggests that in montage, it is not the elements that are significant, but the space in-between that defines the potential depth. The space of the interval is a shallow, compressed space, unfolding in time and linked together by the perception and recall of the observer—a transparent space developed out of the density of information and event. Le Corbusier's cinematic promenades, Hannes Meyer's assemblage of standardized elements, Robert Venturi's architecture of signs and surfaces, or

Bernard Tschumi's montage of programmatic "attractions" could all be read as manifestations of the montage idea in architecture.

Montage works with visuality, on the surface of things. Its object is what Norman Bryson has referred to as a *screen of signs*: "Between subject and the world is inserted the entire sum of discourses which make up visuality, that cultural construct, and make visuality different from vision, the notion of unmediated visual experience. Between retina and the world is inserted a *screen* of signs, a screen consisting of all the multiple discourses on vision built into the social arena."[36] Architecture and the history of its paradigms of representation are an integral part of this screen. Although always present, this screen at times fades to invisibility, and at other times asserts itself as an intermediary presence. Montage practices render the presence of this screen literally. But architecture, even in a world of postmodern consumer culture, is more than a game of images. Architecture cannot do without space, and consequently without geometry. This is the dilemma for the architect working in the present. Recent practice has tended on the one hand toward ever more complex geometries in an effort to create a new depth by folding and multiplying the shallow surfaces of modernity, and on the other to a retreat into the world of signs and surface, seeing architecture as merely a scaffold for an information-based culture.

It is in this context that it seems worthwhile to pay close attention to the complex history of projection in architecture. Architecture's relation to its techniques is never innocent, and however mechanically, the architect has no choice but to employ geometries of projection. Those geometries may become thematic to the work, and the project of architecture may be redefined as a pure work "on representation": an architecture that works self-critically to interrogate its means of representation. But in order to carry that project to its logical conclusion, architecture must give up its ability to intervene in the world, which necessarily entails a compromise with instrumentality. Architecture's means and ends may be brought into perfect concord, but its scope will be drastically reduced.

In order to subject drawing practice to a critical scrutiny, its practical fluidity must be artificially fixed. These critical practices miss the relational character of drawing, which can never be separated out as a specimen. They ignore the tactical mobility of drawing practice. Projection is an active condition, bound up with the agency of the creative subject on the one hand and the complex history of architecture's techniques on the other. If there is one thing

Dziga Vertov. Still from *Man with a Movie Camera*, 1928.

to be learned from this history, it is that its paradigms are always open to revision, never susceptible to the false certainties of prescriptive theory. In postmodern practice, geometry's authority to establish limits and closure has not so much been negated as simply bypassed. The visual paradigms of postmodern practice often recapitulate obsolete, "exhausted" visual practices. To work critically today is also to function instrumentally—that is to say, to be willing to bring projects and proposals into direct confrontation with the complexity of the real. To work critically is to learn to be comfortable with the paradox of simultaneously affirming and calling into question the means of representation employed. Practice works in the gap between theory and the world. If the grounded authority of theory—as a construct given from "outside"—is no longer credible, we must begin to work within the "field of operations within which theory is itself produced."[37]

1992/1997

Cluster Band Notation.

2

mapping the unmappable
on notation

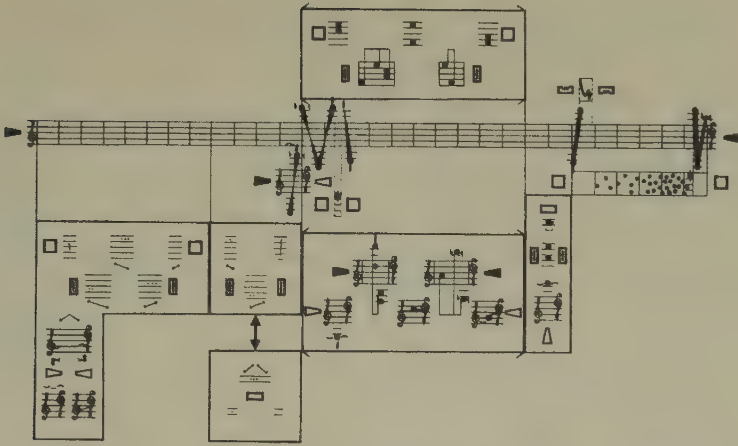
autographic vs. allographic practices

IN BOTH RECENT AND MORE DISTANT HISTORY, there have been those who claim that the sense of a work of architecture, like music or poetry, resides in the design rather than in the realized building.[1] The architect's intentions, they argue, are expressed in their most direct form through notation, set down once and for all in the abstract geometries of the drawing. In this view, architecture can only be diminished by the exigencies of construction, compromised by the complexity of realization and the unpredictability of reality. Others have argued that only the realized work has meaning, and that the drawings are irrelevant once the work is constructed. But these attempts to pin down representation always artificially fix the fluidity of drawing practice. The nominally conservative position that would look exclusively to the built work for affirmation of architecture's stability, and the "experimental" position that would locate architectural practice exclusively on the more slippery ground of representation, share a notion of drawing as pure abstraction, disconnected from reality.

I would argue instead that architectural drawing is in some basic way impure, and unclassifiable. Its link to the reality it designates is complex and changeable. Like traditional painting and sculpture, it carries a mimetic trace, a representational shadow, which is transposed (spatially, across scale), into the built artifact. Drawings are, to some degree, scaled-down pictures of buildings. But to think of drawings as pictures cannot account either for the instrumentality of architectural representation nor for its capacity to render abstract ideas concrete. Architectural drawings also work notationally, and can be compared to musical scores, texts or scripts. An architectural drawing is an assemblage of spatial and material notations that can be decoded, according to a series of shared conventions, in order to effect a transformation of reality at a distance from the author. The drawing as artifact is unimportant. It is rather a *set of instructions* for realizing another artifact.

Notations are necessarily reductive and abstract, yet the products of notation do not necessarily resemble the notation itself. Notations are "abstract machines" capable of producing new configurations out of given materials.[2] They work across gaps of time and space, but they are not universal. They work by means of *transposition* rather than *translation*. That is to say, notational diagrams are not "decoded" according to linguistic conventions, but rather their internal relationships are transposed: moved part by part into the new organizational context.[3] Each notational system articulates a specific interpretive community, a loosely bounded collective domain. The abstraction of notation is instrumental, and not an end in itself.

A consideration of drawing as notation also directs attention toward all of the intangible properties of the real that cannot be set down in graphic form. Many aspects of the experience of architecture can never be effectively simulated or predicted by representational drawing. As a thing in the world, architecture will always produce effects beyond those captured in its initial graphic descriptions. The limits of architectural drawing map out a paradox: we tend to think of building as the realm of tangible proof, and of drawing as the realm of ephemeral effects. Yet buildings are much less subject to control than drawings. In the experience of the real, a whole series of unpredictable and intangible effects can be produced: effects of light and shadow, reflections, shifting atmospheres, the movement of the spectator or the intricacies of peripheral vision. A representational drawing that tries to simulate those effects will always fall short, freezing, diminishing, and trivializing the complexity of



Karlheinz Stockhausen. *Zyklus*, 1959, Excerpt from the published score. **© Universal Edition (London) Ltd., London 1960 © renewed All rights reserved Used by permission of European American Music Distributors Corporation, sole U.S. and Canadian Agent for Universal Edition (London) Ltd., London.**

the realized building. Paradoxically, the dry, unemotional form of notation, which makes no attempt to approach reality through resemblance, is better able to anticipate the complexity and unpredictability of the real. This is the realm of building that can only be addressed through notation, and which connects architecture to the most abstract arts: poetry and music. In the passage from drawing to building, the real and the virtual will always be present in some unpredictable mixture.

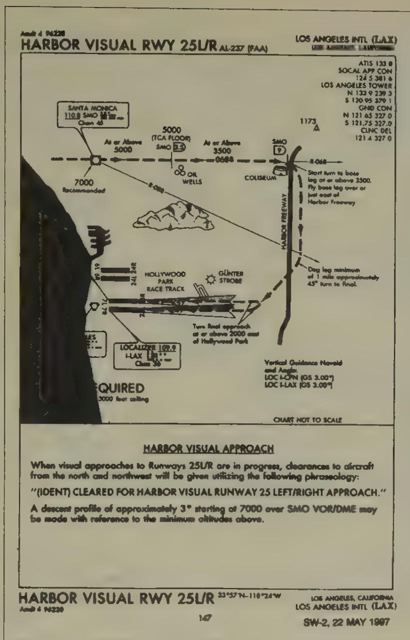
Philosopher Nelson Goodman has proposed a theoretical context within which this question can be given a more rigorous formulation.[4] In his extensive discussion of the question of notation, Goodman distinguishes broadly between two types of art forms. He calls *autographic* those arts, like painting and sculpture, that depend for their authenticity upon the direct contact of the author. In music, poetry or theater, on the other hand, the concept of authenticity is described differently. These arts, where the work exists in many copies and can be produced without the direct intervention of the author, he calls *allographic.* Allographic arts are those capable of being reproduced at a distance from the author by means of notation. In Goodman's account, despite different circumstances of performance, changes in interpretation or instrumentation, every performance of a musical composition, Franz Joseph Haydn's *London Symphony,* for example, counts as an authentic instance

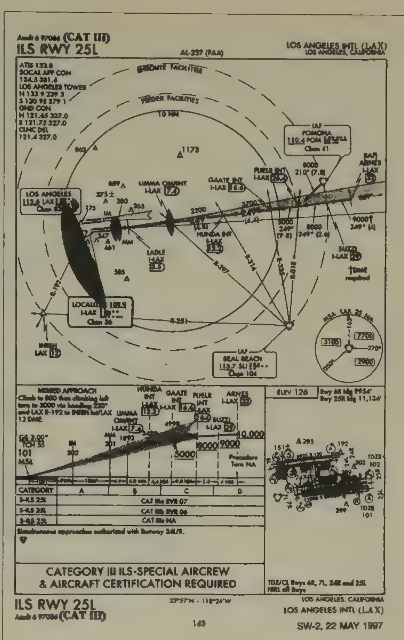
of that work. The guarantee of that authenticity is not the (now obviously impossible) contact with the original author, but the internal structure of the work as set down in the score.

Allographic arts operate through interpretation and on the basis of convention. They are subject to changing standards of performance. The use of notation is the defining characteristic of the allographic arts: "an art seems to be allographic just insofar as it is amenable to notation."[5] Functionally, allographic arts depend upon notational practices as a consequence of the ephemerality of the work itself (poetry, or music), or the need to coordinate an intricate collaborative structure (dance, or symphonic music for example). In these artforms, the abstract schemas of representation precede the tangible form of the work. Allographic arts do not imitate or reproduce something already existing, they produce new realities, imagined by means of notation.

By these criteria, it is obvious that architecture is neither clearly allographic or autographic, and Goodman says as much: "The architect's papers are a curious mixture. The specifications are written in ordinary discursive verbal and numerical language. The renderings made to convey the appearance of the finished building are sketches."[6] Architecture, like music or dance, is not concerned with imitating reality.[7] The architectural plan and the musical score both describe yet-to-be-realized works; both score and plan vanish in the realized work. But unlike these ephemeral art forms, the built work of architecture is durable and physically present. And as a thing in the world, the meaning of a building is even more definitively disconnected from its author (and hence subject to the shifting contingencies of the real) than the work of a choreographer or musician. This paradox—Goodman's "curious mixture"—is fundamental to any discussion of architectural representation: how to understand a system that is at once highly abstract and self-referential, and at the same time has as its goal instrumental transformations of existing reality. Can Goodman's narrow description of notational systems be extended to encompass architecture's more complex situation?

Having called attention to the mixed character of architectural representation in general, Goodman goes on to stress the notational character of architectural plans specifically: "Thus although drawing often counts as sketch, and a measurement in numerals is a script, the particular selection of drawing and numerals in an architectural plan counts as a digital diagram and as a score."[8] Rather than understand the plan as a reduced picture, a scalar analog similar to a painter's





Airport Approach plates. ***US Terminal Procedures*****, 1997.**

sketch, Goodman emphasizes that architectural plans function as notation to the extent that they combine graphic information with measurements and specifications. Drawings become notations—diagrams—precisely at the moment at which numerical and textual information is added to the exclusively visual.

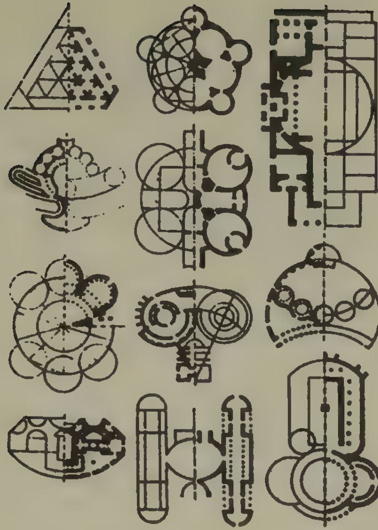
But the analogy breaks down when the individual work of architecture is considered. What Goodman calls the "compliance class" in architecture is traditionally a unique building. Further, it is also possible to point to the direct involvement of the architect in the process of construction as in some way analogous to the activity of the painter or sculptor. "The work of architecture," Goodman writes, "is not always as surely disengaged from a particular building as is a work of music from a particular performance. The end product of architecture, unlike that of music, is not ephemeral; and the notational language was developed in response rather to the need for participation of many hands in construction . . . insofar as its notational language has not yet acquired full authority to divorce the identity of the work in all cases from particular production, architecture is a *mixed and transitional case*."[9]

To elaborate the consequences of architecture's mixed status requires looking more closely at the interaction of the built and the drawn. How does the concreteness of reality temper the abstraction of drawing, and how does the

abstraction of architecture's instruments leave its mark on reality? Architectural drawings are neither an end in themselves (artifacts, like paintings), nor are they simply transparent technical instruments. The architectural drawing is *transitive* in nature, uniquely capable of producing something new from something else. Far from being ideal constructions, architectural drawings are marked by their contact with a messy and inconsistent reality. Representation is not something added onto building, but that which makes it possible in the first place. But technique is never neutral, and the means of representation always leave a trace on the construction. It is this continual shuttle between the abstraction of architecture's graphic instruments and the unyielding concreteness of the building that defines the work of the architect, and makes it possible for architecture to work within the complexity of the real, and to engage the shifting field of the contemporary city.

the illegible city[10]

The problem of architecture and the contemporary city is also in part a problem of representation, resulting from the substitution of the intangible for the tangible, and marking the inadequacy of the image as a descriptive mechanism. In "Reading the Illegible: Some Modern Representations of Urban Experience," critic Steven Marcus refers to the long literary history of urban description. He contrasts the description of the modern city as found in novels by Thomas Pynchon and Saul Bellow. Traditionally, as the city grows more complex, the novelist is still able to give a coherent account of the incoherent city. Like Dickens rendering the complexities of nineteenth-century London, Bellow's descriptions of New York or Chicago retain "meaning, impressiveness and coherence." But in the more recent fiction of Pynchon, the city ceases to be readable. The modern city, Marcus writes, "has gone out of control . . . it has lost the signifying potencies and structural coherences that it once seemed to possess." The text of the city—from the language of its inhabitants to the space of the street—can no longer be read in any coherent or predictable manner. Marcus quotes Pynchon to the effect that "In order to see the contemporary urban world clearly . . . we must be able to see past 'the fiction of continuity, the fiction of cause and effect, the fiction of humanized history endowed with 'reason''. The structural categories are, in these words, meaningless deceptions themselves. The whole has become again destabilized, obscure, baseless, mystified—and most efforts of

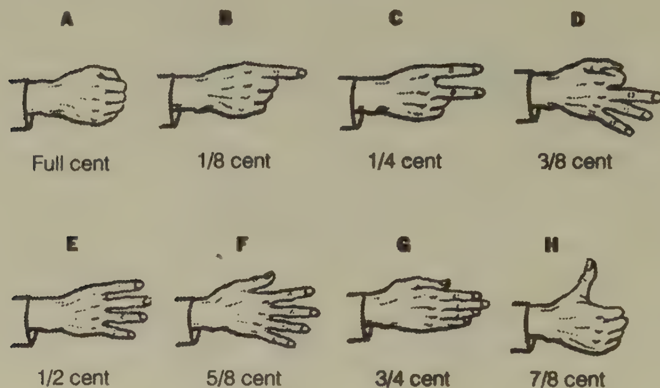


Planimetric diagrams of the architectuiral elements inserted into G.B. Piranesi's *Campo Marzio*, from Manfredo Tafuri, *The Sphere and the Labyrinth*, 1987.

understanding or constructing a whole are themselves part of a mystification."[11]

Historically, the architecture of the city embodied collective memory through a structure of finite definition. A close correspondence was maintained between the city as a tangible site on the landscape and a series of representations based on a fixed point of view and static conventions of representation. Today the technologies of communication, information exchange, and war, along with the economies of multinational capitalism and global commodity exchange, have produced a condition in which the urban site is no longer simply geographic. The local, physical difference of cities, from the first world to the third world, is being progressively erased with the exchange of information, knowledge and technique. All cities today are instantaneously connected as part of vast networks, in which images, data and money flow freely. And if the advent of mass communication and information technology has undermined the idea of the city as the place of architectural permanence, the social value of memory itself has been eroded by the series of catastrophic political events that have marked the twentieth century.

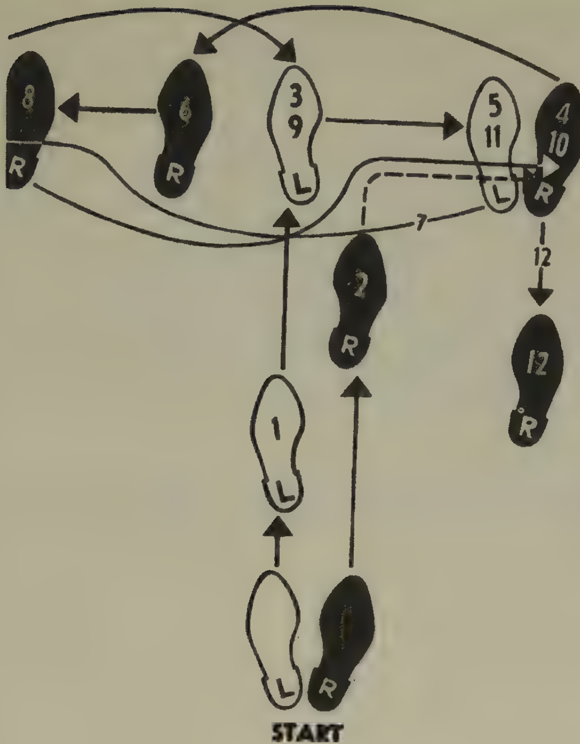
The technology of war has further undermined the residual notion of the city as a protective enclosure. The fracturing and disintegration of the city that



Chicago Board of Trade. Hand signals for trading.

began with the perfection of ballistics and the development of roads and railways in the nineteenth century has been greatly accelerated by the defense requirements of the nuclear age and its supporting technologies. As the only means of defense, dispersion has become the primary tenet of an antiurban ideology causing further erosion in the public realm.[12] As Paul Virilio has pointed out, "the representation of the contemporary city is no longer determined by a ceremonial opening of gates, by a ritual of processions and parades, nor by a succession of streets and avenues. From now on architecture must deal with the advent of a 'technological space-time.'"[13]

One consequence of this has been the marginalization of the discipline of architecture itself. Michel Foucault has noted that "Architects are not the engineers or technicians of the three great variables: territory, communication and speed."[14] Architects seem condemned to work on the surface of the city and not its structure. This is a situation that is historically determined and unlikely to change significantly as a result of anything that the architectural profession does. But it can also be argued that architects have yet to examine the consequences of this shift. If architecture has lost its historic capacity to fix and determine the limits of urban space and territory, are architects left to work exclusively with images? Or is it possible to accept the reality of this new condition, and to creatively reinvent the tools of the discipline in order to meet these new challenges?



Andy Warhol. ***Dance Diagram,*** **1962.**

In the rhetoric of the early modern movement, technology was represented in symbolic form. The ocean liner, the airplane, or the dynamo acquired ideological value as icons of modernity. Frederic Jameson has remarked that contemporary technology does not lend itself to iconic representation.[15] But today the artifacts, the new machines, are uninteresting in themselves. More important for the city are the effects of technology: the atomization of information, the splintering of perspectives, the uncontrollable proliferation of "depthless" images. Jameson's call for new "cognitive maps" and his reference to the studies of Kevin Lynch on the image of the city are suggestive, but the most significant new effects in the city are not registered as images. New urban phenomena—so called "edge cities," or "generic cities"—are the consequence of technological and social changes but they reflect those changes only in the most indirect and mediated form. In order to map this unmappable territory, the conventions of representation itself need to be rethought. If architecture is to work beyond the level of image it needs to invent

new tools to work more effectively within the immaterial networks and systems that comprise the city in the late twentieth century. In order to sustain its own relevance, architecture needs to address the social and political implications of the shift from artifact to effect.

Traditional representations presume stable objects and fixed subjects. But the contemporary city is not reducible to an artifact. The city today is a place where visible and invisible streams of information, capital and subjects interact in complex formations. They form a dispersed field, a network of flows. In order to describe or to intervene in this new field architects need representational techniques that engage time and change, shifting scales, mobile points of view, and multiple programs. In order to map this complexity, some measure of control may have to be relinquished.

To propose a new attentiveness to notation in architectural representation is not to propose another paradigm shift—a simple substitution of one way of working for another—but rather a proposal to enlarge the catalogue of techniques available to the architect working in the city. Even the most conventional architects work notationally to some degree. To further open architectural representation to the score, the map, the diagram and the script could establish a basis for exchange with other disciplines such as film, music and performance.[16] The score allows for the simultaneous presentation and interplay of information in diverse scales, on shifting coordinates and even of differing linguistic codes. The script allows the designer to engage program, event, and time on specifically architectural terms. New maps and diagrams might begin to suggest new ways of working with the complex dynamics of the contemporary city.

Hence a pragmatic program is outlined here: to radicalize the already present and highly specific capacity of architectural drawings to work on reality from a distance; to be highly specific in a material sense and at the same time to engage the invisible or to activate the virtual; to work simultaneously with the abstract and the concrete; to begin to use notation's capacities not only to take the measure of the already existing complexity of the new urban field, but also to develop strategies to intervene productively in the city today with proposals that are open and optimistic, devoted to affirmative change rather than commentary or critique.

Thomas Eakins. ***Pole Vault*, c. 1885.**

glossary: working definitions

anticipation

Notations always describe a work that is yet to be realized. Even if already performed, the work it describes is open to interpretation and change in the course of future performance. In this sense, notation is optimistic and anticipatory. Unlike classical theories of mimeses, notations do not map or represent already existing objects or systems but anticipate new organizations and specify yet to be realized relationships. Notation is not about interrogation, critique or commentary. These "critical" practices utilize notation's discursive capacities only in retrospect (pointing out what is wrong with existing reality), whereas notation's more radical possibility lies in the possibility of proposing alternative realities. Notation's special properties can be exploited by the urban designer to produce a kind of "directed indeterminacy": proposals that are robust and specific enough to sustain change over time, yet open enough to support multiple interpretations.

invisible

Notations go beyond the visible to engage the invisible aspects of architecture. This includes the phenomenological effects of light, shadow, and transparency; sound, smell, heat, or cold, but also—and perhaps more significantly—program, event, and social space. Notations are not pictures or icons. They do not so much describe or represent specific objects, as they specify internal structure and relationships among the parts. In as much as the use of notation signals a shift away from the object and toward the syntactic it might open up the possibility of a rigorous, yet nonreductive abstraction. The use of notation marks a shift from demarcated object to extended field.

time

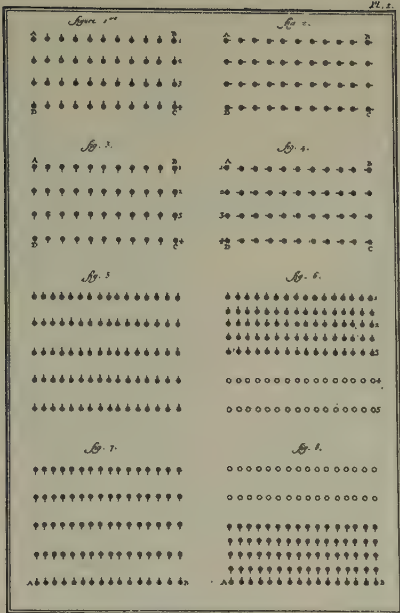
Notations include time as a variable. It is not accidental that notations figure most significantly in the arts that unfold in time: music, dance, or theater. If we allow, along with Paul Virilio, that the life of the city and its experience today belongs more to time than to space ("Now speed—ubiquity, instantaneousness—dissolves the city, or rather displaces it, in time."[17]), the special capacity of notation to make thematic the measurement and unfolding of time takes on a special importance. Interval, duration, and tempo, acceleration and accumulation are the key variables in a notational schema.

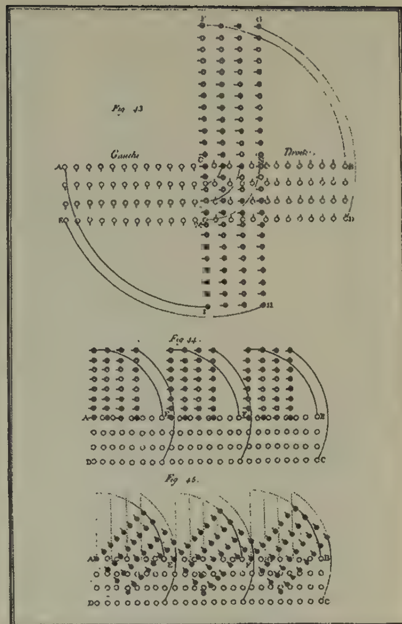
collective

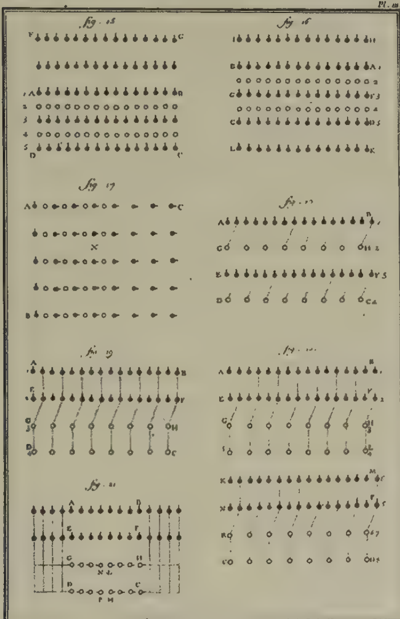
Notations presume a social context, and shared conventions of interpretation. The score is not a work itself, but a set of instructions for performing a work. A score cannot be a private language. It works instrumentally to coordinate the actions of multiple performers who collectively produce the work as event. As a model for operating in the city, the collective character of notation is highly suggestive. Going beyond transgression and cross-programming, notations could function to map the complex and indeterminate theater of everyday life in the city. The use of notation marks a shift from the *production of space* to the *performance of space.*

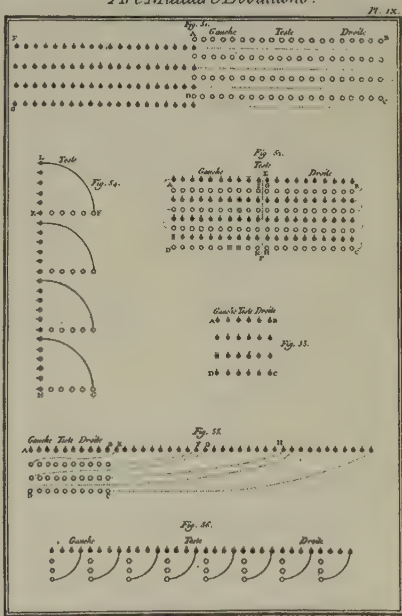
digital diagrams

Notations work digitally. To say this is not to suggest any specific relation to computer technology, but rather to return to a precise definition of the digital: "A digital scheme . . . is discontinuous throughout; and in a digital system the char-

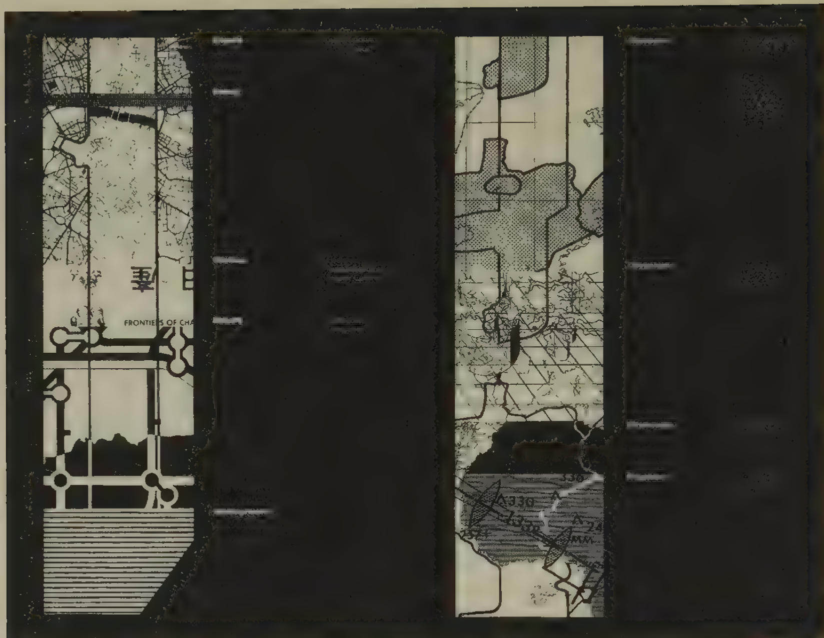








Denis Diderot. Military Formations, from *The Encyclopedia*, 1762–1777.



Stan Allen and Marc Hacker. *Scoring the City*, 1986 (details).

acters of such a scheme are one-to-one correlated with a compliance-class of a similar discontinuous set." Notations work through difference, not resemblance. If the new technology is understood as a shift from machines of production to machines of reproduction, and if this shift is characterized by the replacement of the analog by the digital, a corresponding shift toward notation in architectural practice might follow. To cite Goodman again, "The more we are startled by this, because we think of such diagrams as rather schematized pictures, the more strongly we are reminded that the significant distinction between the digital or notational and the non-notational, including the analog, turns not upon some loose notion of analogy or resemblance but upon the grounded technical requirements for a notational language."[18]

Some caution is necessary at the end. To appeal to notational systems in urbanism is not to suggest a return to perfect transparency of meaning and the smooth implementation of functionality. Fully aware of the dangers of mystification and false totalities, these proposals do not set out to impose coherence on an otherwise incoherent city, or to regulate meaning or behavior. Rather, they propose an open-ended series of strategies to use within the indeterminate field of the contemporary city. They propose new scenarios, provoke unanticipated

combinations and allow incremental adjustment over time. They leave space for the tactical improvisation of the user in the field. Whatever coherence is attained is always a provisional stabilization of the mobile forces of the city, not set down in advance, but developed in practice.

theory's consequences

Perhaps at this juncture it is important to insist that the problem of representation in architecture is always double. It is important to distinguish carefully between the *techniques* of representation—mapping, projection, or notation—and the idea that *architecture itself* operates as a representational system. These two aspects are linked, but are not identical, and a great deal of confusion arises out of the failure to pay close attention to the difference. As Jacques Derrida has put it, "In the architectural work the representation is not structurally representational—or it is, but according to a detour so complicated that it would undoubtedly disconcert anyone who wanted to distinguish, in a critical manner, the inside from the outside, the integral from the detachable."[19] Diana Agrest and Mario Gandelsonas have cogently remarked on the *inevitability* of architecture, as a social system, behaving to some degree like language, and on the other hand, the *impossibility* of architecture ever approaching the fluidity and transparency of discursive language.[20] It may well be that the "crisis of representation" in the contemporary city is nothing more than an escalation of an already present conflict in representation—a deep, always present conflict in language and representation brought to crisis in the context of new technologies and urban conditions. But architecture's response to that crisis, under the influence of deconstructionist theory—which has been to register the instability of the system through *representations* of instability—seems inadequate.

One conclusion that we might legitimately draw from the deconstructionist project is that the dream of a perfect fit between object and its representation needs to be given up. Doubt and indeterminacy may have to be accepted as the everyday working material of the architect. Accepting the impossibility of a diaphanous communication between architect and public, a turn to the somewhat crude instrumentality of notation may in fact be reasonable. Theory acts to provoke doubt, but once that doubt has been registered,the challenge of the present is to make do with this corrupt and imperfect material.

1989/1997

Gull tracks in Sand

3

plotting traces
on process

tracks;
architecture and the index

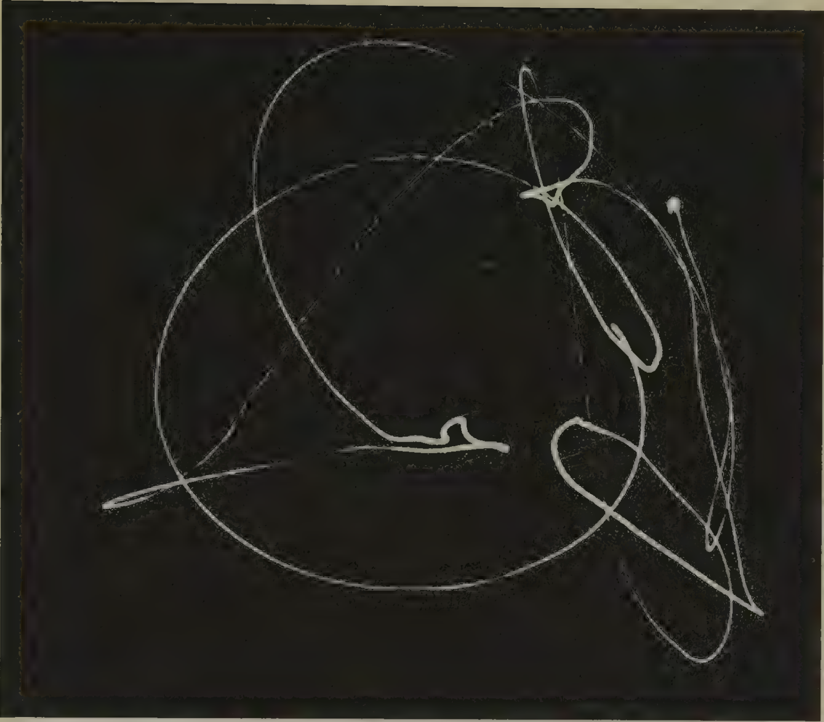
> Like the Archbishop of Paris who, when he walked with a mistress in his garden had three men with rakes following to erase their footprints, we are obliged to dissolve into silence a sentence scarcely formed.
>
> —Georges Bataille

In an anecdote related at the beginning of book VI in Vitruvius's *Ten Books on Architecture,* the Socratic philosopher Aristippus is shipwrecked and cast ashore on the island of Rhodes. Initially in despair, he observes geometrical figures drawn in the sand, and cries out to his companions: "*Bene speremus, hominum enim vestigia video* (Let us be hopeful, for I see the traces/tracks of men)." While the story serves to reinforce the privileged status of geometry in classical architecture, the tracings in the sand suggest other meanings. For the philosopher these geometrical tracings are a sign of hope. But the Latin *vestigia* also implies

footprints, signs, traces, or ruins, and seems to point toward the past.[1] How do these geometrical traces work their way into architecture? What distinct mechanisms of meaning are suggested by the track and the trace?

To exemplify the concept of the index, Charles Sanders Peirce also refers to imprints in the sand. The footprint that Robinson Crusoe found in the sand, Pierce writes, "was an Index to him that some creature was on his island." Indexical signs are bound to their referents through some form of contact, physical or otherwise: "An *Index* is a sign which refers to the Object that it denotes by virtue of being really affected by that Object."[2] Examples often given include animal tracks, fingerprints, handwriting and medical symptoms. Yet, as any physician knows, the link between a disease and its symptoms is not always direct. Peirce takes note of this indirectness, placing the index under the category of "secondness." The index is doubly marked: by the *definiteness* of physical contact and by the *uncertainty* of interpretation. (This is a large part of the narrative motor of the conventional detective story: the clues point to the criminal, but never directly; it requires the interpretive powers of the detective, unfolded over the course of the story, to unravel the mystery.) With indexical signs, causality is inverted, pointing back in time, eliciting a reconstruction of causes from effects. The index is an empty slot awaiting interpretation: "Such, for instance, is a piece of mold with a bullet-hole in it as a sign of a shot; for without the shot there would have been no hole; but there is a hole there, whether anybody has the sense to attribute it to a shot or not."[3] Among signs, indexes are unique in that they are not ciphers in an abstract system, but physical artifacts. Some concrete mark is always left behind, and the materiality of the receptor surface is decisive: the wet sand that holds the shape of the footprint; the light sensitive coating of a photographic film; the polished surface of a glass that preserves an individual fingerprint.

Historian Carlo Ginzberg has suggested that the origins of a reading model based upon decipherment and interpretation of clues might be traced back to early hunting practices where small signs—"prints in soft ground, snapped twigs, droppings, snagged hairs or feathers, smells, puddles, threads of saliva"—led the hunter to his invisible quarry, and to a divinatory paradigm that worked through a close reading of minute, even trifling matters: "animal's innards, drops of oil on the water, heavenly bodies, involuntary movements of the body." Both worked through traces to approximate events that could not be directly experienced by the observer. Ginzberg then links this to the invention



Frank B, Gilbreth. ***Cyclograph Record of the Path of the Point of a Rapier Used by an Expert Fencer*****, 1914.**

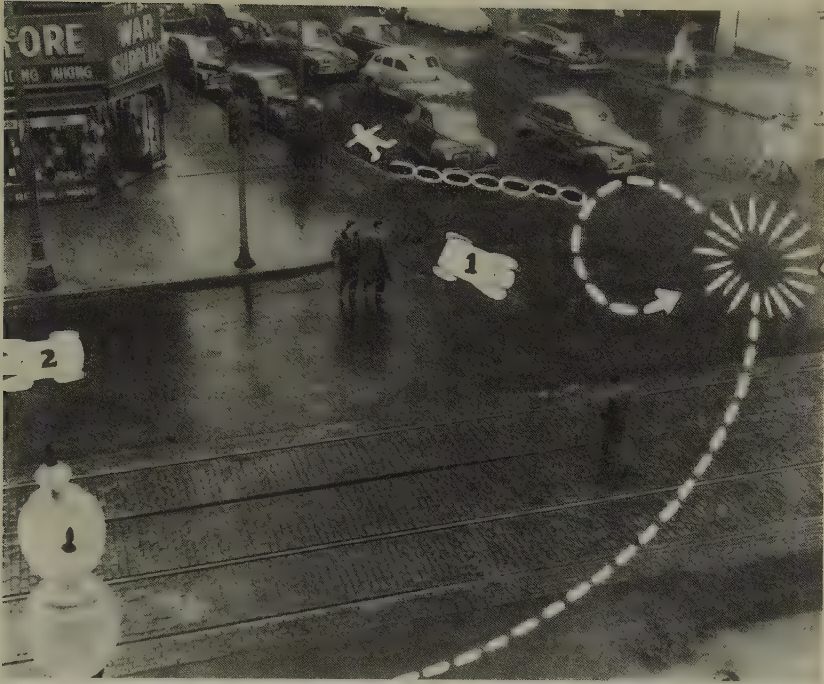
of elementary writing systems, but now based on iconic resemblance: "The identification of soothsaying with the deciphering of divine characters inscribed in reality was reinforced by the pictorial features of cuneiform writing: like divination, it too designated one thing through another."[4]

The index holds a privileged place in the ontology of the photographic image. Photography is identified with modern values of progress and exactitude, but this alone does not account for its evidential authority: "A photograph," Susan Sontag writes, "is not only an image . . . an interpretation of the real, it is also a trace, something directly stenciled off the real, like a footprint or a death mask."[5] Photography's truth value is directly linked to its indexical status. Photographs (like fingerprints, fossils, the tracks of gulls in the sand, the trajectories of electrons in a cloud chamber or the image on the Shroud of Turin), can be classified as indexical by virtue of the spatial connection of the object in question to the chemical surface of the photographic negative, as translated through the optics of the lens. The index, operating under the logic of metonymy, points a finger back over time to a moment of physical contact,

now fixed and detached according to the logic of its own materiality (soft sand, fired clay, photographic film).

The physical character of the index has another consequence in theories of representation. The index produces external correspondence in a mechanical, or "automatic" fashion. Following a schema proposed by Gilles Deleuze, it could be said that the negative, the imprint, or the trace all operate in resemblance's territory without sanction of the Idea. The index proceeds from one thing to another. Deleuze writes, "For if copies or icons are good images, well founded ones, it is because they are endowed with resemblance. But resemblance must not be understood as an external correspondence. It proceeds less from one thing to another than from a thing to an Idea, since it is the Idea that comprises the relations and proportions that constitute internal essence." The index, insofar as it is an image, is always an illegitimate one; it cannot claim the sanction of the Idea. It functions on the surface, never in depth; hence the affiliation with the simulacrum. Deleuze continues: "If we say of the simulacrum that it is a copy of a copy, an endlessly degraded icon, an infinitely slackened resemblance, we miss the essential point: the difference in nature between simulacrum and copy, the aspect through which they form two halves of a division. The copy is an image endowed with resemblance, the simulacrum is an image without resemblance."[6]

For Rosalind Krauss, the capacity of indexical operations to short-circuit representational conventions based on resemblance is decisive. In her 1976 essay "Notes on the Index," Krauss employs the concept of the index to impart some consistency to the apparently heterogeneous art of the seventies.[7] The diverse production of that decade, Krauss suggests, might be understood to have shared a point of reference in the notion of the index. Thus Richard Serra's rubber castings or thrown lead sculptures could be related to video, and photorealist painting to Dennis Oppenheim's *Identity Stretch* of 1975 (in which the artist transferred the magnified image of his own thumbprint onto a large field near Buffalo, New York). In all these works, the immediacy of indexical operations takes the place of art's traditional reliance on more mediated systems of representation. Unlike the minimalists of the preceding decade, these artists wanted to engage meaning in more specific terms than allowed by minimalism's generalized appeal to phenomenological presence. But they wanted to do so without reverting to the conventionalized codes of painting and sculpture. Indexical operations offered a model of signification that was at once highly specific but did not rely on given symbolic structures. Through the "snapshot effect" of the



Anonymous Press Photograph. Freak car crash 2 April, 1948, Minneapolis, MN.

index, the interpretation of the work is connected back to the process of its making. Minimalism's emphasis on making is reread in the context of evidential reconstruction: the index initiates a narrative of process. Like a photograph, each of these works freezes a moment in time, and calls for an interpretive effort on the part of the viewer to fill in the empty place of the indexical sign. The making of the work can be reconstructed from clues left behind.

Architecture has often borrowed concepts from the visual arts, and in architecture too, the index has been linked to a narrative of process. But it may be important to point out that what Vitruvius's Philosopher saw on the beach were not footprints but geometrical figures; not indexes, strictly speaking, but abstracted tracings of idealized forms and coded signs.[8] The idea that buildings or drawings embody abstract concepts through the medium of geometric traces is an old one. More recently, the idea that a work of architecture registers the process of its own design through an index of procedures has gained currency. But indexical operations evoked in architectural design lose the immediacy that characterizes them in the first place. Architecture's extended time of realization, the necessary indirectness of its procedures, and its complex affiliations with social practice all function to take the physicality and directness

associated with the index and draw it out in abstracted form. Is an index still an index if the trace is processed through a coded representational system, even if all the information is preserved intact? Think of the difference between a digital scan and a photograph. Both register the traces of an object through reflected light, but in the case of the scan, that information is converted, piece by piece, into a digital code that permits its storage, retrieval, and manipulation. The dumb mechanical character of the index, and its corresponding immediacy (and incidentally, its evidential authority) is bypassed.

The architect's medium is not buildings, but drawings, which are in turn employed by others to realize buildings. In architecture, the index does not point to a moment of physical contact between the designer and the fabric of the building, but it points instead to a set of virtual movements (cuts, displacements, grid shifts, shears, inversions, rotations or folds) registered through the abstract codes of representation. If a drawing is to function as an index of this complex and sometimes dynamic process it will always be through the mediation of complex representational conventions. And, if in turn, a building is to function as an index of the drawing, it will be through the further mediation of complex social and technical operations involving large numbers of people, capital investment, building codes and techniques of construction, regulatory agencies, the properties of materials, and the limits of available technologies. Even more radical operations of process (invoking chance, complex geometries or computer simulations), are forced at a certain moment to arrest movement and capture a particular instant of the process. At this point, another system (which is dominated by signs that Pierce would classify as iconic or symbolic[9]) necessarily intervenes, stabilizing the potentially disruptive properties of the index.

This could be clarified with an example. In a 1985 review of the exhibition of Peter Eisenman's *Fin d'Ou T Hou S* at the Architectural Association in London, Robin Evans makes a connection between an appeal to indexical procedures in the design process and Eisenman's claim that his architecture is a kind of writing. Eisenman invents a series of "morphological fictions" in order to construct a narrative of his procedures. In this case, he describes a process of pulling a smaller cube through a larger one as a way of explaining the final form of the building. Eisenman imagines that the traces of this process are registered—imprinted, or inscribed—in the material of the model as indexical signs. But for Evans, this requires a strange suspension of disbelief: "The nature of the material of which the thing is made of is inimical to it, so that the

Man Ray. *Space Writings*, 1936.

orthogonal crystalline cubic forms have to be thought of as having passed through a suitably soft, igneous phase."[10] That is to say, the object has to be imagined as momentarily composed of a soft material (like wet sand or soft clay) so that it might register the traces of these operations. This imprinting of signs, whereby the traces of the design process are embedded in the object, seems to be what allows Eisenman to speak of his architecture as being like writing. And consequently, by understanding design as inscription, a model

of interpretation follows that presumes the viewer's ability to "read" the building by decoding the traces and reconstructing the narrative of design procedures.

For Evans, it is the implausibility of these fictions that is problematic. I would say that Eisenman is locked into the evidential structure of the index, which can only point backward to the operations of design. But he also is unable to take full advantage of the radical uncertainty of the index in as much as the inevitable mediation of conventionalized systems of representation in architectural practice tends to stabilize meaning. The meaning of the work is dominated by the structure of representation itself, which will always allow only partial access to the procedures of design. The promiscuity of the index, which moves from thing to thing without sanction of the Idea, is as yet unavailable.

Evans notes that Eisenman represents an exaggerated case of practices that are commonplace in thinking about architecture and design process. How often are the formal characteristics of a building explained by reference to the implication of fictional movement? Every time an architect refers to a *rotated* cube, a *shifted* grid, to *inverted*, or *compressed* space, to *warped* axes, to *hinges, joints* or to *folded* surfaces and *aggregated* volumes, he unconsciously implies movement. "It is the verbs turned to adjectives that do it," notes Evans.[11] In every case, some notion of the indexical sign, however mediated, is at work. Regardless of the formal character of the operation, that is, whether it is a shifted grid (1970s) or a folded surface (1990s), the implication of narrative time and fictional movement persists.

Indexical signs, which make it possible to reconstruct causes from effects, invariably point back in time, in this case to the event of design and the hand of the author. A closed circle results in which the means of *interpreting* things are recycled as a model for *making* things. These operations work very effectively to interrogate the means of representation, which are foregrounded in process, but they are powerless to engage any material not already implicated in the hermetic procedures of design. The result is a self-referential architecture, locked in the examination of its own history. More than for their implausibility, in my view it is for this reason that we should question the persistence of such indexical procedures in design operations. Unable to engage the more radical possibilities of the index, they inevitably privilege the private language of design, and imply a retrospective model of interpretation. A critique of the idea of the trace in architecture would therefore not only interrogate its capacity to convey meaning over time and space (allowing for architecture's extended time of realization and its mediated procedures of realization), but would also question its

ideology of authorship and retrospection. "If we are still sometimes touched by the ancient idea that rocks are animate, we ourselves are in the grip of a similar sentiment amplified by language when we think of buildings as *animated*," Evans tells us. "In its modern form it has less to do with the willful breathing of life into inert objects, more to do with a willful *unrealizing* of them. The hallucination of a transcendental yet entirely corporeal world is involved."[12]

traces: architecture and deconstruction

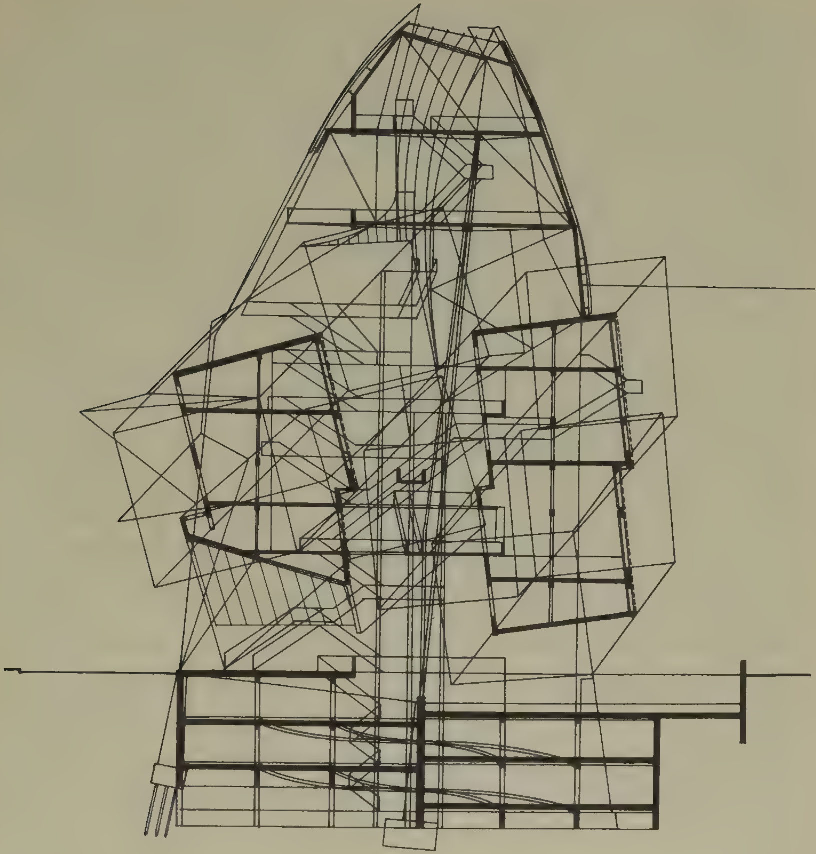
> Whatever you say, don't say it twice
> If you find your ideas in anyone else, disown them.
> The man who hasn't signed anything, who has left no picture
> Who was not there, who said nothing:
> How can they catch him?
> Erase your traces.
>
> —Bertolt Brecht

Some traces are indexical signs. In "Paris, Capital of the Nineteenth Century," Walter Benjamin notes the simultaneous appearance of the detective story, which investigates these traces, and the fully realized bourgeois interior: "The interior was not just the universe, it was also the protective casing of the private citizen. Living means leaving traces. In the interior, these were stressed. Coverings and antimacassars, boxes and casings, were devised in abundance, in which the traces of everyday objects were molded. The resident's own tracings were also molded in the interior. . . ." For Benjamin, these traces represented the comforting presence of the past. They were linked with the narrative time of history and the marks of private possession. A radical modernity would erase those traces. Benjamin writes: "A beautiful word from Brecht helps us go far, farther: 'Erase your traces,' so says the refrain of the first poem in the *Reader for Those who live in Cities* . . . Scheerbart and his glass and the Bauhaus and its steel have opened the way: they have created spaces in which it is difficult to leave traces."[13] Indifference, distraction and anonymity characterized the experience of the early modern metropolis; to cover your tracks was one way to survive. What Brecht described with a melancholy sense of resignation, Benjamin saw as a redemptive possibility. Benjamin linked modernity's utopian project to reception in a state of distraction and the loss of the aura. Under the hard logic of

Michaelangelo Antonioni. Still from *Blow Up*, 1966.

mechanical reproduction, the intractable surfaces of steel and plate-glass replaced the rich texture of the nineteenth-century interior: "It is not for nothing that glass is such a hard material upon which nothing attaches itself. . . . Things of glass have no aura." While conscious of what had been lost, Benjamin was hopeful that other forms of collective expression (film and photography, for example) would arise along with mechanical reproduction and, like the spaces of modern architecture, could help to realize new subjectivities, and to refigure relations of private and public life in the metropolis.

In architecture, the modernist project also sought to efface the trace, substituting industrial materials for handmade ones, and displacing the drawn trace to the disembodied, geometric form of the regulating line (*trace regulateur*). Over the course of the century, Benjamin's hopeful scenario has foundered, and the instrumentality of the regulating line today seems to dominate architectural practice. Faced with an apparent loss of meaning, some architects have attempted to recover an idea of the trace in the form of an architecture that takes writing as its model. Wolf Prix of Coop Himmelblau writes: "A confusion of languages prevented the completion of the tower of Babel. Only through a new invention of language, through new writing, building, and thinking will it be possible to finish it."[14] The design process of Coop Himmelblau is well known. A quick sketch, sometimes drawn with eyes closed, is translated, as accurately as possible, into the three-dimensional form of the



Coop Himmelblau. Apartment Building, Vienna, Austria, 1986. Cross Section.

building. The basis of such an operation is a faith that meaning—the energy and vitality of the initial concept—is somehow lodged in the tracery of the sketch, and the job of the designer is to tease that meaning out, to translate the intensity of that moment into an equally intense three-dimensional space. "The frozen chance" they write, "is the basis of the plan, which translates vitality into a scale of 1:1." The trace, in this case, is a vehicle for the preservation and transmission of meaning, like the pictographs of a primitive writing system. But these meanings are necessarily abstract and nonspecific. They are not subject to decoding in the same way that an indexical sign can be read. What then is at stake here? The trace has become an important point of reference in the architecture/deconstruction exchange. Dismissing the optimism of the modern movement as a utopian dream, and faced with the realities of

contemporary practice that seem to exhaust themselves in meaningless practicalities, these architects seek to restore some sense of meaning to the operations of the discipline. But unwilling to believe anymore in a perfect transparency of meaning, the trace is reinscribed in architecture under the sign of undecidability, of babble: "Writing is a trace in which is read an effect of language. It is what happens when you scribble something."[15]

Architecture has been ambivalently attracted to the thought of deconstruction, which simultaneously reveals and erases its traces: "There is no trace *itself*, no *proper* trace. . . . The trace of the trace which [is] difference above all could not appear or be named *as such*, that is, in its presence," writes Jacques Derrida in his *Margins of Philosophy*.[16] The irreducibilty of the concept of the trace is crucial in deconstruction. It will always resist naming or exemplification. Derrida understands the trace as pure difference, never to be resolved into presence, always produced out of an elusive movement from text to text. In a later work, Derrida makes it very clear that the linear, the bodily, the indexical or the geometric have little to do with his notion of the trace: "I have the impression now that the best paradigm for the trace . . . is not . . . the trail of the hunt, the fraying, the furrow in the sand, the wake in the sea, the love of the step for its imprint, but the cinder (what remains without remaining from the holocaust, from the all-burning, from the incineration, the incense) . . ." [17] For Derrida, the trace is always the trace of absence, manifest through erasure: "The trace is produced as its own erasure. And it belongs to the trace to erase itself, to elude that which might maintain it in presence. The trace is neither perceptible nor imperceptible."[18] Thus only a figure as fragile as the cinder could be an adequate image for the radical disembodiment required by such a concept.

The poetic desire of deconstruction to inscribe itself in the formless form of the cinder, and to recover the moment of absolute loss, would seem to be hopelessly at odds with all of those instrumental and idealizing discourses with which architecture is inevitably compromised. Classical architectural theory conceived drawing as the realm of idealized, abstract speculation: "Since that is the case, let lineaments be the precise and correct outline, conceived in the mind, made up of lines and angles, and perfected in the learned intellect and imagination."[19] The codification of the operations of architectural drawing coincides with the separation of design and construction in the early Renaissance. The need for accurate systems of projection arises out of the requirement for a legible code to transmit the desire of the architect from a

distance. The drawings mark that distance, and are marked by it. Absence necessarily figures in the conceptual makeup of drawing practice. Orthographic projection, for example, consists in the tracing out, or cutting through, the imagined contours of an absent body—a body not given in advance, but proposed as construction. But as Herbert Damisch has pointed out, the delineation of the contour distributes figure and ground. The openness of the mark is dissolved by the authority of the line.[20] Architectural drawings are freighted with what Catherine Ingraham has referred to as architecture's "burdens of linearity."[21] They enforce divisions of inside and outside, and they refigure the trace as bounding line, or demarcation. Félix Guattari writes: "The architect's drawing (*dessin*), which in French is the homophone of plan, project (*desein*), and implies goal, axiological finality, sets out in search of a partial enunciator that will give consistency to the group of components put into question."[22] From Alberti's lineaments to Le Corbusier's *traces regulateurs*, the propriety of the line as regulator, and geometry as underlying structure has persisted. "The choice of a regulating line fixes the fundamental geometry of the work," writes Le Corbusier.[23] In this case the trace acts as an as an idealized scaffold that maintains form in its proper place, but disappears in construction.

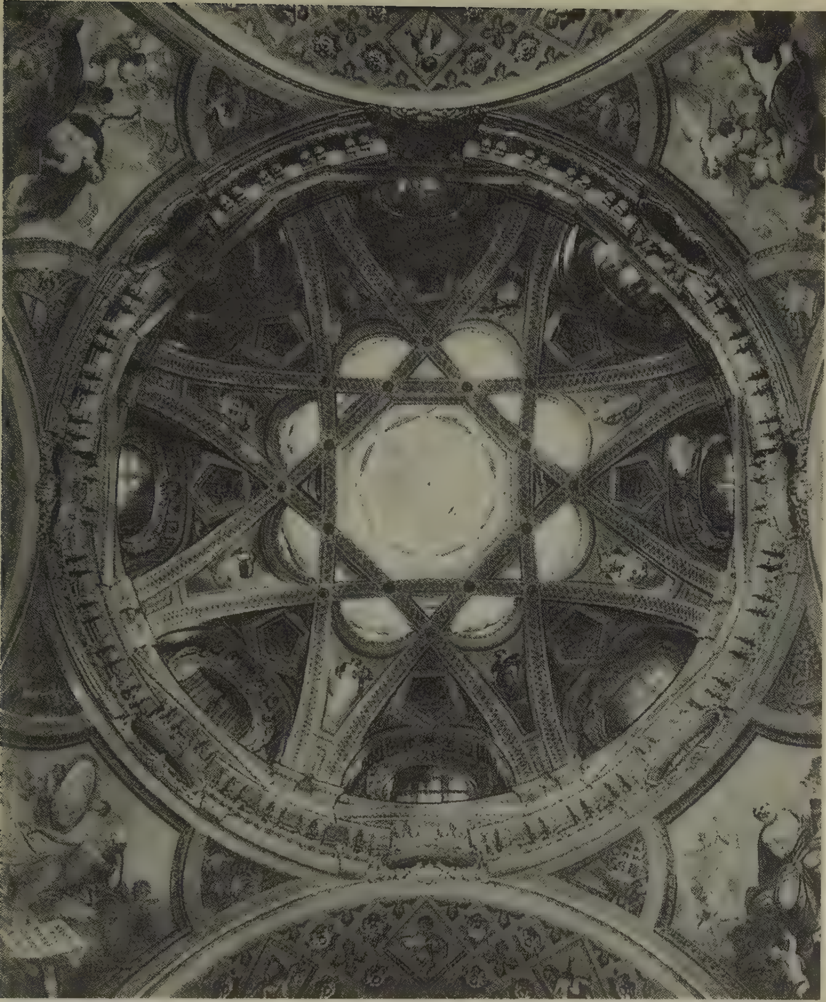
Faced with the elusive character of the trace in deconstruction, one legitimate response would be to say that there is an unbridgeable gap between deconstruction's notion of the trace as absence and erasure, and architecture's necessary compromises with propriety, instrumentality and authority. Architecture's assertive physicality seems to override the delicate subtleties of deconstruction's texts. It is clear that the effort to represent the undecidability of deconstruction in structures that appear to be unstable is not a promising project. But simple dismissal gives too little credit to architecture's capacity to make the invisible visible. I would suggest that to locate the trace in architecture means not turning away from building's concreteness, but precisely getting closer to it. The presentness of the building in this sense would not be seen as an impediment to be dissolved into the flux of representation, but rather as the site of architecture's contact with the complexity of the real. This requires moving beyond design process and its abstract codes, and paying closer attention to the unpredictable transactions between the drawn and the built. In the work of both Eisenman and Coop Himmelblau—despite important differences—the building is understood as a representation of the abstract procedures of design. The conventions of representation, where one sign always designates another,

are projected onto the experience of the real. For these architects, as for Derrida, there is nothing outside of the text.

But buildings do not simply embody the abstract concepts that enable them, but erase them—incompletely—in the messy physicality of construction. Traces are produced out of the necessary heterogeneity of architecture's procedures: the strange mixtures of technique required to move from the abstraction of representation to the concreteness of building. The trace, if it remains, persists in an excess that is unaccountable according to the simple logic of either the tectonic or the semiotic, and is produced as much by mismatch as by correspondence.

Between architecture's instruments of representation (linear, immaterial, and transparent) and the complex, contingent reality they enable, there exists a curious and shifting distance. Drawings can only remotely approach the physicality of that which is built, and the nature of the operations required to bridge that gap range from social and institutional to technical. Some are local and highly specific: techniques of building or conventions of representation. Others are institutional, from schools and professional organizations to regulatory agencies and labor unions. Others are more abstract: operations of projection, notation, or, more recently, computer drawings and simulations. Inevitably, the means of realization—whether in the form of the abstract operations of design or the procedures of implementation—leave their mark on the building. This may be trivial, or it may be more complex and subtle. But representation is neither a perfectly transparent medium for the communication of the designer's intentions, nor is it a dubious suspect to be interrogated. It is instead an active middle term in a complex transaction involving matter, ideas and the social body. It seems worthwhile to pay closer attention to the form and manner in which it leaves its (sometimes indecipherable) traces on the built work.

One result of this would be to understand geometry not as the regulator, or preserver of meaning, but as a contingent mark of always shifting systems of description. A kind of "trace" can be located in the incompleteness of translation that persists in construction. The genealogy of this concept can be quickly sketched: in the Italian baroque this improper marriage of geometry and construction first becomes visible. The complex interplay of concave and convex form in Francesco Borromini's St. Ivo Church, for example, seems to have been imagined not only as the overlay of geometric systems, but also out of an intuition that the fabric of the construction is something tangible, matter that can be carved and shaped to interact with an equally tangible space.



Guarino Guarini. ***San Lorenzo*****, Turin, 1666 ff. View of the dome, photographed before damage suffered in World War II.**

Borromini's near contemporary, Guarino Guarini, who was an accomplished mathematician and geometer, produced strange, apparently immeasurable structures by understanding that (since all structure behaves geometrically) it is possible to push the limits of architectural structure by putting into play new systems of projective and descriptive geometry. Jacques-Germain Soufflot, working in Paris a century later, was able to produce an astonishing sense of infinite space disappearing into light by radically lightening the structural support in the dome system at Ste. Geneviève. These structural advances required close calculation. They marked an intricate interplay between a

Le Corbusier. Study model of the Palace of Assembly, Chandigarh, showing construction of ruled surfaces, model c. 1960.

knowledge of construction technique, the strength of materials and the architect's geometric facility. But they produced experiential effects that went far beyond the pragmatic problem-solving of engineering design.

In the twentieth century, the use of the ruled surface in the late work of Le Corbusier (as well as in that of other architects and engineers such as Felix Candela or Eduardo Torroja) marks another privileged intersection of the geometric and the tectonic. In the ruled surface, the pragmatics of construction (ruled surfaces can be formed with straight members) and the abstraction of mathematical description coincide.[24] Robin Evans has written convincingly of the importance of Iannis Xenakis in some of the postwar projects of Le Corbusier.[25] Xenakis worked in Le Corbusier's office as an engineer, and later became one of the most significant composers of the twentieth century. He was involved notably in the design of the monastery at La Tourette, where he translated his own experiments in counterpunctual notation to the system of *pans de verre ondulatoire*, and at the chapel at Ronchamp, where he helped calculate

Antonio Gaudi. Funicular Structural Model for Güell Chapel, model c. 1898.

its assemblage of complex curvatures. These examples occupy an indeterminate zone between mathematical precision and sculptural expression. At the Philips Pavilion, Xenakis was responsible for Le Corbusier's most radical deployment of the ruled surface. (And the only case where Le Corbusier ever ceded primary design credit to one of his associates.)

In some of the figures considered marginal to the history of modernism this interplay between the drawn and the built is also visible. Antonio Gaudi used an assemblage of suspended weights and wires to "draw" the structure of

the Güell Chapel upside down in his workshop. The result is a structure that while appearing to be highly personal and irrational, exactly translates the structural forces into built form. In Carlo Mollino's furniture, interiors and buildings, dynamic structural forces and the movements of the human body imprint analogous traces at distinct scales. These examples are, quite intentionally, distant from the stylistics of deconstructivism, and perhaps from the theories of deconstruction as well. Is it useful then to continue to call them traces?[26] Perhaps not. To do so requires rethinking conventional ideas of the regulating function of structure, and the origin of concepts. Referring to contemporary concepts of structural design, engineer Cecil Balmond writes: "I prefer structure as *trace rather than as skeleton,* with pathways that attempt to interpret space."[27] To call these traces is to insist that concepts are produced in and through the materials and procedures of architecture itself, and not grafted onto them from outside. In each of these works, the trace functions out of the *difference* between delineation, projection and construction. It opens the possibility of understanding the trace not simply as absence reified, but as a condition made possible precisely by architecture's promiscuous presentness.

tricks: an architecture of effects

Pas une image juste, juste une image.

—Jean-Luc Godard

Three distinct concepts of the trace have been outlined above: traces as indexical signs, the trace as absence and erasure, and the trace as regulating geometry. I have also suggested that architecture produces another kind of trace: the ephemeral marks that its abstract instruments of design and projection leave on the built work. But each of these seeks, in some way, to ground the meaning of the building in the architecture's procedures of design or construction. They look for some meaning beyond or outside of the thing itself, but still within the culture of architecture and its design procedures. They are the instruments of a critical, hermeneutic practice. Put another way, is the persistence of the concept of the trace in some way a disguised attempt to reinscribe architecture in a metaphysics of depth? Félix Guattari has spoken instead of "an architectural transfer that would not manifest itself through an objective knowledge of a scientific nature but through the angle of complex aesthetic affects."[28] Recent practice is

turning away from process and away from models of meaning in depth and looking instead for strategies to extend and multiple possible meanings and performative effects.[29] This post-ideological turn in architecture plays on the superficiality of postmodernism, but it is not satisfied to simply combine and recombine a catalog of available signs. These practices tend to look to the behavior of buildings in the world, and to pay attention to constructed effects generated by the architecture *in the field.* They have as a goal the production of complex meanings in and among the world of things. An *architecture of effects* works with surfaces and images, but not exclusively. It is a cunning architecture that covers its tracks. This is not to accept the simple opacity of the postmodern (in the form of cardboard-facade historicisms or the mute grid of the corporate office tower) nor is it to imagine that it is possible to return to a perfect modernist transparency. Instead it works with complex mixtures of transparency and opacity—masks, scrims, veils, or other forms of illusion that conceal and reveal at the same time.

But architecture is uncomfortable in the world of illusion. The discipline retains a Ruskinian concept of morality that holds the trick under suspicion. In film studies, on the other hand, there exist (not surprisingly) various theories that make illusion thematic. Christian Metz notes that the "image track" of the film contains many elements that are not, properly speaking, images. They are some of the means by which the filmmaker manipulates the materials of film. These would include written matter (subtitles, inter-titles, credits, the words "The End"), but more importantly, all of the "optical effects obtained by the appropriate manipulations, the sum of which constitute *visual* but not *photographic* material."[30] In this category Metz places blurred focus, accelerated or slow motion, the "wipe" or "fade" (all of the "visible material of transitions") as well as color shifts or superpositions. Metz assigns the term *trucage* to these effects, which are defined by their divergence from photography (and by implication, the truth-value of the index).

Usually translated as "special effects" or "trick photography," the connotation of trucage is broader. Metz elaborates and classifies cinematic trucages on the basis of those "profilmic" effects that take place before the camera (the use of stunt men), and "cinematographic" effects that are achieved by the manipulation of the film or the camera: blurred focus, slow motion, and so on. Cinema's earliest "tricks" already employed both effects simultaneously. The "disappearing trick" of Georges Méliès was achieved by stopping the

camera while the actor left the set: simply a substitute for the theatrical trap-door. Trucage is further categorized on the basis of the reading conventions of classic narrative film. An invisible trucage (the stuntman) is not intended to be noticed by the audience; "visible" trucage functions rhetorically to signal psychological or narrative intent: the use of slow motion to heighten suspense, the use of blurred focus to indicate a dream sequence. Yet there are also effects, designated as "imperceptible" by Metz, that are unnoticed—that is to say impossible to localize—yet intrude upon the senses and contribute to the affective power of the film (cuts, transitions, color shifts and lighting).

Trucage does not function primarily as syntactic marking (as a punctuation or structuring of the cinematic narrative) although this rhetorical function is present. Rather, the sum of these effects is to operate specifically in the realm of the cinematic but outside of the conventional codes of the linguistic. "Trucage," Metz writes, is "avowed machination. . . is always a certain duplicity attached to the very notion of *trucages*. There is always something hidden inside it (since it remains *trucage* only to the extent to which the perception of the spectator is taken by surprise), and at the same time, something which flaunts itself, since it is important that the powers of the cinema be credited for this astonishing of the senses." Metz goes further: "It is in fact essential to know that the cinema in its entirety is, in a sense, a vast *trucage*, and that the position of the *trucage*, with respect to the whole of the text, is very different in cinema than it is in photography."[31]

Bearing in mind the dangers of mechanical cross-disciplinary transfer, it might be interesting to speculate on the possibilities of trucage in architecture. Trucage aims at effects and does not give the game away. It might suggest a rethinking of architecture's capacity to construct illusion through images. This ability has in the past linked architecture to theatrical design, but what I have in mind would go beyond a scenographic architecture. In this context, the problem with a scenographic architecture is not its duplicity or its shallowness (and connotations of ethical impropriety) but rather its limitations as a spatial model: scenography always implies frontality, flatness, and a static observer. An architectural trucage, on the other hand, might work to construct illusions that are fully corporeal, inhabitable, and mobile. It would work with space, program and image, but would be somewhat indifferent to the procedures of design. The criteria to evaluate architectural space might in turn shift from the ontological to the pragmatic. Instead of asking what category of thing it is, we might simply

ask how well it works. Does it enable new social spaces or produce alternative possibilities of exchange? This in turn could suggest a theory of construction that does not simply oppose the rationality of tectonics (presence, materiality) to the slipperiness of illusion (absence, immateriality). Construction creates effects and manipulates appearance. It brings architecture into contact with the real, which is never wholly rational nor wholly imaginary. The effectiveness of architecture would then be located not in the ability of the building to operate as an index it own procedures, but in the specificity—and unpredictability—of architectural effects in the realm of the constructed.

Paraphrasing Metz, trucage in architecture might be all of the effects (visual *and* haptic) obtained by appropriate manipulations, the sum of which constitute *spatial but not architectonic* material. It would consist neither in a denial of architecture's enabling fictions, nor in the simple embodiment of those fictions. Because it would not have to believe in the reality of the categories it erects, its space could support a multiplicity of programs and events, without resorting either to obsolete hierarchies or utopian attempts at the dissolution of hierarchy. By unhinging architecture from its appeal to origins, process, and unmasking, attention is redirected to the architectural artifact itself, a construct which must be capable of generating its own terms of interpretation outside of the protection of the author and the control of the institution. By shifting attention from artifact to effect, *trucage* undermines the finality of the architectural.[32] Instead of a monumental structure devoted to its own preservation, a delicate provisional framework is proposed, open to revision and capable of evolving over time.

It has already been suggested that the idea of architecture as trucage has its origins in the conjunction of architecture and the theater. The materialization of the conventions of representation in architectural scale can be traced back to Andrea Palladio and Vicenzo Scamozzi, and Renaissance theater design. The sense of theatricality is further heightened in the Baroque. Giovanni Lorenzo Bernini's *Scala Regia* at the Vatican deploys geometric and spatial material to construct an inhabitable illusion—not a stage set to be looked at but a passage to be traversed. Its spatial effects can be put in play by the mobile observer. The history of garden design is full of tricks, illusions, and the manipulation of perception. In the garden, architecture can escape the rational strictures that keep the play of illusion at arm's length in buildings and cities. Twentieth-century architecture, in turn, has been seen through a lens of "honesty to materials" that

treats illusion with suspicion. Yet in Le Corbusier's villas of the 1920s it is a thin coat of stucco, and a play of colored surfaces, that transforms the somewhat crude construction into a series of flowing spaces, supporting the delicate illusion of the house as an inhabitable painting.[33] Mies van der Rohe, perhaps the figure most often identified with tectonics and the direct expression of materiality, has in recent criticism come to be seen (somewhat ironically) as a master of the effect: "If Mies adhered to any logic, it was the logic of appearance. His buildings aim at effect. Effect is paramount."[34] In recent architecture, Rem Koolhaas is associated with operative concepts such as bigness and deregulation, but his built works combine a thinness of material with the multiplication of surfaces to create airy membrane-like spaces and generate complex surface effects. He operates in a kind of stylistic vacuum, indifferently appropriating from an open catalog of modernist, technological, and popular vernaculars. His building practice affirms that there is no intrinsic depth-content behind his formal choices—no objective or scientific basis. Rather, it is the effect of the amalgamation that matters above all. Alternatively, in John Hejduk's later work, an assembly of known parts yields astonishingly complex wholes—an "avowed machination" where laying bare the device of construction in no way explains or exhausts the associative capacity of the object itself.

A final example. Researchers at Yale University have discovered what may be a very promising strategy to combat HIV infection. They use what is referred to as a "Trojan Horse" virus to trick HIV-infected cells into fusing with a genetically manipulated virus that destroys them.[35] In order to cause infection, a membrane-enveloped virus, such as HIV-1, must first attach itself to the surface of a host cell. After binding to receptor molecules located on the cell surface, the virus fuses its own membrane with that of the cell, and infection results. The Yale biologists genetically engineered the envelope of a common livestock virus—vesicular stomatis virus, or VSV—to resemble that of an uninfected human T-cell. They were able to replace its envelope genes with the genes for the surface cell receptors usually found on cells targeted by HIV. (Additionally, they were able to delete the surface protein that would allow VSV to infect other healthy cells.) In laboratory experiments, the "pseudotype" or "wild-type" viruses obtained by this procedure were placed in contact with infected t-cell lines, and rates of infection were radically reduced. Through a process of *surface* manipulation, the virus is targeted to attack only HIV-infected cells, which it then destroys by stealth: "Turning around what

happens naturally, the remodeled shell of VSV—which now looks like an uninfected t-cell—tricks HIV-infected cells into fusing with it instead. This enables VSV, which easily kills cells, to gain entry into the HIV-infected cell and destroy it."[36] The process is self-regulating since VSV only targets and multiplies in HIV-infected cells. The study's senior scientist, John K. Rose, notes that "the concept could be used to develop a whole new class of agents that are useful for controlling disease."

The Yale biologists, it might be said, utilize counterfeit and trickery to combat HIV infection. Theoretical physicists long ago incorporated uncertainty in to their view of the world. But we should resist the temptation to turn this into a loose metaphor, or to treat the physical world as if it had a conscience. There is nothing ethically suspect about luring an HIV-infected cell to its destruction, and quantum physicists employ indeterminacy not because they are philosophically committed to undecidability but because mathematical models utilizing uncertainty and probability more closely predict the behavior of things in the world. Rather than see science as a metaphor, architects might do better to emulate its empirical procedures. Thomas S. Kuhn has pointed out that scientific "revolutions" take place when experimental anomalies accumulate that cannot be accounted for by normative theories: "Failure of existing rules is the prelude to a search for new ones."[37] When empirical results can no longer be fit into the available conceptual categories, new categories, explanations, or paradigms must be produced. It is not difficult to make the case that in architecture today, the existing rules have failed. Many phenomena and effects emerging in the city today seem to be no longer capable of being accounted for, or controlled by, architecture's available models—theoretical *or* operative. It would follow that architects and urbanists urgently need to work, creatively and empirically, to devise new theories, strategies, and techniques to work with this tricky matter. To keep pace in this shifting field, the architect will have to travel light, and may have to learn to be more comfortable with illusion, affect and tricks.

1993/1997

Mies van der Rohe. New National Gallery, Berlin, 1962-67.

4

mies's theater of effects
the new national gallery, berlin

"Appearance" belongs also to reality: it is a form of its being; that is, in a world in which there is no one being, it is possible to create a certain, calculable, world of *identical cases* only *through semblance*: a rhythm in which observation and confrontation, etc., are possible.

—Friedrich Nietzsche

drawing

No architect has been more strongly identified with the finality of the built work than Mies van der Rohe. The clarity of his tectonic expression and his uncompromising use of materials point toward an architecture that begins and ends with construction. Mies's laconic statement, "We refuse to recognize problems of form, only problems of building," is emblematic of an architecture that justifies itself entirely by reference to the built work and not to design procedures. It is not surprising that drawing has an ambivalent status in the practice of Mies van der Rohe.

Mies van der Rohe. Museum for a Small City, Collage, 1942. Mies van der Rohe Archive, © 1998, The Museum of Modern Art, New York.

Yet recent criticism has begun to chip away at the solidity of this interpretive edifice. In essays published in the mid-1980s, José Quetglas and K. Michael Hays, following more the general formulations of Manfredo Tafuri, present Mies in the context of the critical discourses and operative techniques of early modernism. Instead of affirming the solidity of classical tectonics, they emphasize the fugitive character of Mies's buildings, which they describe as contingent constructions dependent on the viewer's mobile perception. In their readings, the fixity of architectural form dissolves in fragmented perception and collage practices.[1] Fritz Neumeyer's Book *The Artless Word*, which carefully charted Mies's readings in philosophy and aesthetic theory, effectively laid to rest the corollary myth of Mies as "wordless" intuitive genius.[2] In the context of his reexamination of the Barcelona Pavilion, Robin Evans described Mies as a "master of equivocation," devoted above all to the production of effects.[3] "The Presence of Mies," a conference held in 1992, marked the wide acceptance of this more inclusive view of Mies. In the essays collected by conference organizer Detlef Mertins, affiliations with minimalist art, collage, publicity, and postwar consumer culture are developed.[4]

So my starting point, Mies's drawings and the apparent contradiction between building practice and graphic technique, may not appear scandalous. Drawing, in one form or another is a constant presence in Mies's work; yet in the early photo-collages, in his laconic personal sketches or in the limpid pencil renderings executed by his apprentices in the forties and fifties, the architecture as represented in the drawings appears to exhibit the exact opposite character of the built work. Even the famous charcoal renderings of the 1923 glass skyscrapers, which might be seen as graphic equivalents to the play of transparency and reflection in the building, take on a graphic autonomy. The soft charcoal strokes in no way resemble the sharp edges and brittle surface of the glass. In

the drawings, the architecture is emptied out, disembodied and dematerialized. The drawings render the real intangible, and the intangible more real.

In a collage which refers to his 1942 project, *A Museum for a Small City*, the architecture as such has all but disappeared. Its presence is suggested only by absence and implication. Space is described by the layering of the collage plates, and the window mullions are indicated by gaps cut into the photograph of the landscape beyond. The architectural frame is reduced to a barely legible trace. The use of collage sometimes signals a heightened attention to materiality, but in this case, it is precisely not the architecture, but the landscape beyond and the artworks exhibited within that are made more tangible. Moreover, materiality is already mediated by the photographic representations utilized in the collage. The architecture cancels itself out in the act of framing the view beyond. In these collage-drawings, Mies enters into a complex play of presentation and re-presentation, in which mimetic equivalence is bypassed in favor of a codified play of absences and presences.

Although this collage presents an extreme case, we might reasonably ask if architecture is ever "present" in drawings. Strictly speaking architecture is always signified by its absence in drawing. I would like to argue that what appears to be a paradox or an internal contradiction in Mies's work in fact tells us something very fundamental about the nature of architectural representation. Mies located materiality exclusively in the realm of building, and never made the conceptual mistake of confusing materiality as represented in the drawing with the specific capacities and potentials of building itself. Mies considered himself a builder first, and as such, he had no need to *simulate* building through drawing. Instead he made thematic to his practice an understanding that architects are displaced from the material aspect of their discipline, and of necessity work through a disembodied notational form. Drawing, as Mies understood very well, always *stands in* for that which cannot be present. For Mies, technique is never neutral, and drawing's instrumentality is never direct. Drawing is a site of exchange and an instrument of transformation. It works in the interval between thought and thing, provoked as much by architecture's absence as by its presence.

the virtual and the real

A recognition of drawing's in-between status can help to explain some of the other apparent contradictions in Mies's practice. Kenneth Frampton has called

Mies van der Rohe. New National Gallery, Berlin. Detail of Curtain Walls.

attention to the way in which, in Mies's work of the 1920s, the special capacity of glass as a building material to achieve both apparent *and* actual dematerialization was interpreted as the expression of a new spirituality.[5] This equal presence of the real and the virtual is a constant in Mies's architecture.

He understood architecture's special capacity to present the ineffable—light, shadow, transparency, and reflection—as the paradoxical corollary of building's material presence. Mies's buildings produce complex optical effects that can never be simulated or predicted by drawing: the play of light, shadow, and atmosphere, as well as the parallax effects produced by the movement of the spectator and the intricacies of peripheral vision. Mies considered his architecture to be part of the real and he made use of the paradox of architecture as something present *in the world* to make the visible invisible. Buildings are presumably more tangible and physically present than drawings, yet it is only in the experience of the building that the most intangible aspects of reality can be made visible.

This rethinking of Mies in terms of virtuality and complex effects can also have implications at the urban scale. If Mies is understood exclusively as a builder, as the producer of self-sufficient tectonic objects, then it is difficult to relate his buildings to the city. In this case, the autonomy of form would seem to reinforce categorical separation and social hierarchy. But if Mies, on the other hand is understood as an architect of appearances, caught up in subtle manipulations of architecture's optical field, it opens up a new way of thinking about his buildings in relation to the city.

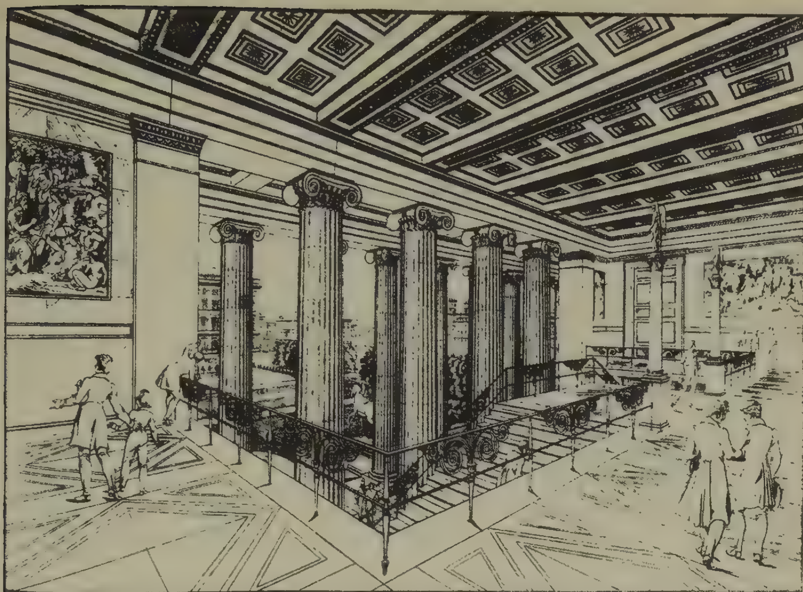
Virtuality is more than a formal, or a visual, property of things. Virtuality concerns *time* above all, and implies momentary configurations of events, shifting use patterns and intricate programmatic exchange. Hence a turn toward the virtual also provokes a reconsideration of architecture's unfolding in time. Urban architecture necessarily functions within a complex network of forces and flows, some visible and others invisible. Buildings in the city act as a scaffold for multiple uses and programs. In the best cases, Mies's buildings form a structured backdrop for the life of the city, creating a relatively neutral datum, against which the full complexity of urban life is allowed to unfold without fixed limits. The insistent horizontality and clarity of tectonic definition create an architecture in which events and figures stand out in high relief. The porosity of boundaries stages unanticipated connections and confrontations of inside and outside. Through a close examination of Mies van der Rohe's New National Gallery in Berlin, I intend to propose an idea of Mies's urban architecture as simultaneously bound up with the production of complex effects in the realm of the visible, and at the same time capable of refiguring the landscape around it.

karl friedrich schinkel and the panorama

Mies's debt to Schinkel is uncontested. Yet while that influence is usually seen in terms of neoclassicism, Mies himself understood the limits of Schinkel's neoclassicism. In an undated notebook entry he wrote: "Schinkel, the greatest building master of classicism, represents the end of an old and the beginning of a new time. With the Altes Museum he built a waning period. With his boring Gothic Churches he was the forerunner of an unspeakably kitschy century, but with his Building Academy he introduced a new epoch."[6] There is a deep ambivalence in this passage that suggests that Mies was not willing to accept everything he found in Schinkel. Instead, As Paul Westheim argues, Mies "penetrates to the specifically architectonic in Schinkel; the classicizing formal language, the mere temporal aspect of Schinkel becomes irrelevant."[7]

Still, it may not be so easy to detach surface image from tectonic depth in Schinkel. He was active as a painter and set designer, immersed in the culture of representation. The spare, linear character of the plates in his *Sammlung Architektonischer Entwurf*, for example, tends to dissolve the physicality of the buildings depicted. While spatially expansive, his built works exhibit a similar tension of thin, brittle surfaces. Kurt W. Foster has demonstrated an intricate interplay between Schinkel's practice as a painter of urban scenes and his actual constructions in the city.[8] But significantly, the connection made here is not one of image to image—weaving architecture into a network of signs—but one that moves from carefully crafted *representations* of urban space to carefully *constructed* spaces in the city itself. For Foster too, Schinkel is a transitional figure, aware of the potential effects on architecture of the emerging *artificial* culture of the image: "In the world, the site of urban civilization created an ever greater impression of total artificiality. New forms of production gave rise to a complete second nature that conveyed upon both nature and history artificial status. Potentially, everything became a re-production and, as such, was made to be consumed."[9]

The panorama was one manifestation of this "second nature." It was an integral part of a culture of the reproducible image created by new forms of production, new urban spaces and new social structures that emerged in the course of the nineteenth century. Panoramas were constructed as popular entertainment in large numbers of European and American cities beginning in the



Karl Friedrich Schinkel. Altes Museum, Berlin. Perspective View of the Upper Vestibule, 1831.

1790s. They were laid out according to conventionalized codes of vision, which dictated their ideal circular form and complex sectional configuration. But unlike the fixed viewpoint of classical perspective, the panorama allowed—in fact necessitated—the movement of the observer.[10] The continuous band of painted scenery could not be scanned from a single station point; the movement of the viewer was the necessary counterpart to the encompassing spectacle. The panorama looked back at the observer, but not with the ideal gaze of the panopticon, with which it shared certain formal characteristics. The panorama was constructed to sustain an illusion around the complex reality of spectators in motion; the panopticon modeled the all-seeing gaze from an abstract locus of power, directed at fixed bodies.

If the plan of the panorama mapped the laws of vision and the compass of the spectator, the section revealed most effectively the apparatus of the illusion. Spectators entered from below, occupying an artificial horizon (in more elaborate versions, these too were fitted out illusionistically, including one example built in England where visitors occupied the deck of a ship that swayed gently on a concealed mechanism). By means of a suspended curtain or dome, the illusion of the sky was maintained, usually pulled away from the perimeter, in order to cut the gaze of the viewer and to allow the painted scenes

to be lit from above. The illusion was made as complete as possible, but the spectacle was concentrated in the *horizontal* extension of the gaze, dissolving the architectural fixity of the perimeter and grafting a new spatiality on the city beyond. Insistently spatial and three dimensional, a painted panorama cannot be accurately reproduced in two dimensions. Either the continuous surface is arbitrarily cut and flattened, or the circular continuity is maintained and the view is represented anamorphically, the upper boundary being elongated along its entire perimeter.

Schinkel's involvement with the panorama was in part circumstantial. Returning to Berlin from Italy in 1805, Schinkel was unable to obtain building commissions (Prussia was at the time occupied by Napoleon's armies) and he made his living as a painter of urban scenes. In 1808 he executed the *Panorama of Palermo* in the royal palace during the king's absence. Foster has suggested that Schinkel made use of this circumstance to test ideas for the replanning of Berlin: "Schinkel used this entirely modern medium as a laboratory for his ideas on the city."[11] In a series of projects for central Berlin realized between 1816 and 1832, Schinkel was able to put these ideas into play at the actual scale of the city. Instead of planning single buildings in isolation, the whole is conceived as an integrated visual and functional ensemble. He understood (perhaps on the basis of his work as a painter) that the urban architect had to work simultaneously with the object and its context. These interventions, while resulting in closely crafted vistas and harmonic relations of parts, are not shallow scenographic follies, but fully realized urban fragments. He choreographed a complex and subtle interplay between architectonic objects and urban infrastructure. Schinkel's concerns were functional as well as visual. The heating and fireproofing of the new buildings, internal systems of movement, and external access for service were all taken into consideration in the planning.

Foster suggests that beyond the notion of integrated planning, something of the extensive visual character of the panorama is visible in Schinkel's planning of central Berlin. The notion of a unified urban ensemble is not in itself new in the history of architecture. In Renaissance and Baroque city planning similar relationships between representational conventions and urban building programs could be outlined. What is significant here are the specific visual attributes of the panorama, its particularly modern way of representing the city. The panorama implies a form of vision that unfolds with the movement of the spectator, and in which order is not imposed from outside but is continuously

reformed from within. This is the new paradigm of vision that organizes the actual fabric of the rebuilt Berlin: "The structures along the Spree Canal offer an 'exploded view' in which distance is as much a part of the composition as is mass." The motion of the viewer is anticipated as a working element in the composition: "Moreover, as one emerged from the *Unter den Linden* and moved across the palace bridge, the extended riverside panorama of Schinkel's buildings would come into view and then rapidly close up again behind the museum as the spectator continued on toward the palace square. This dynamic unfolding and contracting of the building prospect signals a sharply modern quality . . ."[12] Schinkel anticipates the modern condition of the metropolis: a dynamic urban field that supports multiple effects, mobile subjects, and a complex interplay of surface and depth. Foster underlines Schinkel's modernity with an analogy to the most characteristic art form of the twentieth century: "The architect created a sort of 'urban CinemaScope' in which proximity and distance, appearance and disappearance, together spell out a dynamic architectural order far from the obvious."[13]

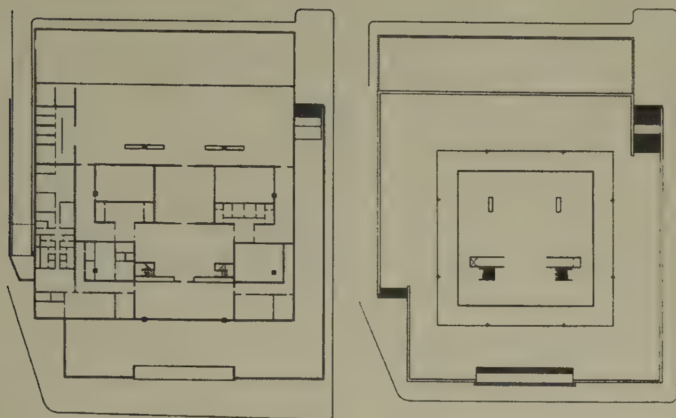
the new national gallery, berlin

To suggest a simple extension of the panoramic analogy from Schinkel to Mies relying on Mies's admiration of Schinkel and the coincidence of a site in Berlin would be to ignore the specific historical circumstance that made these panoramic operations possible in the first place. As Foster has pointed out, "With only a little exaggeration, one could say that the very developments which made Schinkel's renovations and constructions possible in the early nineteenth century, largely consumed them in its latter half and during the early twentieth century."[14] Mies, in Berlin, confronts not only the compromised visual culture of the late twentieth century, but a city scarred and fragmented from the Second World War and its Cold War aftermath. He works within distinct and more limiting conditions of patronage, and under complicated shadows of memory and history. Questions of totality and fragmentation take on an inescapably political overtone in postwar Berlin.

Mies therefore faced a much more difficult task than Schinkel. How to construct a convincing architectural space for a cultural institution in the late twentieth century? How to create an effective city fragment with the depleted

Aerial View of Berlin Kultur Forum in 1984.

arsenal of tectonic and visual resources now available? There is an understandable temptation to propose an autonomous object, encoding the ambivalence of the century in a silent, monumental object. In the opinion of an unsympathetic critic such as Alan Balfour (who refers to the New National Gallery, along with Hans Scharoun's Philharmonic Hall, as "two dinosaurs from an extinct modern age") this is precisely what Mies has done: the New National Gallery, he writes,



Mies van der Rohe. New National Gallery, Berlin, Plans.

"negates all pasts and conveys a spirituality more intense, more alienated and more tragic than the future needs. In its obsessive autonomy it diminishes all art and the people placed within its area of influence."[15] Coming from the opposite perspective, Fritz Neumeyer also underlines Mies aspiration toward a "larger totality" characterized by autonomy and spirituality, but assigns the opposite value to it: "What characterized that need for Mies was a 'higher unity' between man, building, and surroundings, which had evolved from the tradition of German Idealism. Reciprocal perfectibility and autonomy combined with responsibility toward the whole—these were the principles Mies honored most in his philosophy of serving in freedom."[16] But I think the visual evidence will show that Mies avoided the temptation either to construct an aloof, autonomous object that turns its back on an all too imperfect context (Balfour), or to impose that order universally beyond the limits of the site (Neumeyer). In order to make this case, it is necessary to get beyond the dominant critical framework that sees Mies's buildings as the embodiment of abstract concepts such as "spirit," "autonomy," or "higher unity," and to pay close attention instead to the performative and experiential realities of the building on site. To do so is to move beyond suspect notions of authorial intention and to see Mies's own declarations as part of a carefully crafted mask. In the New National Gallery, Mies staged a delicate choreography of object and urban field. Working with the diminished means of the late twentieth century, he created a subtle and paradoxical building that keeps its distance from the city around it only in order to reframe it in more complex ways.[17]

To read the New National Gallery in this way is to propose that Mies's architecture, often understood as a paradigm of constructed, material presence—aloof from its context, a synthesis of romantic classicism and technological rationality, expressed in uncompromising details and absolute structural clarity—can with equal validity be seen as an architecture of image and affect, capable of establishing complex relationships with its fragmented urban context.[18] It is to suggest that in the final half of the twentieth century, the classical certainty of Schinkel is unavailable, and that architecture of necessity works with more uncertain materials.

The base of the New National Gallery is usually understood in classical terms as a plinth functioning to isolate the building from its surroundings. As a device to detach the structure from an otherwise all too haphazard site, the plinth constructs an idealized ground free from contingency. However, this reading is contradicted by another well-known fact: Mies placed all of the services and functional accommodation into the base in order to maintain the severity of the visible pavilion form of the building. The solidity of the base itself dissolves into a floating plane at the back of the building. Therefore the blind socle, which wants to be understood as artificial ground, solid and resistant, is instead a hollow, occupiable space that conceals the apparatus necessary to preserve the ideal form of the pavilion. This insight should also direct attention to the stage-like form of the plaza itself as an integral part of the building. Mies takes great pains to place the interior in continuity with the platform, minimizing and multiplying the architectural separation; note the suppression of the railing, which would mark the edge of the plaza and the multiple demarcations of interior: the overhang of the roof, the glass wall, the railings and partitions within. Far from isolating the experience of the building from the city, the architecture of the plaza establishes complex continuities with the now disjointed city. The building and its surroundings are always seen in juxtaposition. The foreground of the plaza interrupts the previously perceived ground, fragmenting and reframing the city. The real event is to put the city on display, but by means of a device that constructs a defamiliarizing distance between the viewing subject and the reality of the surrounding context.

The plan, far from exhibiting the axial symmetry characteristic of Mies's supposed neoclassicism, is dominated by ubiquity and directional equivalence. The eight structural columns are deployed with absolute neutrality; both in configuration and placement they are identical from all sides. The placement of

the columns at mid-quarter points does not pin the corners with a vertical mark, but reinforces the horizontality and floating effect, freeing the cantilevered corners to direct the gaze to the distance beyond.[19] The paving grid and the egg crate effect of the space frame ceiling exhibit a similar indifference to axiality. They serve to create a universal field open to multiple directional and functional accommodation. The inverse symmetries of the access stairs at the perimeter reinforce a circular movement that is an effective counter to the frontality of the main stair along Potsdamerstrasse. The perimeter is sheared and does not close upon itself. In this centripetal space, the eye moves quickly past the symmetrically placed service stacks, which in turn are dissolved and multiplied in the play of reflection and transparency. The cornice and roof are immaculately neutral.

As in the panorama, the ideality of the plan contrasts with the pragmatism of the section, which reveals the apparatus of the illusion. Note for example that the columns at the lower level (which would be wider, according to a strict tectonic logic) are actually smaller in profile than the cruciform columns above. For rhetorical effect, Mies has increased their dimension on the plaza level while maintaining the minimal required dimensions on the lower levels where they are not visible. The hollowness of the base is also manifest, as is the indifference of the platform, which sometimes rests on filled ground, and at other times roofs over occupiable space. The continuity of this primary datum is underscored by the minimal representation of the glasswall. The great floating horizontal roof plane functions, like the plaza, to slice the gaze of the viewer and reframe the city beyond. Together, these two horizontal planes reproduce the effect of the panorama, turning the city into a continuous band, detached from the ground of the city, horizontally wrapping the space of the viewer. Hans Scharoun's Philharmonic Hall and the nineteenth-century St. Matthaus-Kirche float, like collage elements, on an artificial ground. As in the panorama, the eye moves to the perimeter, tracing out a horizontal extension of the gaze. This panoramic vista cannot be taken in all at once, and the spectator is forced into motion. The city that looks back at the spectator is a city of disjointed fragments, upon which a new unity has been conferred by virtue of the architectural frame. To see the New National Gallery in this light is also to call attention to the experiential aspects of Mies's architecture: the ephemeral play of reflection and transparency on the massive plate glass walls, which always function in opposition to the assertive materiality of the tectonic elements. The play of reflections

doubles the city and superimposes it onto the blank screen of the architecture. In contrast to the bronze finish of the Seagram Building in New York, the matte black finish of the steelwork at the New National Gallery tends to further dematerialize the materiality of the structure. The softness of the matte surface absorbs light, while the hardness of the glass reflects it. This causes the support of the glass at times to disappear, making the glass panels stand out independent of their structure. This is not to propose that Mies's architecture must be seen entirely as illusion and ephemerality, but rather to underline the way in which the very definiteness of the architectural support, instead of being understood as sufficient in and of itself, is necessary to frame and set in motion a play of illusion and representation that is its dialectical counterpart. Mies deploys, without apology, the logic of appearance: the experience of the New National Gallery is an experience of effects that are undeniably spatial, doubtless specific to architecture, achieved by a subtle choreography of architectural elements, but which themselves are all something *other* than the architecture itself. To read Mies in this way is to appreciate the exquisite measure with which he has calibrated the play of fixity and freedom, absoluteness and contingency, absence and presence.

This would support a reading of Mies's architecture not in terms of its "timeless" presence, aloof from the contingencies of history and experience, but rather as a foregrounding of the actual experience of real visitors in real time. Hence a characteristic experience is that of climbing up from the lower galleries by the austere stairs, the spectator carrying with himself/herself the memory of the representations of the city (fragmented and disjointed) from the canvases displayed below, to test and compare that reality against the image of the city flattened onto the plate glass, detached from its own ground by the artificial horizon of the plaza. The city is converted into a representation of itself, as contingent as any of the representations displayed within. The reframing is double: not only spatial and architectural, but conceptual, experiential and ultimately political. What is contingent and constructed may itself be altered and reconstructed.

It might be noted that there is (at least) one significant difference between Mies and the anonymous nineteenth-century architects of the panoramas. In the case of the panorama, all the mechanisms necessary to construct the illusion were concealed. The codes of popular entertainment then (as today) required that the illusion be sustained by every possible trick. Mies, on the other hand, strips away the mask. Any visitor can examine the way in which the illusion is

Mies van der Rohe. New National Gallery, Berlin, Night View.

constructed, can understand the source of a reflection, can re-occupy the ground of the city if required. As exhibited in details like the hinged roller-bearing joint separating the space frame from the column head, the construction declares its own self-evidence (this despite minor deviations and inconsistencies that have often been noted but in no way detract from the overall project of clarity). But is this the opposite of the nineteenth-century strategy for the production of illusion, or its inverted double? Mies covers his tracks, masterfully. Unlike the modernist impulse to "lay bare the device," Mies's architecture declares the futility of the unveiling operation. He realizes that it is not necessary and not effective; not necessary under conditions of reception in a state of distraction, and not effective because of the impossibility of the perceiving subject ever standing outside the web of illusions constructed by the architectural.

1989/1993/1997

Frank Lloyd Wright. The Solomon R. Guggenheim Museum, New York, Design, 1943 - 46. Construction photo, 1955–59.

5

the guggenheim refigured

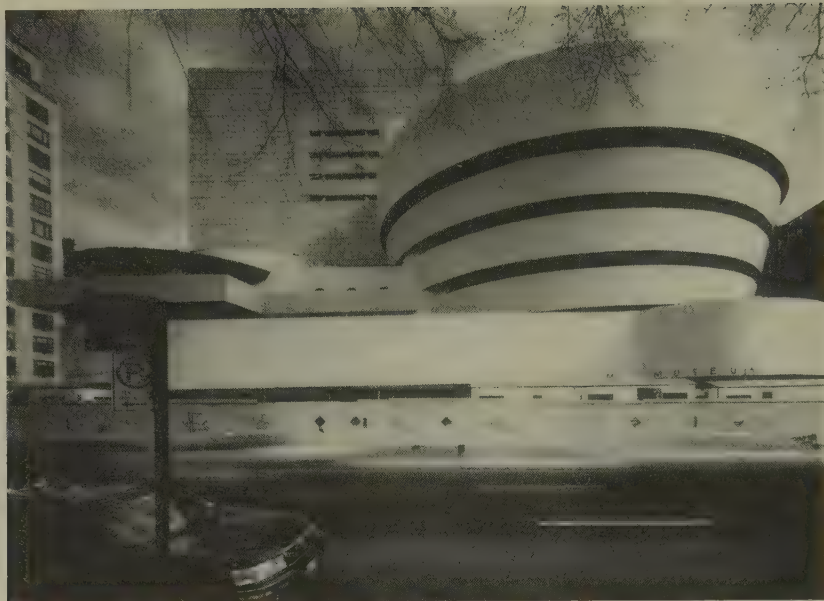
the solomon r. guggenheim museum, new york, ny

Direction emerges from figure.

—Novalis

WRITTEN ON THE OCCASION OF THE REOPENING of the Solomon R. Guggenheim Museum in 1992, this essay was an attempt to see beyond the inevitable polemics surrounding the restoration of Frank Lloyd Wright's original building and its expansion by Gwathmey Siegel Architects. Sidestepping questions of judgment, I wanted to avoid nostalgia for some imaginary idea of a pristine, untouchable original. No architect has been more willingly mythologized than Wright, but the idea of Wright's building as a masterpiece, confirmed or compromised did not seem useful here. Instead of entering into the tedious debates on the politics of preservation, my strategy was to reexamine the messy reality of the building's construction and its reconstruction.

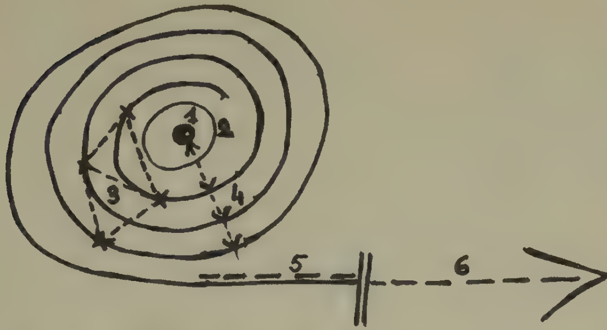
I prefer to think instead of the building as a kind of "scandalous" device: an unanticipated invention, and a concrete technical advance. I will limit myself to speaking about *technique*, but technique understood not as the combination and recombination of given conventions (a series of delimiting codes) but of technique understood broadly as invention and improvisation. Following the



Frank Lloyd Wright. The Solomon R. Guggenheim Museum, Construction photo, 1992.

distinction proposed by Gilles Deleuze and Félix Guattari, I define Wright's technique as an *ambulant science*: "There are itinerant, ambulant sciences that consist in following a flow in a vectorial field across which singularities are scattered like so many "accidents."[1] Deleuze and Guattari contrast ambulant procedures to the regulated spaces of the royal science that reduce technique to technologies, or applied sciences, devoted to reproducing what already exists. Wright, on the contrary, opened up the realm of the possible with this building.

Wright's antipathy to the international style is well known, as is his uncanny ability to appropriate and refigure key devices of modern movement vocabulary. What he ostensibly rejected, he often refigured and made his own: the cantilevers of Falling Water, the ribbon windows of the Johnson Wax building, or the smooth stucco skin of the Guggenheim. Wright's relevance today, in the midst of a desperate search to overturn or exceed modernist paradigms, is especially evident in his idea of space and its relation to structure. The architects of the international style, consistent with philosophical systems undergirding modernism, proposed a dialectical relationship of space and structure: a fluid (curvilinear) space as a counterpoint to a regular structural rhythm. The *plan libre* presents a figural void wrapped in an abstract enclosure: structure as punctuation to space. Wright, at the Guggenheim, constructs a distinct tautological

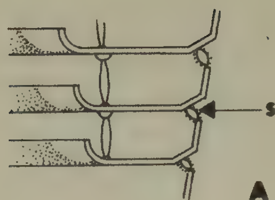


Gilles Deleuze and Félix Guattari. Diagram of partial, or blocked deterritorialization, showing movement from the Center or the Signifier (1) to the scapegoat, or the negative sign of the line of flight (6). From *A Thousand Plateaus*, 1987.

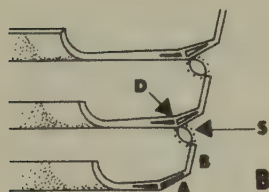
hybrid: figured space enclosed by figured space.[2] There is no stable frame to ground the emergent figure. Wright never idealizes structure, because in his work, structure can never be precipitated out and isolated as a *thing*.

It is instructive to follow the evolution of the building's structural design. Wright's early proposals utilized matchstick-like columns to support the tiers of the ramp, a solution clearly at odds with the organic continuity Wright desired. These were soon eliminated in favor of a structural scheme based on the continuity of the structural members with the spatial membrane, achieved through the use of the fold as a structural principle. As William Jordy has perceptively written, "It is at least theoretically possible that the curved and folded cross section of the ramp would stiffen the building structure in an important way. All the more since both curvature and folding are doubled. The ramp curves in plan, as a circle, while its floor plane simultaneously curves up into a parapet at its inside edge. On the outside, the floor plane of the ramp folds once at an oblique angle so as to separate one turn from the next above, and provide a notch for the ribbon window of the one below. It folds again more sharply to make the gently out-canted wall which, in turn encloses the building."[3]

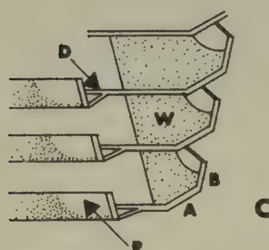
To construct the spiral, the form that Wright preferred for spatial and symbolic reasons, the fold is both a practical expedient and a logical extension of the fluid geometries of the spiral ramp as a structural concept. In contrast to the universal Cartesian geometries of the late work of Mies van der Rohe, Wright proposes a form equally universal (and marked with certain metaphysical overtones) but characterized by topological complexity. In Mies, the fluidity of space is channeled around and through a rectilinear frame; at the Guggenheim, both space and its



A: ORIGINAL STRUCTURAL PROPOSAL UTILIZING COLUMNS.



B: IDEAL FOLDED STRUCTURE.



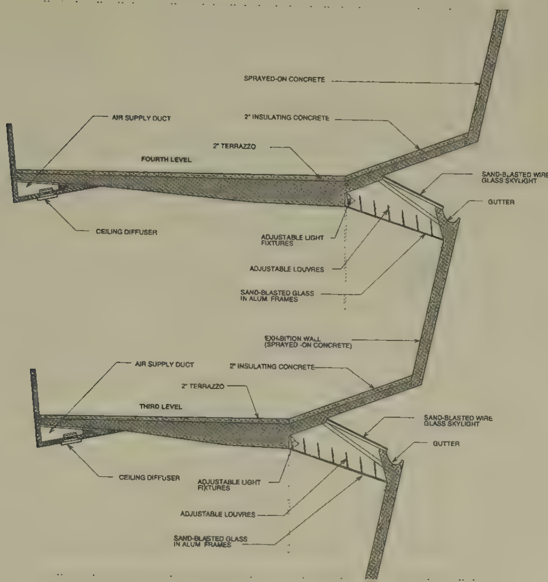
C: STRUCTURES AS CONSTRUCTED WITH RADIAL WEBS.

S=METAL STRUT
W=WEBS

Frank Lloyd Wright, The Solomon R. Guggenheim Museum. Structural Diagram from William Jordy, *American Buildings and Their Architects*, 1972.

enclosing envelope are fluid. Wright's geometry is characterized not by linearity, assemblage and divisibility (as in the case of Mies), but by folding, continuity and vectorial extension. In 1954, Wright had written of a modern constructional sensibility he called "tenuity" that he contrasted to the post-and-beam logic of classical architecture based on superimposition: "Of course this post-and-beam construction will always be valid, but both support and supported may now by means of inserted and welded steel strands or especially woven filaments of steel and modern concrete casings be plaited and united as one physical body: ceilings and walls made one with floors and reinforcing each other by making them continue into one another. The Continuity is made possible by the tenuity of steel."[4]

However compelling from an architectural point of view, this folded structure proved impractical—not due to faulty structural design, but rather to logistics of implementation and objections from regulating agencies. Among other difficulties, the perfect integration of structure and space envisioned by Wright would have required excessive and overly complex wooden formwork to support the



Frank Lloyd Wright. The Solomon R. Guggenheim Museum. Construction Detail redrawn by Stan Allen.

concrete structure during construction. Additionally, the metal struts that were to connect the canted exterior walls to the folded edge of the beam above would have become bulky when fireproofed.[5] In this regard, it is interesting to note that Wright sanctioned many compromises in order to realize the spiral ramp of the Guggenheim.[6] He allowed conventional reinforcing rods to be substituted for the expanded steel mesh originally proposed; he made concessions to allow for the reuse of form work (which meant that the ramp had to be poured in sections, not all at once as Wright had wanted); he sanctioned the elimination of compound curves (the formwork was too labor intensive and hence expensive); and, most significantly, he introduced into his structural design a series of radial "webs" at thirty-degree intervals, which functioned like piers to provide vertical support in place of the continuous folded structure. But all of these changes, while they may undermine the *literal* continuity of the structure, in no way detract from the sensation of smoothness, continuity, and the integration of space and structure in the finished building. Because Wright, unlike the architects of the international style,

was not ideologically committed to structure as a symbolic construct (as Colin Rowe has argued[7]) he gained a pragmatic, improvisational flexibility that allowed the realization of this unprecedented space. He was more concerned with effective and realistic means to realize the building than with the expression of the intrinsic properties of concrete as a building material. Wright could deploy multiple structural principles with operational freedom precisely because he was committed to structural rationality as *practice*, not as *project.*

Wright's spiral inserts itself into the laminar flow of the urban grid and works to de-stratify the space of the city. This seems to me to be the key to the apparent conflict between the openness of the base—where Wright characteristically dissolves the boundary between interior and exterior—and the hermeticism of the top-lit drum space. First, it should be noted that the visual boundary of the drum whose edges can never be located precisely from within, is spatially indistinct. Second, by placing the city in continuity with the unbounded space of the spiral drum (through the mediation of the open entry lobbies), the ground plane of the city is looped back on itself, warped and extended almost infinitely. Note for example, that the geometry of the spiral could not be dimensioned by conventional means. For the purpose of the working drawings, Wright established a three-dimensional matrix derived from the eight foot rectangular design grid, utilizing polar coordinates for the curved forms. All measurements run simultaneously up and across, and key components are located by reference to the intersection of three dimensional grid lines. The contractor in turn laid out the grid lines on the ground floor, and, as the ramp progressed, built a wooden tower in the middle of the floor that would allow him to project from the centerpoint to coordinates at the various levels.[8]

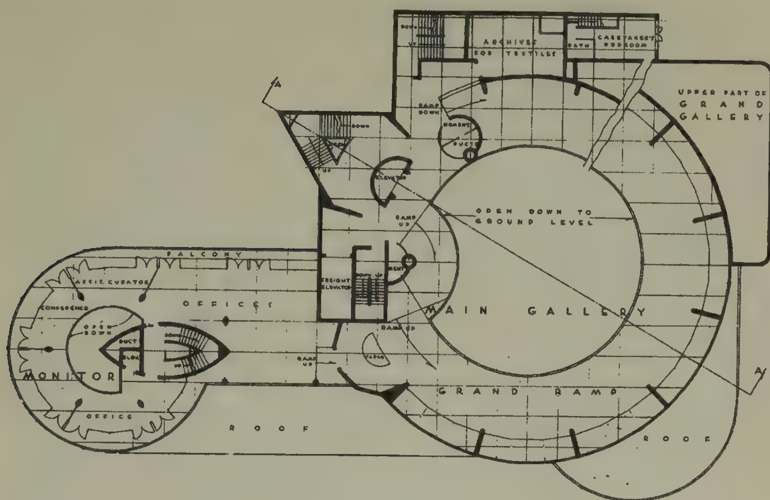
This refiguring of space has implications beyond the purely formal. One of Wright's greatest accomplishments in this building is the creation of a complex topological object that is simultaneously open and closed. This in turn implies a rethinking of the space of the institution. It allows the Guggenheim to be connected to the life of the city, yet apart from it. Wright manages to open up a calm space of contemplation within the city without appealing to conventional institutional forms or elaborate sequential hierarchies. This is accomplished by fully three-dimensional effects, requiring precise technical control, and only partly described in either plan or section alone.[9] In plan, for example, the ramp curls in on itself and increases in width as it ascends. In section, a truncated cone of open space is produced, smaller at its top, and hence exaggerating the apparent height

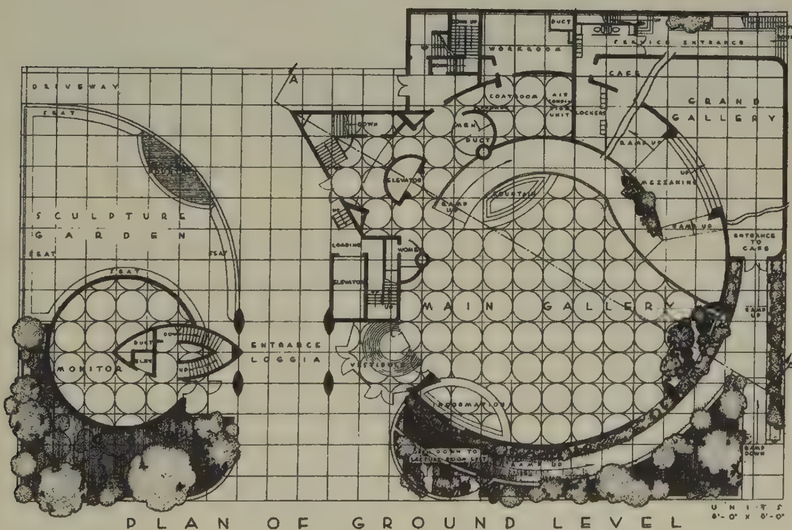
of the interior space from below. From above, each turn of the spiral ramp overhangs the one below, creating a sensation of weightlessness, rather than of stacking. On the exterior, the effect is a gentle outward taper of the spiral enclosure. The inverted pyramid thus formed signals the unconventional nature of the structure. Instead of a massive structure that increases its density as it approaches the ground, it appears as a coiled spring, a dynamic element poised on the site. The use of reinforced concrete allows Wright to open the building radically at its base, an effect further emphasized by the dominant horizontal "bridge" spanning the length of the front facade immediately above the entry level. Although rooted to the site at either end, this blank band hovers ambiguously above the entry level. The enclosing glass at street level is recessed. Both the ground and the structure itself are carved away to admit light to the basement levels. Upon entering, the insistent sense of a "space beyond" draws the visitor into and through the exhibition spaces. By means of these complex internal geometries and careful relations of material to form, Wright maintains contact with the horizontal movement of the city at the same time that he consolidates that movement into the extensive vertical space within. The transition from street to museum, from horizontal to vertical, from open to closed, is at once seamless and extended. A taut calibration of separation and connectivity is achieved.

When Wright's design was submitted to the New York City Department of Buildings, it was precisely this question of the continuity of the ramp, and its connection with the surface of the city that elicited confusion. For the purposes of the building permit, it was necessary to determine how many stories the building contained. Counting the stops on the elevator or the turns of the ramp, building department officials suggested it was the equivalent of six or eight stories. Wright logically (if somewhat mischievously) suggested that it was in fact a one story building.[10] Beyond the deadpan literality of Wright's response, it seems as if his antipathy to the partitioned structure of New York City might be evident here as well. A "story" in this sense represents a strata of the city, separating classes, functions, and limiting social exchange. Wright's preferred formal and social models, on the other hand were the open spaces of the American Midwest, and its freer forms of sociability. Wright's own description of the building emphasizes continuity and flow: "Here for the first time architecture appears plastic, one floor flowing into another . . . instead of the usual superimposition of stratified layers cutting and butting into each other by way of post and beam construction."[11]

Wright's "other" space, constructed out of fuzzy edges and folded planes, could not be realized with conventional constructional techniques. As late as 1954, Wright was still promising his clients that the building he designed could be built for the two million dollars left for that purpose by Solomon R. Guggenheim at the time of his death in 1949. When, later that year, the bids were returned, only one came close—a bid of around three million, tendered by George N. Cohen of Euclid Contracting Corporation. Significantly, Euclid were not building contractors, but concrete experts whose previous experience consisted entirely of highways and bridges. Wright made the best of it, writing that he had, "five bids—four almost or over four million, one about three million. That one, Euclid—a big concrete bridge construction concern [in fact Euclid was relatively small] joining with Chuckrow, an old N.Y. builder with a good reputation (just awarded contracts for a bridge over the Hudson). This concern was the only one really bidding on the building, I believe."[12] Euclid was chosen, and as a result of this pragmatic expedient, Wright's temple to art was built not as a building but as a piece of civil engineering: the smooth curves of the American interstate system wound tight and provisionally roofed over. Working closely with the contractors, Wright modified some details, always fighting for the continuity of the spiral, which Cohen had proposed to build in jointed segments.

It deserves to be noted that despite Wright's continual insistence on *spatial* continuity, the Guggenheim represents a departure in an *oeuvre* characterized by intricate piece by piece assembly. As in the apparently seminal Froebel Gifts (the system of educational blocks given to Wright as a child), the sense of the whole in Wright's work is often produced by the repetition and accumulation of small elements, organized by interlock or overlap. Hence the characteristic woven texture of Wright's building fabric—as exemplified in works such as the concrete block houses, or his early interest in Japanese screens—which always preserves the trace of its assembly. There is always an interplay between the fabrication of a whole and the identity of the individual elements that make up that whole. It is significant in this regard that Wright's original proposal for the concrete structure was to use gunite sprayed onto a basket-like steel mesh. This gunite/mesh assemblage might have maintained some of the intricacy typical of Wright's woven construction; concrete, on the other hand, is a liquid material, tending towards plasticity and stereotomic form. In the end, a somewhat ad hoc mixture of constructional technique was utilized. Conventional reinforced concrete forms the floor of the ramp; the outer walls of the spiral were made by spraying five inches





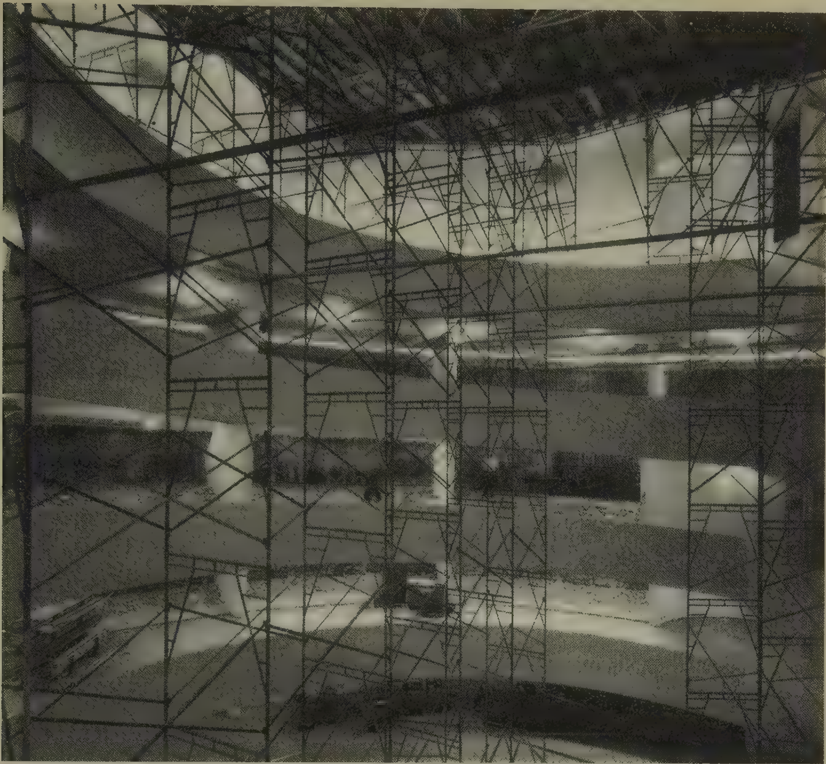
Frank Lloyd Wright. The Solomon R. Guggenheim Museum, Plans, 1958.

of gunite from the inside against bent plywood formwork, and the inner parapet was constructed of conventional plaster and metal lath.[13] However, none of these material differences are expressed; here at the Guggenheim (and practically unique in Wright's work), the construction is *seamless*, the evidence of the assembly of parts covered over by a smooth skim coat of plaster.

Frank Lloyd Wright. The Solomon R. Guggenheim Museum, Construction photo, 1955–59.

Another technical detail confirms this: In the Guggenheim ramp, there are no expansion joints. Rather than an assemblage of rigid members that must be jointed, the building is an elastic whole. In literal continuity with Wright's ideas of "organic" architecture, the building breathes: the structure accommodates thermal change by the coiling and uncoiling of the ramp, and by a subtle in and out deformation of the curved walls. Wright was so convinced of the building's elasticity that he remarked, "When the first atomic bomb lands in New York it will not be destroyed. It may be blown a few miles up into the air, but when it comes down it will bounce."[14]

"Architecture," John Hejduk has asserted, "is a static thing that moves"; in the case of the Guggenheim, this is more *and* less than true. Once again the contrasting attitudes of Wright and the modern movement masters deserve to be noted. Wright's space is neither the materialization of a local fragment of a universal metric grid (Mies van der Rohe), nor the encoding of movement systems by ramps and stairs against the measured cadence of structure (Le Corbusier).



Frank Lloyd Wright. The Solomon R. Guggenheim Museum, Construction photo, 1992.

Wright's architecture is not only a backdrop for movement, it participates in movement itself. This was noted by Peter Blake, writing in *Architectural Forum* shortly after the opening of the Museum: "Wright had felt for some years prior to the Johnson Wax Building that the only way truly to experience space in motion was to let people 'glide' effortlessly through the space so conceived. . . . His theory was this: as people moved along the path of the spiral, the space around them would revolve gently, and unfold in a thousand ever changing views and vistas."[15] This free flowing movement was not limited to pedestrians. Automobile traffic was originally brought directly through the building from 89th street through to Fifth Avenue (which was a two-way street at the time). The effect was to smoothly integrate the internal movement flow with the traffic flow of the city. Wright's forceful desire to find, on this restricted urban site, some measure of the free movement of the American Midwest is evident here as well.

The effect on the interior is one of smooth interaction of multiple traffic flows, knots of viewers forming and reforming, without fragmentation or conflict.

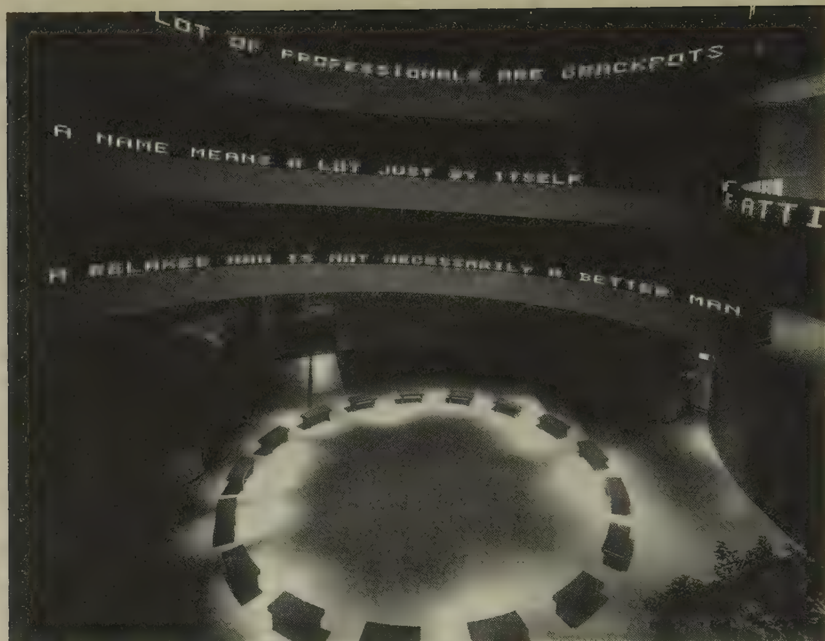
Frank Lloyd Wright. The Solomon R. Guggenheim Museum, Construction photo, 1992.

Looking down or up, the movement of spectators is the most evident occupation of the space. (The works are usually invisible to the vertical gaze, with the significant exception of those installations—by artists as diverse as Carl Andre, Mario Merz or Jenny Holzer—that make the space and its structure thematic in the work of installation itself.) On the other hand, a characteristic experience of the museum is the pleasure of an unexpected (and often unfamiliar) new vista of a work just seen, from across the void, now seen horizontally from slightly above or below, the lack of metric punctuation having dissolved to imperceptibility the interval of walking.[16]

The Guggenheim reopened in June of 1992 with the exhibition in the spiral space of Wright's museum of a single work by American minimalist Dan Flavin. Working with standard florescent tubes Flavin occupies space not so much with objects but with reflected light. In selecting this artist, the curators decided to put the building itself on display (without, perhaps, the incisive interplay between word, light and movement that characterized the 1989-90 Jenny

Frank Lloyd Wright. The Solomon R. Guggenheim Museum, Construction photo, 1955 - 59.

Holzer installation, which also incorporated the ramp into the architecture of its display). This self-conscious display of the *space* of display connects the building—in the context of the 1950s in America—to unfolding histories of pop art and to the architecture of the World's Fairs (1939 and 1964) that bracketed its construction, and in turn suggests readings perhaps unfamiliar to the standard hagiography of Wright. For pop artists of the fifties and sixties, the Guggenheim quickly became an icon of modernity—or better, an American logo for the project of a "late" (in the double sense of "tardy" and of "recently passed away") modernism. Like the structures of the fairs, it appeared as a consumable image, devoted to presentation and display, constructed out of thin modern materials, and incorporating movement of crowds into its strategies of exhibition. The Guggenheim is nothing if not identifiable and singular. Like the Sydney Opera House it has become something of a tourist icon. It figures as a subject in works by artists as diverse as Jiří Kolář or Richard Hamilton. This is not to suggest that the experience of the building is in anyway exhausted or consumed as its image

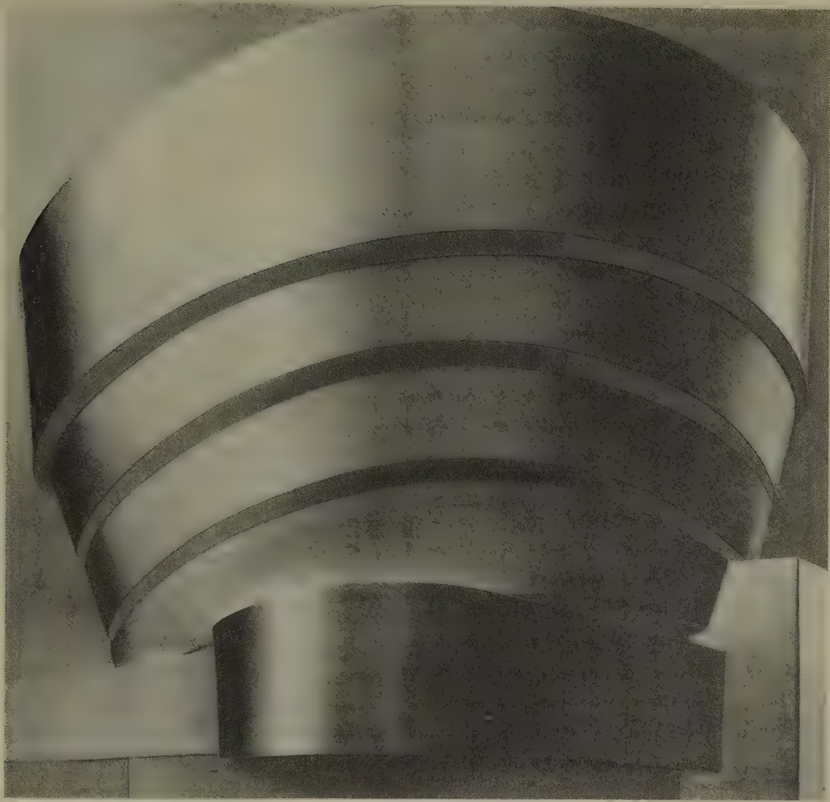


Jenny Holzer. from the series *Truisms*, Installation Photo, The Solomon R. Guggenheim Museum, 1989–90.

circulates in the media, but rather to take note that the building is capable of generating effects and meanings not originally anticipated in its design.

Once again, a technical description seems significant. Wright stated in 1945 that the building "is a modern problem in air conditioning and acoustics. The structure itself is novel in New York. A fibrous fabrication like a steel basket shot with gunite (a high pressure plastic concrete)—a new process saving several hundred thousands of dollars over standard construction. Except the marble facing of the construction."[17]

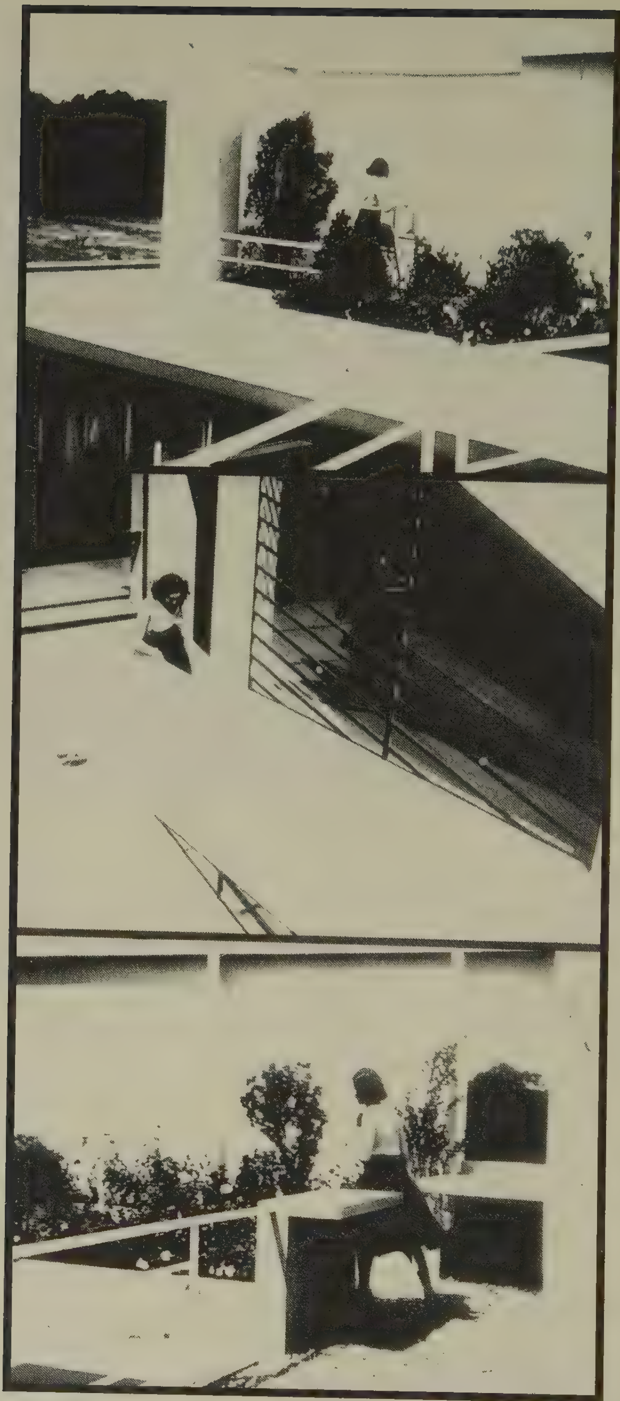
Wright never conceived of the Guggenheim as merely a problem of form. He was ready to investigate new constructional techniques, and yet he was willing to cover over that innovative structure in a marble facing. Yet at one point early in the development of the project, Wright also contemplated a structure of steel plates, to take advantage of wartime shipbuilding technologies underutilized in the postwar economy. Significantly, while both the marble facing and the steel basket fabrication proved to be too expensive, the architectural innovation outlives its "compromised" means of realization (including all of the complex battles fought over the paint colors, both inside and out).[18] In this respect, Wright exhibits a tactical flexibility that could be seen as the exact counterpart to the fluid



Richard Hamilton. ***The Gold Guggenheim*****, 1965 - 66.**

geometries of the Guggenheim. As a corollary to his intimate knowledge of construction, Wright had a keen pragmatic sense of "differences that make a difference." He is quite willing in this case to sanction a mismatch between structure and surface. This also marks the Guggenheim as an anomaly in Wright's career. Perhaps of the singularity of the spatial concept he was willing in this case to be flexible. (His uncertainty is encoded in the grammar of the passage—even here, the marble facing sounds like an afterthought.) In this instance at least, Wright is not the dogmatic adherent of tectonic consistency or the expression of the "nature of materials," but rather an architect of supple tectonic imagination at the service of unfettered spatial invention. A double history of ingenuity and compromise made possible the realization of this unprecedented structure. This double history offers paradoxical confirmation that the later appropriation of the image of the building, its circulation as available currency in an economy of images, was in fact already anticipated by the architecture's uncharacteristically delicate disavowal of its own material presence.

1992



Pierre Chenal. Stills from *L'architecture d'aujourd'hui*, 1931.

6

le corbusier and modernist movement

the carpenter center for visual arts, cambridge, ma

the movement-image

> . . . film and calculus, both pornographies of flight.
>
> —Thomas Pynchon

THE CARPENTER CENTER FOR THE VISUAL Arts at Harvard University: a late realization of the modernist dream of movement in continuity, or a new kind of movement? Thirty years before, Le Corbusier had written: "A stair separates . . . a ramp connects."[1] At the Visual Arts Center, the ramp traces the mobile section drawn by the observer in motion. Its path moves the spectator through the building, opens interior up to exterior, and connects the building to the life of the campus. The visitor is drawn into the structure on the oblique, lifted up assertively from the ground plane, and allowed to view the campus before being drawn inside. "The line does not go from one point to another, but runs between points . . . the line has become the diagonal."[2] In this movement, two conventional expectations are contravened. The first is the building's frontality, the polite face expected (and maintained) in every other building on the Harvard campus. Instead of producing a facade

that separates itself from the surroundings, Le Corbusier brings the negative space of the context into the spatial force-field of his own building.[3] The second is the possibility of entering the building at all. The ramp does not so much penetrate the building, as slip in between its parts, making visible the openness of the structure; one does not enter the Carpenter Center so much as pass through it. It *is* possible to enter at the landing of the third floor, where the ramp touches, but even here, entry is delayed. Inside the door the first sensation is of internal transparencies. One looks from inside through outside to inside again. Big chunks of exterior space seem to be lodged inside the building. This further delays the sense of having entered. This effect is present throughout the Carpenter Center. One of the building's most striking passages is the long interior window that looks down from the first floor lobby into the auditorium, connecting that usually dark space directly to the exterior. Transparency codes all the public spaces of the building. The building is a shell-like space, lightly protected without but radically opened within; not penetrated at its periphery, but unfolded from inside.[4]

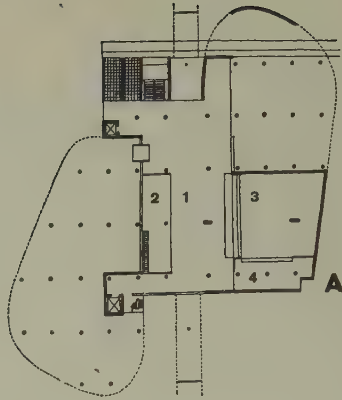
The ramp, which at first appears to be a device limited to the entry sequence, in fact conditions the entire spatial organization. Robert Slutzky has noted that, typical of Le Corbusier's late work, the ramp allows the observer to enter the building as the eye enters a painting, at the center of its spatial field, as opposed to the hierarchical stacking of a classical facade.[5] John Hejduk extends this, noting the importance of the diagonal in the Carpenter Center: "The ramp is a three dimensional torque. . . . Like a bicycle pedal, when pressure is brought down upon the terminal ends, the whole building starts to revolve and spin."[6] Yet this is not a simple dialectic of movement and stasis. What is astonishing about the Carpenter Center is the almost total absence of fixed points of reference. To say that an object is destabilized implies a distortion from a prior stable state; that prior condition is difficult to identify in this case. If the ramp, for example, is the most obvious measure of movement, it is equally important to note that the entire ground plane swells downward as the ramp moves up in space. As one moves toward the center of the site, the ground drops away, front and back. Just as there is no facade as a stable vertical datum against which horizontal movement is registered, there is no fixed ground plane as horizontal datum. This is evident even in the detail of the ramp itself, which slopes asymmetrically in cross section to accommodate a drainage channel.

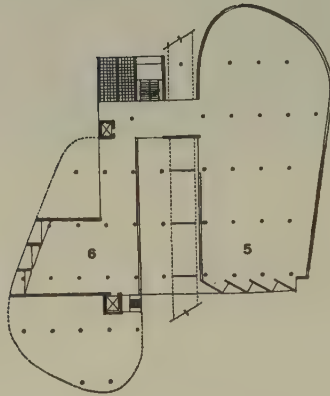
Hejduk's analysis delves deeply into the order of the building, showing how even the column grid participates in the mobile dynamic. His exacting formal

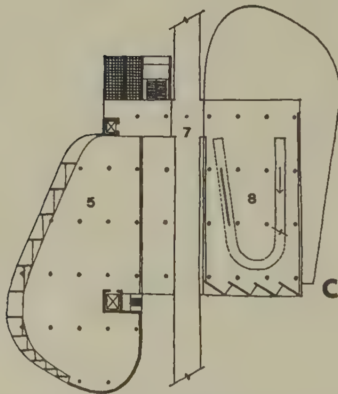
Le Corbusier. The Carpenter Center for the Visual Arts. Exterior View. photo by Steven Rosenthal.

reading calls out the presence of the "ghosts" of cubism and neo-plasticism: Juan Gris, Piet Mondrian, "all the known protagonists and ancestral impregnators." But he also begins, significantly, with a cinematic reference: "The eye is like a camera; the moment the same image is clicked twice and interposed on the same frame an interesting affect can be obtained although in the process the initial form becomes blurred and might be irrevocably lost."[7] There is an uncanny parallel here with filmmaker Sergei Eisenstein's definition of montage: "When the tension within a movie frame reaches a climax and cannot increase any further, then the frame explodes, fragmenting itself into two pieces of montage."[8] Montage, in other words, is not so much a synthetic mounting of one image on top of another as it is an analytic that releases a multiplicity of dimensions and simultaneous meanings from a given figure. Hence, a fluidity of form: "At the basis of the composition of the architectural ensemble . . . lies that same unique 'dance' which is the basis of the creation of works of music, painting and film montage."[9]

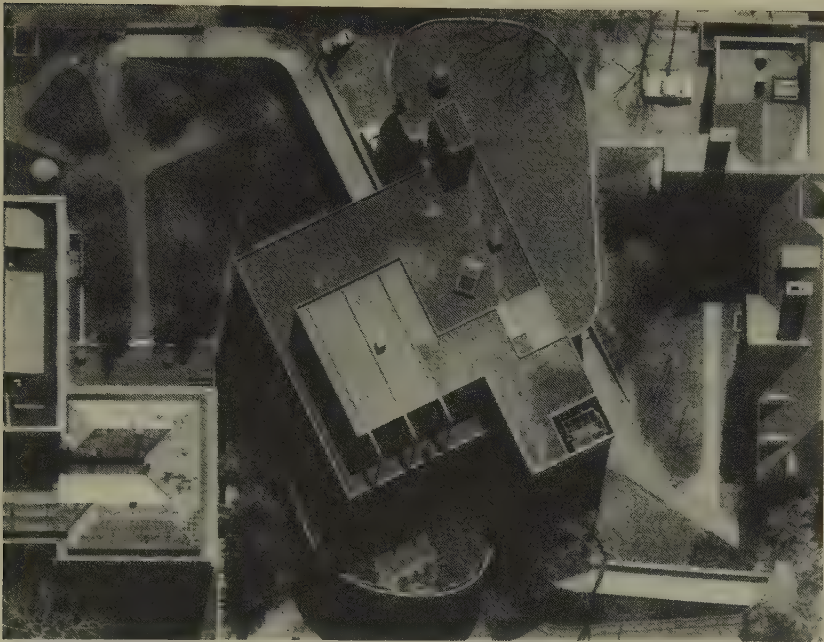
Eisenstein has elsewhere developed an even more exact parallel between the sequential movement of the observer in architectural space and cinematic montage. When speaking about cinema, he says, "the word *path* is not used by chance."[10] The mobile camera, and the virtual movements suggested by montage,







Le Corbusier. The Carpenter Center for the Visual Arts, Plans.

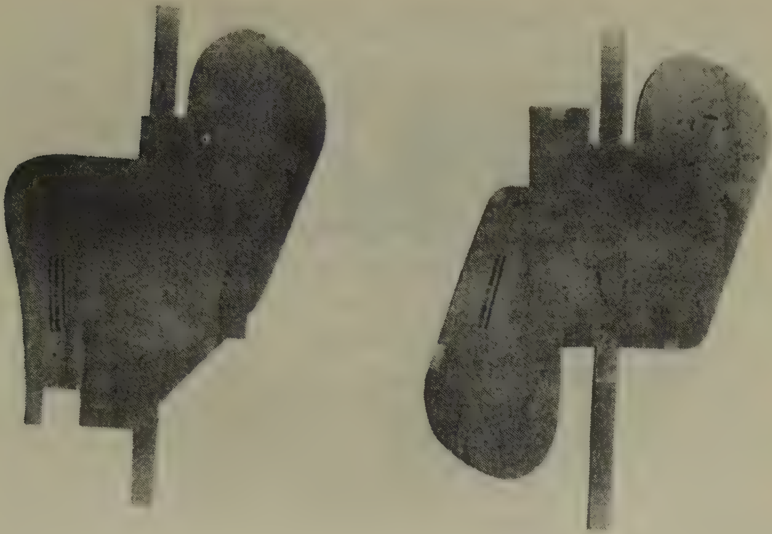


Le Corbusier. The Carpenter Center for the Visual Arts, Aerial View.

condense and extend the movements of the architectural observer. It is not surprising that Eisenstein's model—August Choisy's analysis of the spatial sequences of the acropolis of Athens—is a point of reference shared also by Le Corbusier. Eisenstein writes: "Painting has remained incapable of fixing the total representation of a phenomenon in its full visual multi-dimensionality. Only the film camera has solved the problem of doing this on a flat surface, but its undoubted ancestor in this capability is—architecture . . ."[11] Le Corbusier, for his part, had written in 1934 that "Arab architecture has much to teach us. It is appreciated *while on the move*, with one's feet; it is while walking, moving from one place to another, that one sees how the arrangements of the architecture develop."[12] Choisy scripts the movement of the observer through the spaces of the acropolis, charting the parallax effects of the spectator in motion, and the unfolding of the space in time. Here it might also be noted that simultaneity in architecture, as in film, consists not only in the superposition of views, but in the recall and comparison of the parts experienced along the way. The subject assembles a whole out of discontinuous fragments of experience. Eisenstein thus rereads Choisy's description of the acropolis as a shot-by-shot montage sequence composed by the passage of the viewer through the monumental assemblage. Unlike Dziga Vertov's "creative geography," which consists in assembling new wholes out

of disparate parts, the idea of montage developed by Eisenstein has to do with setting in motion a hidden complexity within a given architectural sequence. While Vertov emphasizes the mobile camera, Eisenstein constructs movement through montage. This is a capacity specific to cinema, but an effect available in architecture: "Cinematic montage is, too, a means to 'link' in one point—the screen—various elements (fragments) of a phenomenon filmed in diverse dimensions, from diverse points of view and sides."[13]

Le Corbusier returns to the idea of movement again in his later work, but not as a simple repetition of known themes. In this work, movement goes beyond the parallax views of the *promenade architecturale*, or cubist simultaneity. Movement is at once more local, atomized; and larger, rolling off the curves and ruled surfaces. Instead of Juan Gris, a more significant point of reference would perhaps be Etienne-Jules Marey, whose experiments with chronophotography anticipated aspects of cinematics. Marey worked with fixed and regular sections, not in an effort to freeze time but to make visible (and measurable) the invisible interval of motion, to recuperate movement through division and transduction.[14] Gilles Deleuze in has similarly described the functioning of the "movement-image" in cinema. Beginning with Henri Bergson's theses on duration, he notes that movement cannot be reconstituted by the simple addition of "immobile sections" (cuts) according to an abstract idea of succession (of time as mechanical and homogeneous). To do so is to miss the movement in two ways: "On the one hand you can bring two instants or positions together to infinity; but movement will always occur in the interval between the two, in other words behind your back. On the other hand, however much you divide and subdivide time, movement will always occur in a concrete duration [*durée*]; thus each movement will have its own qualitative duration."[15] Paradoxically, this is in fact the mechanism of film: still images projected at regular intervals. But Deleuze insists that cinema always produces something other than what is given as structure: "Cinema proceeds with photogrammes—that is, with immobile sections—twenty-four images per second (or eighteen at the outset). But it has often been noted that what it gives us is not the photogramme . . . cinema does not give us an image to which movement is added, it immediately gives us a movement-image."[16] The movement is always in between, not literally present, but visible and affective. The movement-image implies a mobile section, a cut, not through time but along time, with measure and duration of its own. The language of Deleuze's analysis is also a language of architectural projection: the



Le Corbusier. The Carpenter Center for the Visual Arts, Cardboard cutouts of first and second projects, 1961.

architect begins with immobile sections, but produces a movement-image as an intermediate given. The mobile section of the observer in motion brings time and duration into play in architecture as much as in cinema.

Is there a way to understand the Carpenter Center as a cinematic architecture? Not "an image to which movement has been added or appended," but a movement-image itself? At the Carpenter Center, invisible currents of movement appear to become visible at the moment that they come in contact with the curving envelope of the building. It produces a movement-image not concretely present (i.e. as literal movement) but evident as affect, as the taut surface energy of a body in motion. This is not an interpretive fiction of movement, but an experiential reality.[17] In the most precise architectural terms, we could say that the movement-image is generated by the intersection of the fixed interval of the *brise-soleil* with the curving building envelope. The frames generate movement out of incremental difference one to the next, functioning not so much as regulating structure, but like cinematic frames: the movement is in between. The curved bodies of the building keep the eye continually in motion, even when the spectator is still. Time is spaced out by the curvatures of the movement-image.

Deleuze qualifies his analysis with a second concept, which concerns the nature of movement as it unfolds in time. The premodern world conceived movement as a regulated transition from one ideal form to another, an order of

"privileged instants." With the modern scientific revolution (and the calculus of René Descartes and Gottfried Wilhelm Leibniz) the "mechanical succession of instants" replaced the "dialectical order of poses."[18] This mechanical succession of instants produces what Deleuze calls the "any-instant-whatever." "The any-instant-whatever," he explains, "is the instant equidistant from another. We can therefore define cinema as the system which reproduces movements by relating it to the any-instant-whatever."[19] An architectural reference is suggested here as well in Deleuze's substitution of "sections" for "poses." Movement, Deleuze notes, is still recomposed, but "*it was no longer recomposed from formal transcendental elements (poses), but from immanent material elements (sections).*"[20] The any-instant-whatever does not imply a flattening or homogenizing of experience; rather, it maintains the possibility of producing the extraordinary out of the ordinary. In architecture, as in cinema, "The any-instant-whatever can be regular *or* singular, ordinary *or* remarkable."[21] The indifference of the material itself is registered in the infinitesimal interval of differential calculus.

Film is here linked unambiguously with mathematics. Differential and integral calculus both work with sections brought infinitely close together, recalling Pynchon's "pornographies of flight": "Δ-t approaching zero, eternally approaching, the slices of time growing thinner and thinner, a succession of rooms each with walls more silver, transparent, as the pure light of the zero comes nearer. . . ."[22] But in film there is no need to *literally* bring the sections together; the collapse to infinity is already implied in the process of division into self-same parts. The subject constructs the bridge in perception. There is precedent for this higher mathematics in architecture as well. Paul Frankl writes that, "In the third phase [c. 1700–1760] the whole space, or its subdivisions, or at least some of them, are *infinitesimal.* I mean by this that they are forms of higher geometry, the calculation of which was possible only by infinitesimal calculus." Significantly, for Frankl, this is not simply an aspect of the viewer's experience: "Even if such calculation is not the observer's task, we can define the essential feature of ecclesiastical architecture in this third phase by saying that it could have been achieved only with the help of higher mathematics."[23] In the late works of Le Corbusier, the infinitesimal interval also makes its appearance. The calibration of the curves, laid out, by necessity, as a series of "immobile sections" becomes, in the realized building, the movement-image: a series of mobile sections tied to the passage of the observer through space and governed by the fluid tectonics of flat slab construction or ruled surfaces.

It might be argued that these effects are evident, but immaterial. In an essay that sets the tone for much of his late work, Le Corbusier speaks of these "ineffable" qualities: "*Action of the work (architecture, statue, or painting) on its surroundings*: vibrations, cries or shouts . . . arrows darting away like rays, as if springing from an explosion." He refers to the "magnification of space" undertaken in the early part of the century, and a line of flight: "The fourth dimension is the moment of limitless escape evoked by an exceptionally just consonance of the plastic means employed . . . a boundless depth opens up, effaces the walls, drives away the contingent presences, *accomplishes the miracle of ineffable space*."[24] These "flights" need to be taken seriously. Before even beginning to draw the image of the building in Cambridge, Massachusetts, Le Corbusier had imagined a richly choreographed scenario of movement and sound:

> OBJECT: Visual Arts Center
> It will be necessary to prepare a route across the
> building for the students between times of
> courses.
> A tourist route perhaps in a spiral if we make
> the building go up.
> Electric ringing sounds will be composed and
> emitted once, twice, three times a day, at fixed
> times, emission of a formidable nature of
> softness and power.
> These emissions will be according to a sonorous,
> stereophonic route,
> —in a spiral, going up, coming down
> —in a vertical going up, coming down
> placing the sound in the ground and sky[25]

In this description, the Carpenter Center begins to sound like a version of the Phillips Pavilion. But even without the literal realization of the sound emissions, it is possible to see a continuity with the building as realized. Note that Le Corbusier had spoken of the chapel at Ronchamp as an "*architecture acoustique*."[26] The capacity of the built work to initiate a whole series of sensations beyond what is given as structure—movement, sound, light and boundless space, has to be seen as one of Le Corbusier's most significant accomplishments in these late works.

the key to the solution for reinforced concrete

...be light like a bird, and not like a feather.

—Paul Valery

R. Buckminster Fuller's well-known statement, "if you want to determine the degree of development of a building, just weigh it" defines one trajectory for a light architecture.[27] This is of course valid if one imagines that a nomadic population needs a mobile architecture, but is it the only way to achieve lightness in architecture? Are the properties of materials always fixed, for example? Movement as mobile sections, according to Bergson and Deleuze, coincides with the qualitative change of matter. Lightness could be one effect produced when the inert matter undergoes a change of state. The lightness of Le Corbusier's late works is a lightness having to do with direction, mobility and precision. It is a lightness that works not against the hardness of technical laws, nor gives in uncritically to the technological imperatives for lightweight construction, but instead works tactically to achieve effects of lightness by the close calibration of available technical means.

Kenneth Frampton has observed that in Le Corbusier's early work an unresolved contradiction exists between the machine-like precision of the forms and finishes and a crude and approximate means of realization (in the villa at Garches, for example, a rough concrete frame and block infill rendered in stucco to appear seamless).[28] Now this contradiction is apparently resolved is the postwar work where *béton brut* is employed. A weighty, plastic material is rendered as weighty and plastic. But in some of his last works, something distinct and more complex happens: there is a return to the light planarity of the early purist work, now rendered in cast concrete; the heavy is made light. Concrete construction is made to behave with the taut precision of aircraft engineering. As with parallel works by Pier Luigi Nervi or Eduardo Torroja, an astonishing effect of lightness is achieved with a material not intrinsically lightweight. And at the same time, and parallel to this, movement is integrated into structure itself. This is achieved in large part through the use of figures formed by ruled surfaces (the roof of the chapel at Ronchamp, for example, or the hall of the Palace of Assembly in Chandigarh). Movement here is not simply a metaphor, but present as a material instance of incorporated movement. A ruled surface is a moving

line, line *becoming* plane, or volume. In the case of the Palace of the Assembly, for example, a diagonal line rotated through space creates a hyperbolic paraboloid. The pragmatics of construction here coincide with formal expression (the formwork for ruled surfaces in concrete may be built with straight members) but the experiential effect is one of lightness and movement.

There is some evidence that Le Corbusier himself was not completely satisfied with the conventional definition of *béton brut.* In a letter written to Josep Lluis Sert during the course of the construction of the Carpenter Center, Le Corbusier noted that "*Béton brut* was born at the Unite d'Habitation at Marseilles where there were 80 contractors and such a massacre of concrete that one simply could not dream of making useful transitions by means of grouting. I decided: let us leave all that brute. I called it '*béton brut.*' The English immediately jumped on the piece and treated me (Ronchamp, the monastery of La Tourette) as 'Brutal'—*béton brutal*—all things considered, the brute is Corbu . They called that 'the new brutality.' My friends and admirers take me for the brute of the brutal concrete." At the Carpenter Center on the other hand, the concrete was specified as "*lisse*"—"*béton brut* but smooth," in a "spirit of perfection."[29] By this he intended the use of steel formwork to attain a precision finish, and curved forms to be made of plywood or wooden strips of small dimensions, as had been employed by Nervi at the UNESCO building in Paris: "Those forms for the concrete are extremely elegant and very clean."[30] Concrete is a fluid material; it can function in a primitive state, as a sculptural and tactile material, as at Marseilles. In this case its realism is primary; it functions as a crude and immediate index of the process of construction. But concrete can also perform as a mobile, plastic material, capable of abstract transformation and formal exactitude. At the Carpenter Center, Le Corbusier proposed a "new stereotomy for reinforced concrete," signaling the fundamentally abstract idea of the material as it is used here. He was simply not interested in a realistic idea of the "nature" of the material. "*Béton brut,*" he said, was not "*béton d'une brut*" but simply "the concrete coming directly from the formwork."[31]

Le Corbusier paid close attention to the pragmatics of concrete construction, sending Sert detailed sketches of different kinds of joints and specifying the finishes on the plywood forms to achieve the smoothest finish. He objected to the use of Sonotubes because of the roughness of the finish and the spiral joint left on the surface.[32] Le Corbusier instead spoke of the "softness" of the columns

desired, and enclosed a "confession" regarding the seductiveness of the smooth finish obtained from steel forms: "Columns of reinforced concrete called 'women's thighs' poured in half forms of *metal* (with crossed joints) the concrete is so smooth, so seductive 'that one puts one's hand there.'" The above designation, he adds, is "not official."[33]

All this may seem counter-intuitive, inasmuch as Le Corbusier's late works are often characterized as heavy and sculptural—a kind of late-modern primitivism. But the primitivism attributed to Le Corbusier's late works is at least in part the effect of the predominance of a single material. The Government buildings constructed in Chandigarh or Ahmedabed in the late 1950s and early 1960s, for example, are nearly monolithic constructions of reinforced concrete. This is largely the outcome of a simplified construction and minimal enclosure consistent with the climactic reality and available construction technology. But Le Corbusier exaggerates this. Glass and steel, the details of window mullions or mechanical equipment (unlike the rough concrete frame) are markers of technological modernity. In these buildings, Le Corbusier has strategically recessed all of the visible evidence of such technical accommodation. In this way, a timeless effect is achieved,and the building appears almost like an inhabited ruin where only the most durable materials are left standing. If the buildings of the early period are by preference photographed with contemporary automobiles, those of the late period are photographed with local inhabitants in traditional dress.

In the case of the Carpenter Center, this aesthetic preference came into conflict with the demands of the program. Buildings in America are, as they were in 1961, complex assemblages of different machinic systems. Hermetically sealed by an envelope of thermal glass, insulation and rubber gaskets, the interior air is filtered, cooled or heated, regulated by sensors and circulated through a complex network of ducts and registers. Elevators, electrical, alarm, and security systems exhibit a similar technical complexity. Additional constructions—raised floors, dropped ceilings, or mechanical chases—are in turn required to conceal and accommodate these "invisible" systems. However ironic it may seem for the inventor of the idea of the house as a "a machine for living," Le Corbusier in his late work is highly antipathetic to this assemblage of machines. At the Carpenter Center it would have been impossible to duplicate the primitivism of the work executed at Chandigargh. It was mandatory to offer more extensive protection, and the compromises made to accommodate this are

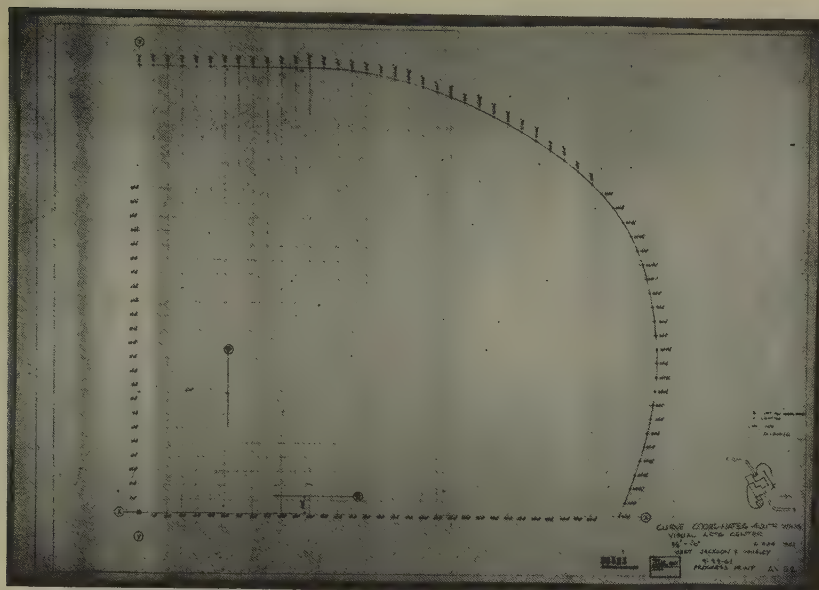
Le Corbusier. The Carpenter Center for the Visual Arts, Cambridge, Massachusetts, 1960–63. Exterior View. photo by Steven Rosenthal.

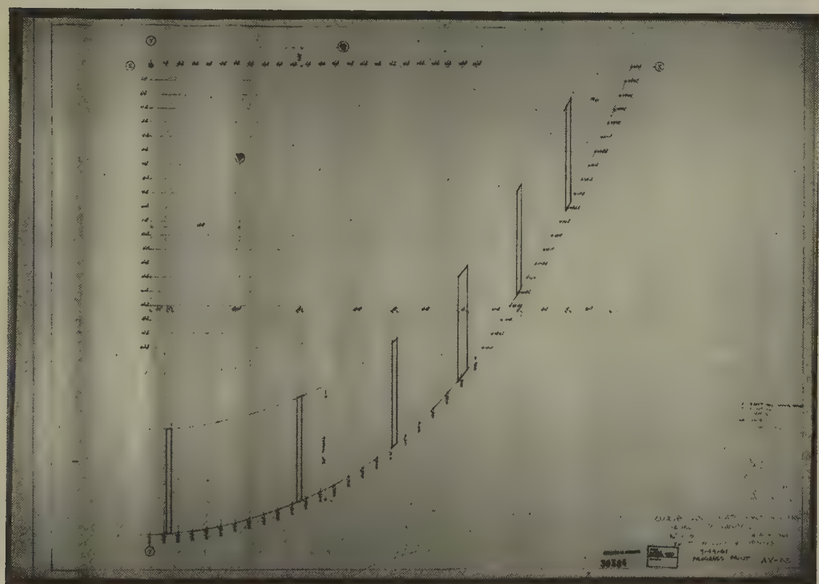
revealing. Le Corbusier only reluctantly accepted the provision of air conditioning (which he blamed for the prevalence of sinus trouble in America). He insisted instead on installing his own invention: a passive system of vertical apertures running from floor to ceiling and fitted with pivoting doors and mosquito netting. These *aérateurs* are set into the facades at irregular intervals. The mechanism is direct and apparent: "The *aérateurs* are there to supply fresh air by physical means of exchange through gravity and orientation."[34] He demands that the construction be simple and durable. Upon receiving the first detail drawings from Sert's office showing an aluminum pivot door with rubber gasket, Le Corbusier replies: "The building is not to be like an automobile. All these rubber luxuries will be eaten away by dust, fly shit etc. . . ."[35] He accommodated the need for ventilation by making the building itself device-like, but without submitting to the demand that the building become a collection of machines. Its dominant character is construction, rather than assemblage.

In other aspects, Le Corbusier and his collaborators exhibited an ingenuity and flexibility that managed to accommodate the realities of modern mechanical systems with the directness of constructional expression desired. Typical of these is the "airfloor," a layer of lightweight concrete poured over the

structural slab into which channels were cast to accommodate the air circulation and floor grilles. Not only did this allow the spaces to be free of the mechanical clutter of ducts, more significantly, it allowed the structural engineer to invert the required shear caps at the column heads, thus maintaining the smoothness of the slabs both above and below. Elsewhere, in the workshop or sculpture studios, duct work is exposed, consistent with the warehouse aesthetic of the building as a whole. In places where interior finishes are applied (the plywood panels in the stairs or the curved walls of the studio) the delicacy is all the more apparent for functioning in contrast to the roughness of the concrete texture. The same is true of the other details, such as stairs, scuppers, built-in benches or even the curtains. In each case, industrial materials are used in a direct manner, usually attached directly to the concrete without elaborately designed intermediary. Overall, transitions are smoothly modulated; locally, transitions are direct and unmediated.

This is especially evident in the treatment of the glazing. Large glass panes are let directly into the cast concrete so that the eye moves without transition from the slow, textured density of the concrete to the quick reflectivities of the glass. Intermediate mullions are rarely employed. Knowing that in the climate of New England the glass skin could not be made to disappear, Le Corbusier actively incorporates it into the formal definition of the building mass. He accommodates the necessity for protection from the climate without reinforcing a metaphysics of shelter. At strategic moments, for example, the glass is brought directly out to the building's edge. Here the glass becomes the space defining material, constructing the spatial envelope as a delicate, volumetric membrane. Where glass is co-planar with concrete, the weighty, sculptural quality of the concrete is momentarily denied. It may be reasserted again immediately above or below, but this only serves to reinforce the tension created by this material slippage. Note for example, his insistence that the verticals of the *ondulatoires,* which visually connect the two slabs, be cast in concrete, rather than in wood, as Sert and others suggested. By establishing material continuity between the two horizontal slabs, he allows the exterior to read as a heterogeneous but continuous membrane, rather than as paired concrete slabs infilled with distinct materials. The skin is defined in places by concrete, and in places by glass; sometimes glass seems to support, and concrete is used to enclose and protect, as if these materials had exchanged properties.





Le Corbusier. The Carpenter Center for the Visual Arts, Curve Layouts, 1961.

More than a defined response to an immediate problem, Le Corbusier understood the propositions of the Carpenter Center to be definitive: "It is the *key to the solution of reinforced concrete* . . . the building is made of slabs, their

Le Corbusier. The Carpenter Center for the Visual Arts. Night View. Photo by Steven Rosenthal.

ceilings smooth, without capitals and without beams."[36] Why should this particular detail be the "key"? It is not the first example in Le Corbusier's work of a flat slab without beams or capitals. The 1914 Dom-ino frame—another highly specific invention with generalizable implications—shares with the Carpenter Center the absence of beams and capitals. In both cases the monolithic character is the result of complex artifice. In the case of Dom-ino, concrete is poured over hollow tiles supported on temporary steel beams.[37] The reinforcing follows the rectilinear geometry of the tiles, allowing cantilevers only in one direction. At the Carpenter Center, a more complex result is achieved by the use of the airfloor, multidirectional steel reinforcing and the inverted shear caps. Both solutions exploit the plastic capacities of concrete more fully than the treatment (c.f. the work of Auguste Perret or François Hennebique) of concrete as an assembly of beams and columns. In flat slab construction there is no visible trace of the movement and transfer of tectonic forces. The logic of support and transition is more complex, and largely invisible. It is in this sense that the Carpenter Center moves radically beyond Dom-ino. The round columns signal a more fluid tectonic at work. Space flows

around the columns, much as load flows through the slabs to the columns. This contrasts with Dom-ino, where the square columns and directional bays recall the post and lintel tectonics of wood or steel construction. At the Carpenter Center, after the columns were placed, the slabs were poured all at once, giving them a continuous plastic and monolithic character. The curved slab recalls the once liquid state of the concrete, woven together internally by the reinforcing, and monadically continuous in its grain.

Le Corbusier takes full advantage of the flexibility of flat slab construction, which allows multidirectional cantilevers and does not require the columns to be placed in a regular grid. He modulates the internal spacing of the columns according to an elastic interval, stretching the grid in the center where the ramp falls, resulting in a complex interplay of enclosure and punctuation. The distinction between movement and stasis is blurred at the Carpenter Center. The grid of columns is not a stable counterpoint to movement, but itself participates in the movement dynamic.[38]

One final episode might serve to sum up the theme of "smooth" construction. As was the usual practice in Le Corbusier's late work, the curves of the studio and gallery blocks were not generated according to mathematical formulas (that is to say by calculable radii or other means) but instead laid out in scale according to coordinates. It is perhaps important to note that the building throughout is anything but systematic. This presented great difficulties in the realization at full scale. In *Le Corbusier at Work*, the construction of the curves is described as follows: "A grid was laid out on the floor of a large warehouse at full scale, and the curve was then 'plotted.' At full scale it was found to have some kinks and waves, so Tucker [the concrete contractor] laid out a long length of rubber hose between the points, which he and Kruegar [his foreman] than adjusted an inch or two to give an even though irregular curve. Next templates were cut to fit the curves. Formwork was then made by Nova Scotia shipbuilders specially taken on for the job."[39] The ingenuity of the solution lies in the bridging of the necessary segmentation (i.e., the coordinate system, which is the residue of the graphic apparatus of the architect's studio) with a material supple enough to make a smooth passage from one point to the next (one "any-instant-whatever" to the next). These in turn undergo additional material transformations: first templates, then wooden form-work and finally concrete construction. The translation from drawing to building is complex and indirect.

the late work of le corbusier

> Then we have computer science. It is true that software cannot exercise its powers of lightness except through the weight of hardware. . . . The second industrial revolution, unlike the first, does not present us with such crushing images as rolling mills and molten steel, but with "bits" in a flow of information traveling along circuits in the form of electronic impulses. The iron machines still exist, but they obey the orders of weightless bits.
>
> —Italo Calvino

There is often a moment in the late career of an artist when the youthful pressure of constant innovation wanes, and those who have not digressed into a facile parody often return to consolidate and complete the unfinished projects of an earlier career. In the case of Le Corbusier, lateness has been variously interpreted. Fred Koetter, for example, calls the Carpenter Center a "contextual grotesque" and smugly suggests that it is nothing more than a museum piece, the "last of a magnificent and dying breed." For Koetter, its lateness corresponds to a project that has outlived its usefulness.[40] John Hejduk, on the other hand, sees in this return a belated rediscovery of the primary motivations of the early work, and a refiguring of the teleologies of history and interpretation: "Le Corbusier . . . returns to some of his earliest triumphs with a more poignant commitment to expanding space. If the Harvard Visual Arts Center had arrived prior to *Villa Garches*, all the armchair historians could rest unmoved, for "was this not the natural order of events?" The fact that it postdates *Garches* by some 30 years can only prove the quirks of time. Whereas *Garches* heralded the promise of things to come, the Center postpones them."[41]

Hejduk, perhaps marking out his own dilemma, describes the double bind of the late modernist. The better world promised by Garches has in fact failed to materialize. That project can be abandoned, but to do so is to refuse one's own modernity. So instead of retreating into the crude historicism of Koetter, Hejduk, like the late Le Corbusier, seeks to delay or postpone the closure of the modernist project. It is a more difficult but more hopeful project. And it does not seem accidental that much of the most interesting and important work of the intervening thirty years—including Hejduk's own—has in some ways continued to work out of the paradox of belatedness defined by the late work of Le Corbusier. Le Corbusier, too, rejected his early machine age enthusiasms, but

without losing the light, optimistic spirit of the modern. In the late work, he recuperates and extends the formal sophistication of the early works without the polemics of a machine style.

But perhaps there is an additional significance to the thirty-year lag. In a postindustrial culture, when architects are again looking for alternatives to an exhausted oppositional culture of negation, themes of continuity, smoothness, and lightness find an increased resonance. The political necessity of engaging (and cultivating) new programmatic complexities has also provoked a rethinking of this work. Projects by Rem Koolhaas and younger architects return to themes of the later Le Corbusier not previously explored. In his late works—the Carpenter Center in Cambridge, the complex of buildings in Ahmedabed and the monuments of Chandigarh, in unbuilt projects like the Congress Hall in Strasbourg, and the Rho-Milan project for the Olivetti company—Le Corbusier loops back on himself, refiguring form, structure, and program into ever more complex paradoxes. These late works present a kind of clarity that is not the result of reduction, but of a kind of *condensation.* Contradiction is internalized, reworked, and dissolved in unexpected and powerful syntheses. These buildings do not set out to achieve closure as much as they keep fundamental questions open. Rather than looking backward, making incremental adjustments to known solutions, these buildings look forward: they propose new projects, and they hold out the possibility of as yet unrealized solutions.

1993

James Stirling. Preston Housing. 1957.

7

ex novo architecture and photography

MODERN ARCHITECTURE'S CONSTRUCTION of its own newness was a highly complex operation. It was played out in buildings, projects, manifestos, and above all through images. The role of photography—a nineteenth-century mass media technique reworked in light of the complex currents of the early-twentieth-century avant-gardes—has a key position in this construction.The ambition of this collection of images is modest. On the one hand, I see it as a minor contribution to the genealogy of the idea of the modern as construction *ex novo*. On the other hand, it expresses a frankly nostalgic admiration for the startling freshness of discovery and invention that was perhaps only possible under the spell of the now discredited myth of a new beginning. The modern itself is now part of history, and hence accessible only through this veil of images. My interest here is not so much to unpack this complex

construction, but rather to lay it out for inspection without overdetermining the interpretation.

These photographs underscore the newness of the modern by photographing it with its ideal subjects: children, unencumbered by the weight of history, convention, or tradition. The modern's appeal to innocence was codified in the whiteness of the stucco walls free of ornament, the importance of sunlight, air, sports, and hygiene, the appeal to a universal geometry, and in the rhetoric of the machine. Photography's objectivity—its status as "innocent eye"—gives it a special position within this construction. It would be difficult to deny, from our end-of-the-century perspective, that this is a naive and perhaps self-serving construction. Nevertheless, I think it is interesting to look more closely, and perhaps more generously at this constructed "innocence." By photographing and presenting modern buildings occupied by children, the architects of early modernism put forward a vision of an architecture without history—the return to a happy childhood. Photography collaborates in the production of this vision, but on close reading, also serves to undermine it. As we have learned to be skeptical about the claims of the early modernists to free themselves of history, so too have we learned to be skeptical of the promise of a return to a happy childhood. Photography is about memory, not forgetting; it preserves a past more than it anticipates a future. The newness preserved in these photographs already belongs to an unreachable past.

I have chosen to present a selection of images and a montage of textual sources, with minimal interpretive apparatus. My intention is not so much to expose some sinister intention in the construction of a false genealogy, as to recall the uncanny power, and lyrical beauty that resulted from an authentic

effort of invention. From our perspective today, this is an exercise in remembering: a reminder that the modern was once something new and only partially understood. Perhaps what it means to be "modern" will never be fully understood, nor will its ability to surprise us ever be fully exhausted.

This photo essay was inspired, belatedly and distantly, by a beautiful article written by José Llinas.[1] Llinas, an architect from Barcelona, wrote about a portrait photograph of a young girl pinned up in the Farnsworth House of Mies van der Rohe (page 135). He turned his essay into a meditation on Mies's architecture, and the way in which the inhabitants of this house are converted into ghostly images of themselves. I began to think more about the status of the photograph, and more specifically, the place of the figure in these images. In particular, I was struck by what seemed to me a strange tendency for the documenters of modern architecture to photograph buildings, when not empty, inhabited by children. I began to look for and collect photographs of modern architecture and the people photographed in it. Some rather informal statistical research confirmed my intuition that children were disproportionately represented in the photographs of early modernism. I have extended the essay with a few contemporary photographs that seem to have the same lyrical sense of anticipation shading into loss.

history

Every village has a history which might be preserved by means of the camera.

—Benjamin Stone, Founder of the National Photographic Record Association

The word "history" vacillates between two poles: the story that is recounted (*Historie*) and what is produced (*Geschichte*). This truism still has the value of designating, between these two meanings, the area of labor and change. For historians always begin with the first meaning and aim toward the second, in order to open within the text of their culture a rift of something that happened elsewhere and otherwise. In this fashion they *generate* history.

—Michel de Certeau

Both still and motion picture photography preserved the past with all the clutter of detail that painting and the theater leave out.

—Stephen Kern

Guseppe Terragni. Asilo Sant 'Elia, Como,1935–37.

new beginning

We ourselves carry the deadly germ that goes around in the unspoilt countries, ruining the hearts that used to be simple and believing, and the arts that used to be normal, healthy and natural. . . . One conviction: we must begin again from scratch.

—Le Corbusier

The architect called upon himself simultaneously to assume the virtues of the scientist, the peasant and the child. The objectivity of the first, the naturalness of the second and the naivete of the third . . ."

—Colin Rowe

Rafael de la Hoz Arderius + José M. G. de Paredes. Ultra Economy Houses, Palma del Rio, 1952.

innocence

Children are deemed lucky to a ship; their innocence being, by the sailors, supposed a protection.

—Francis Grose

We know nothing of woman's culture, just as we know nothing of the culture of the young.

—Walter Benjamin

A more searching investigation onto the psychic life of the child teaches us, of course, that sexual motives, in infantile forms, play a very considerable part, which has long been overlooked in the physic activity of the child. This permits us to doubt, to some extent the happiness of the child, as imagined later by adults.

—Sigmund Freud

Guseppe Terragni. Asilo Sant 'Elia, Como,1935–37.

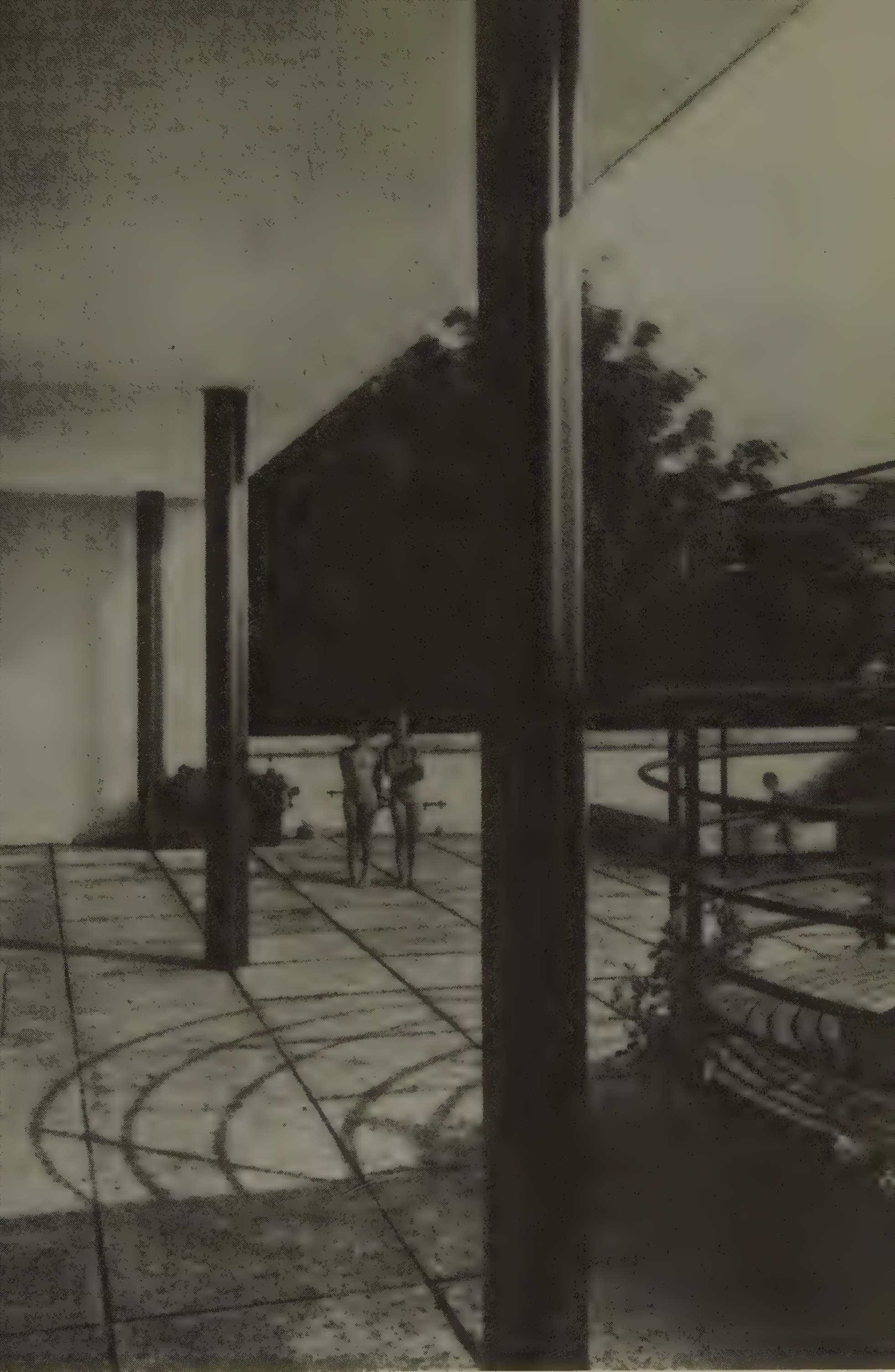
punctum

What I feel about these photographs, derives from an average affect, almost from a certain training . . . it is by *studium* that I am interested in so many photographs, whether I receive them as political testimony or enjoy them as good historical scenes. . . .

The second element will break (or punctuate) the *studium* . It is this element which rises from the scene, shoots out of it like an arrow, and pierces me. A Latin word exists to designate this wound, this prick, this mark made by a pointed instrument. . . . This second element which will disturb the *studium* I shall therefore call *punctum*; [...] A photograph's *punctum* is that accident which pricks me (but also bruises me, is poignant to me).

Very often, the *punctum* is a "detail" i.e. a partial object. Whether or not it is triggered, it is an addition: it is what I add to a photograph and what is none the less already there.

—Roland Barthes



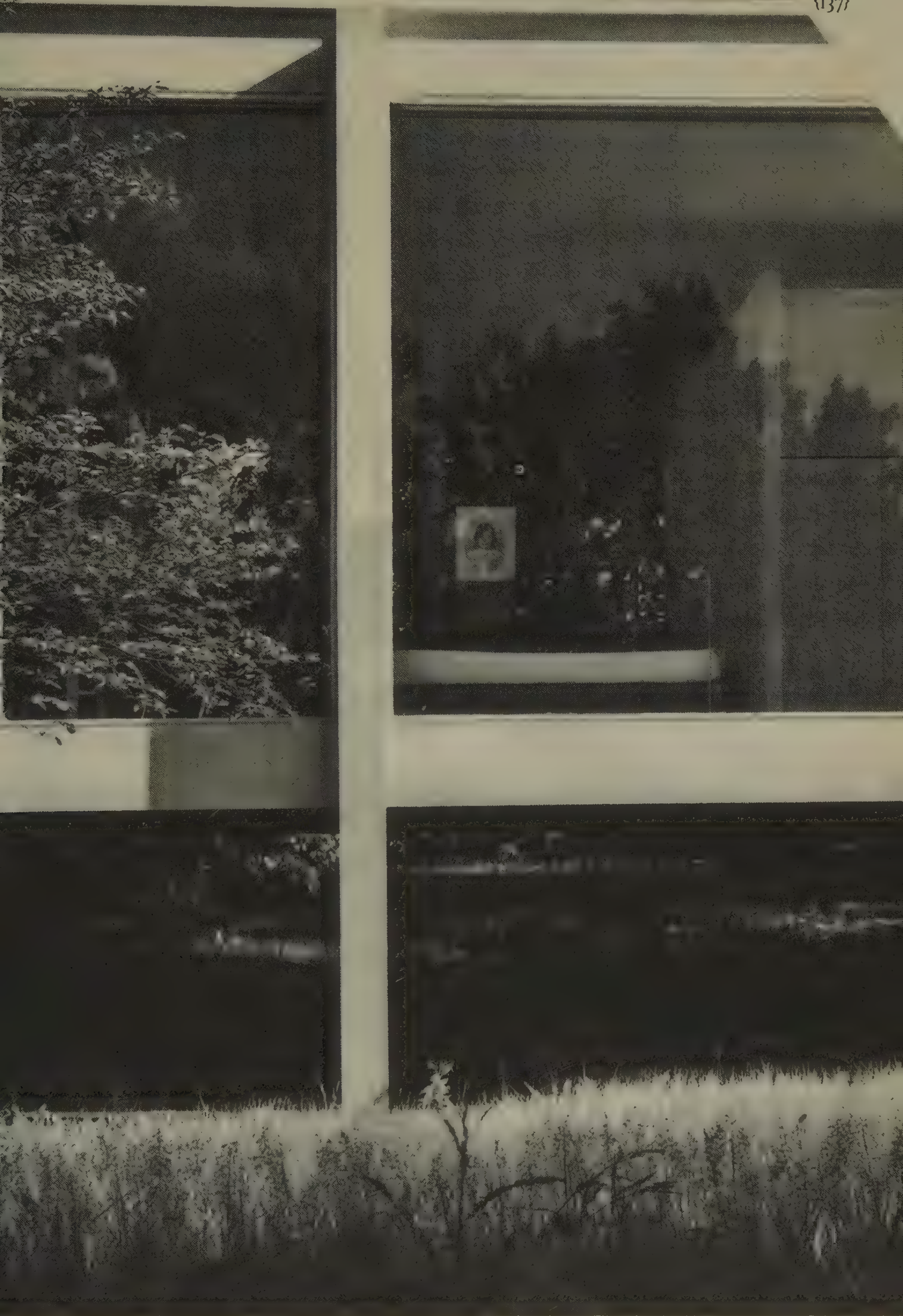
Mies van der Rohe. Tugendhat House, Brno, 1928–30.

spectres

In the case of Mies, it is well known that the client of the Farnsworth house refused to occupy it, considering it unlivable, and even went so far as to denounce it as a fraud. Even now it would be irrelevant to enumerate the possible reasons which might impede its use as a dwelling; nevertheless, I cannot help but note that to enter Mies' house, you must lift yourself lightly, without stepping on the floor, like the Tibetan Lamas when they levitate.

Only a photograph has any sense in this space: because the technique of photography will not consider (it is frozen, or it disappears) precisely that which, in the aspect of a person, most locates them in the strict condition of a real subject condemned to death, that is, time.

—José Llinas



Mies van der Rohe. Farnsworth House, Plano, Illinois, 1945–50.

index

A photograph is not only an image, an interpretation of the real, it is also a trace, something directly stenciled off the real, like a footprint or a death mask.

—Susan Sontag

A pipe here, is always and intractably a pipe.

—Roland Barthes

Francisco Cabrero y Torres-Quevedo. Villa, Puerta de Hierro, Madrid, 1953.

evidence

It has quite justly been said of Eugéne Atget that he photographed [deserted Paris streets] like scenes of crime. The scene of a crime too is deserted; it is photographed for the purpose of establishing evidence. With Atget, photographs become standard evidence for historical occurrences, and acquire a hidden political significance.

—Walter Benjamin

The photograph seems to declare: "This really happened. The camera was there. See for yourself." However, if this *binding* quality of the photograph is partly enforced at the level of "internal relations" by the degree of definition, it is also produced and reproduced by certain privileged ideological apparatuses, such as scientific establishments, government departments, the police and law courts. This power to bestow authority and privilege on the photographic representations is not given to other apparatuses, even within the same social formation—such as amateur photography or "Art photography"—and it is only partially held by photo-journalism. Ask yourself, under what conditions would a photograph of the "Loch Ness Monster" or an "Unidentified Flying Object" become acceptable as proof of their existence?

—John Tagg

Bruno Taut. Taut House, Dahlewitz, 1926.

memory

Besides, how could you remember everybody? Eyes, walk, voice. Well, the voice yes: gramophone. Have a gramophone in every grave or keep it in the house. After dinner on a Sunday. Put on poor old greatgrandfather Kraahraark! Hellohellohello amawfullyglad kraark awfullygladaseeragain hellohello amarawf kopthsth. Remind you of the voice like the photograph reminds you of the face.

—James Joyce

I remember that month of January in Tokyo, or rather I remember the images I filmed of the month of January in Tokyo. They have substituted themselves for my memory, they are my memory. I wonder how people remember things who don't film, don't photograph, don't tape. How has mankind managed to remember ... I know, it wrote the Bible. The new Bible will be an eternal magnetic tape of a Time that will have to reread itself constantly, just to know it existed. As we await the year 4001 and its total recall, that's what the oracles we take out of their long hexagonal boxes at New Year may offer us: a little more power over that memory that runs from camp to camp, like Joan of Arc, that a shortwave announcement from Hong Kong Radio picked up on a Cape Verde island projects to Tokyo, and that the memory of a precise color in the street bounces back on another country, another distance, another music, endlessly.

—Chris Marker

I am not saying that memory is kind of film. That is a banal simile. From the comparison film/memory we learn nothing about the latter. What we learn is how strange and unprecedented was the procedure of photography.

—John Berger

Elliot Erwitt: "Roy Lichtenstein's 'Modern Painting With Classical Head' in Irving Blum's Living Room."

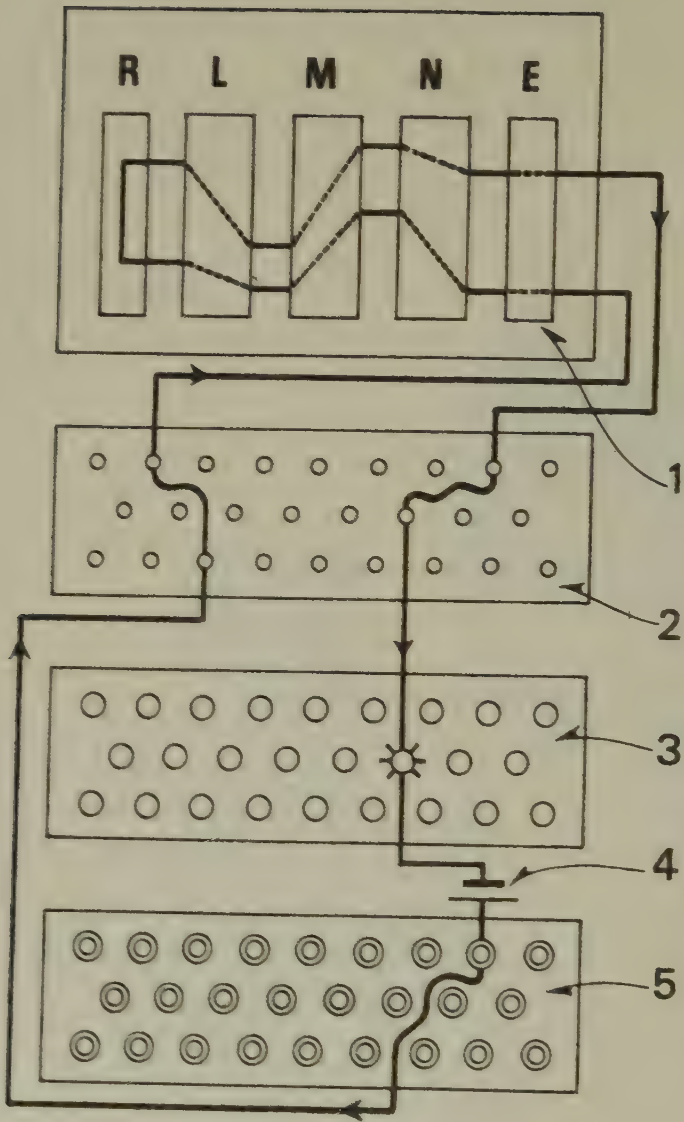
trap

Q: You've talked to me just now of a trap for vision, something like that, is that your camera?

A: No, not at all. Its before, something I did when I was little. When I half closed my eyes, there remained only a narrow slot through which I regarded intensely what I wanted to see. Then I turned around three times and thought, by so doing, I'd caught—trapped—what I was looking at, so as to be able to keep indefinitely not only what I'd seen, but also the colors, the noises. Of course, in the long run I realized that my invention wasn't working. Its only then that I realized that my invention wasn't working. It's only then that I turned to technical tools for facilitating it.

—Jacques-Henri Lartigue

Elliot Schwartz: “I feel the goodness going out of me.”



Internal Connections of the Enigma Machine. (German coding device, WW II).

8

terminal velocities

the computer in the design studio

Oh but its not the fall
That hurts him at all—
It's that sudden stop.

—Bobby Russell, "Sudden Stop," as sung by Percy Sledge

It seems that during the hot summer months in New York City cats begin to fall, or jump, out of high windows. Researchers studying the phenomenon have uncovered a curious pattern: a cat falling one or two stories has a good chance of landing safely, while a cat falling from three to six stories is unlikely to survive. But something unexpected happens with a fall of more than six stories. Apparently, with extra airborne time, cats can twist into proper position and go completely limp, allowing them to develop enough resiliency to survive. Beyond fifteen floors the chances of survival drop again: too much time in the air, and the cats reach terminal velocity.

Speed is fundamental to the rhetoric of the computer. Bigger is better, but faster is best.[1] In advanced imaging and animation programs, for example, it is processing speed and not disk space that is the limiting factor. A key issue like bandwidth takes on urgency in relation to electronic transmission times.

High-end personal computers already run at speeds inconceivable a few years ago. IBM's chess-playing computer "Big Blue," for example, can analyze two hundred million chess moves every second.[2] Mainframe supercomputers and parallel processing promise even greater speed. In part this is bound up with questions of marketing and efficiency. The immense capital expenditure for software development, and the large-scale implementation of computer assisted design (or CAD) systems in design and production would have been impossible without measurable gains in speed and productivity. The same Taylorist impulse at work in early modernism—the elimination of obsolete and inefficient work methods—is still visible today.[3]

But in the rhetorical fictions of the computer, speed brings something else: a future not only more fully integrated with technology, but a promise to recover precisely that which had been destroyed by modernity in the first place. Claims are made for the recuperation of community, self, political space, precision craft, and local identity.[4] The rhetoric of accessibility in turn depends upon the capacity of the computer to simulate reality. And it is speed that guarantees the seamlessness (and thereby the realism) of these new simulations. But between the promise of a digital future and the realities of the present there are complex questions to be answered. In *Pure War*, Paul Virilio has signaled his skepticism about the *depletion* of time as technologies of speed are everywhere put into place: "There again it's the same illusory ideology that when the world is reduced to nothing and we have everything at hand, we'll be infinitely happy. I believe it's just the opposite—and this has already been proven—that we'll be infinitely unhappy because we will have lost the very place of freedom, which is expanse." Control and concentration are the inevitable counterparts of these new technocratic regimes: "The field of freedom shrinks with speed. And freedom needs a field. When there is no more field, our lives will be like a *terminal*, a machine with doors that open and close."[5]

Virilio distinguishes between *metabolic* speed—the speed of the living being, reaction time—and *technological* speed, the artificial speed of machines. Significantly, what differentiates recent technologies from the modernist machines (the aircraft, the telegraph or the automobile) is a blurring of the boundary between technological speed and metabolic speed. Computer speed is microspeed, invisible in its working, visible only as affect. With the computer, technological speed approaches metabolic speed. Genetic algorithms can simulate hundreds of thousands of years of evolution in a few minutes; artificial life

programs bring responsiveness and adaptivity to the technological environment. But the question is not only quantitative. For Virilio, what distinguishes metabolic speed is its *inconsistency*: "What is living, present, conscious, here, is only so because there's an infinity of little deaths, little accidents, little breaks, little cuts." It is through these interruptions that the field is reconstituted—not as seamless continuity, but, through a shift in scale, a finer-grained texture that allows local connection; an order that accepts discontinuity and difference without encoding it as catastrophic disjunction. Hence, as Sylvere Lotringer (Virilio's interlocutor in *Pure War*) notes: "All is not negative in the technology of speed. Speed, and that accident, that interruption which is the fall, have something to teach us on the nature of our bodies or the functioning of our consciousness."[6]

What is at stake for architecture in all of this? The computer in the design studio provokes both extravagant claims and high levels of anxiety. As with the cats falling through the hot summer air, is there a window of opportunity between an initial state of dismay or confusion, and the endgame of "terminal velocity"? Technology, Michel Foucault reminds us, is social before it is technical. Beyond questions of virtuality and information culture, these new technologies have had very concrete effects on the spaces of the city. Telecommuting and the home office modify the structures of domesticity. The wiring of the workplace has created back-office ghettos, vast warehouses of computer operators (usually female) segregated from the centers of corporate power. Contradicting the rhetorical claim for decentralization and the leveling of hierarchy created by the accessibility of information, Saskia Sassen has pointed to a consolidation of information and power necessary in order to circulate information on a distributed network.[7] These are issues that urgently need to be addressed. But if architecture is not to give up its own very specific instrumentality—which lies primarily in the world of *things* and not *information*—it is necessary to look more closely at the paradigms and protocols at work in the use of the computer in the design studio. Precisely in order to work more effectively on the social and urban issues mentioned above, architecture needs to be able to take full advantage of the new instrumentalities of computer technology. Specifically this would imply understanding the computer not in utopian terms (turning away from matter and reality), but in more pragmatic terms: articulating a more complex interplay of the real and the virtual.

A skepticism toward both the technocratic drive for efficient production and the vague promise of a utopian future is therefore legitimate. But simply to

refuse or resist is not sufficient. A positive program is required as well, one capable of reworking architecture's habits of thought and refiguring its patterns of working. This might begin with a speculative and open ended investigation of the possibilities and potentialities of these new technologies within the *specific* demands of the discipline of architecture. It is important not to lose sight of the instrumentality of the computer; it is not *just another* tool, but it is a *tool* nonetheless—a tool with very specific capabilities, constraints, and possibilities. What are its capacities for new types of geometrical description, spatial modeling, simulation of program and use, the generation of formal and organizational systems, or rapid prototyping? A careful reassessment of the implications of these new tools in their theoretical and conceptual context could follow from this. By questioning the rhetoric of the new, it is possible to rethink both the new technology and architecture's own persistent paradigms of order, geometry, and organization. The Luddite option, for all of its rhetorical attractiveness, is in the end not very interesting. We cannot get "outside of" technology; by necessity, any critique needs to be developed from within. What is required is to become familiar enough with the technology so as to be able to go beyond the emotional rhetoric, both *for* and *against*. The interruption and the accident need to be cultivated; software systems must be used against the grain; established protocols need to be tweaked.[8]

first hypothesis: digital abstractions

One of the curious aspects of digital technology is the valorization of a new realism. From Hollywood special effects to architectural rendering, the success of the new technology is measured by its ability to seamlessly render "reality." Even the so-called virtual reality has been used not so much to create alternative realities but to replicate those already existing. In architecture this is evident in "visualization" techniques. The premise here is that if computer technology can create more and more realistic simulations (photographically realistic renderings, simulated "walk throughs" or "fly throughs" of proposed buildings) design mistakes will be avoided. What is left unaccounted for here is the fact that the reality simulated is entirely mediated through the visual conventions of already existing media, primarily cinema and photography. A rendering of a building is deemed successful if it looks sufficiently like a *photograph* of a building.

This move toward the conventions of realism is also evident in another aspect of the day-to-day use of the computer in the design studio. CAD programs have facilitated two important shifts in design practice that have yet to be examined critically. First is the renewed use of perspectives, which once had to be laboriously hand drawn, but can now be effortlessly generated. Second is the use of color. Color in the computer is either extravagantly false or attempts to simulate photographic representations through sophisticated rendering programs incorporating reflection, transparency, or texture mapping. In both cases, the ease of achieving seductive effects has as yet overwhelmed any impulse to question the relationship between the means of representation and its architectural instrumentality.

The unquestioned acceptance of the computer as a visualization tool is clearly market driven. It answers the client's need to predict what the building will look like before spending the money to build it. But the ideology of visualization is both naive and somewhat duplicitous. Its trajectory is not from image to reality, but from image to image. Visualization has limited instrumental utility. It does not work to transform reality, only to reproduce it. In as much as they are concerned exclusively with what things look like, visualization techniques can only innovate at the level of form. Time, event and program cannot be addressed through techniques of visualization. And from the standpoint of perception, visualization techniques assume that a very narrow range of perceptual mechanisms come into play in the experience of architecture: a tunnel-like camera vision, ignoring the fluidity of the eye and the intricacies of peripheral vision—not to mention the rest of the body's senses.[9]

More significantly, these techniques of visualization ignore what has traditionally given architectural representation its particular power of conceptualization—that is to say, its necessary degree of abstraction, the distance interposed between the thing and its representation. Design does not operate on the basis of resemblance, but on the basis of abstract codes and a complex instrumentality. Architecture presumes a transformation of reality, but an architect attempting to work directly with that reality will be paralyzed. The detachment of architecture's representational codes allows the designer to work with relative freedom. But abstraction is more than an expedient. By working with the abstract materials of number, proportion and interval, the architect can structure internal relationships and move smoothly between the visible and the invisible. Paradoxically, a more complex appearance is produced than if appearance were the starting point. In musical notation, by

David Allen. ***The Origin of Painting,*** **1773.**

analogy, a composer who has at hand all of the possible sounds of an orchestra (as is possible with modern sampling equipment) still needs the abstraction of a score to organize and structure the work. Visualization presumes that abstraction is a liability to be overcome, and attempts to bring the designer closer and closer to "reality." But the shift is only incremental inasmuch as the reality it approximates is itself only another visual convention. For marginal gain, a powerful operative and conceptual tool must be left behind.

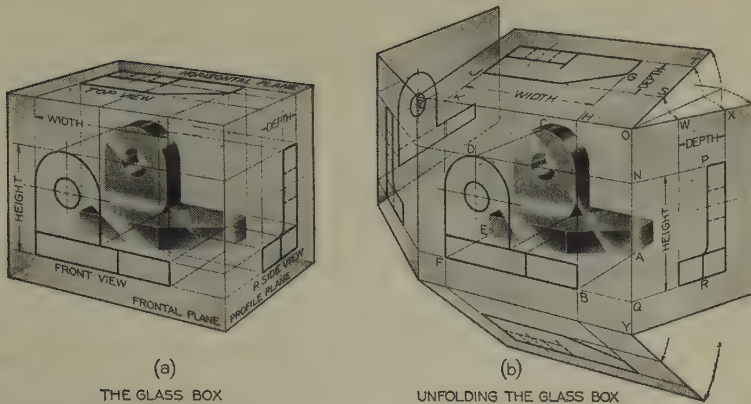


Diagram from *Technical Drawing*, Giesecke and Mithcell, 1958.

The legend of Diboutades is often evoked as an account of the origins of drawing. The daughter of a Corinthian shepherd traces the shadow of the head of her departing lover as a momento. The drawing is a substitute, a partial record of the absent, desired thing. This story of origins is consistent with classical theories of mimesis, but problematic from the point of view of architecture. In architecture, the object does not precede its representation in drawing. The building is both imagined and constructed from *accumulated partial representations.* As codified in systems of mechanical drawing, the object is imagined to exist inside a transparent box, which is the materialization of the Cartesian coordinate system. On the surfaces of the box are registered the traces of the lines of orthographic projection—the intersection of the system of parallel projectors with the transparent sides of the box. Traditionally, the architect works on the two-dimensional surfaces of this box, not on the object itself. The architectural project is a virtual construction, a whole created from abstract parts interpreted and combined according to conventions of projection and representation.

Now the computer simultaneously collapses and increases the distance between the architect's two-dimensional representations and the building's three-dimensional reality. The vector of representation is reversed; the glass box is turned inside out. In computer modeling, the architect works directly on a three-dimensional representation of the object itself. In the virtual space

of the computer, it is possible to go quickly back and forth (or even to work simultaneously) on the two-dimensional projection and the three-dimensional object. (Of course another system of projection/representation intervenes—the two-dimensional display of the screen itself—but the ease with which it is possible to move the object and to move around in that space can provisionally suspend its presence as intermediary.) That object is a series of projections as well as a collection of commands. Instead of a finite number of representations constructing an object (either in the mind or in the world) there is already an object (itself made up of a nearly infinite number of discrete elements) capable of generating an infinite number of representations of itself.

As a consequence of this, the effect of working on the computer is cumulative. Nothing is lost. Elements and details are continuously added, stored and filed, all in perfect transparency. Parts are not necessarily integral to the whole. Any element can be accessed at any time, independent of what has happened around it. Instead of proceeding always from the general to the specific, the designer moves from detail to whole and back again, potentially inverting traditional design hierarchies.

The status of the drawing, and in turn the process of design itself undergoes a transformation. A new kind of abstraction emerges: abstraction not as final result of operations of idealization or reduction, but of the indifferent order of bits. Interestingly enough, a sense of casualness, paradoxical lack of precision, is one result of this. Computer abstractions are radically provisional, open to infinite revision. If the power of the computer lies in its ability to handle large amounts of information, multiple variables, and abstract codes, it is worthwhile to be attentive to an emerging sensibility for diagrams and loose organizational paradigms: a contingent, "conditional" abstraction. This in turn implies a shift away from the false certainties of visualization toward the generative capacities of the computer as an abstract machine. The computer is a relational device, and this capacity could be used to reinforce the conceptual power of architecture's abstract codes instead of in a futile attempt to overcome them.[10]

I do not mean to present this as a mandate, suggesting somehow that the ontological essence of the computer is abstract and therefore requires an abstract form of expression. Abstraction is no longer a categorical imperative, but one choice among many. But when working with the computer, it is a logical choice in as much as it is something that the computer does well.

second hypothesis: digital materiality

It is perhaps obvious but worth pointing out that when we refer to the computer, we are usually referring not to a single device but to an assemblage of devices. A computer standing by itself is useless. In most cases, in addition to the calculating machine, there are input devices (keyboard, mouse, digitizing pad, etc.), display devices (monitor) and output devices (plotter, printer, etc.). There is a strong tendency, in architecture as well as in other disciplines, to see the computer as part of a more general shift from the physical to the virtual: the banal utopia of the paperless office, the virtual realm of the World Wide Web and the Internet, or the vague promise of interactive "environments." In this view, the computer works primarily in and among a traffic of images and information, networking one display device to another, interacting through the mediation of input devices. Now there is no doubt that the computer is an incredibly powerful tool for the manipulation and linking together of images; and there is a certain symmetry in seeing the operative capacities of the computer always cycled back through the world of images.

But mixtures are always more interesting than pure quantities, and perhaps it is more worthwhile to think about extending the instrumental capacities of the computer to the world of things. What I mean to suggest by introducing an apparent oxymoron such as "digital materiality" is that in architecture, the computer gets much more interesting at the moment it is hooked up to any device that allows it to produce something other than another image. This includes such obvious examples as output devices—the everyday exchange between the screen and the plotter or printer, where the specific power of the computer as a drawing machine becomes evident. But it also includes rapid prototyping (the generation of three-dimensional models directly from computer files) as well as the use of computer milling and fabrication in the construction process itself. A consideration of these operations allows the discussion of the computer in architecture enter into complex questions of implementation and realization, and opens up potentially important possibilities for the revision of practice.

The question here is not one of holding the image at arm's length, but rather finding a way to incorporate those innovations at the level of image into architecture in a nontrivial way. If the use of the computer is confined exclusively to operations of design, another system of representation will always intervene

between the image and the reality. If, for example, complex forms generated on the computer are translated into the standardized measuring systems of contract documents, interpreted by a builder and realized by conventional means, the impact of the computer remains exclusively formal. If, however, the specific capacities for computer fabrication are integrated into the process of design itself, new possibilities are opened up. The properties of the material become part of the design process. A complex surface can be proposed, and material constraints—the maximum size of the individual panels, for example, or their capacity to bend or twist—can be entered as working variables. The same system that lays out the grid of the surface in the design process can in turn drive the machine that cuts those panels. Design, calculation (of quantities and stresses), and fabrication are linked together—not necessarily in a seamless continuum, as anyone who has operated a computer milling machine knows, but in a complex interaction of mathematical, material, and procedural variables. Real-world properties have to be taken into consideration—the grain of the wood, the resistance of the surface, or the sharpness of a bit. The sequence of operations is critical. If in turn the logistical complexities of the building site are calculated in, it is clear that we are not talking about a proposition of ideal smoothness, but a complex and interesting mixture.

Computer fabrication can also provoke a rethinking of modernism's conventional formulations of repetition and standardization. Modernism proposed an isomorphism between the part and the whole. The members of a curtain wall, for example, are the products of industrialized mass production and therefore individually regular and collectively similar. Normally, they are assembled according to standardized operations, maintaining regular intervals, in order to produce a whole that repeats the formal characteristics of its parts. The regularity and standardized proportions of the parts are reiterated at the level of the whole. The introduction of difference into such a system will always be as an *exception*, and difficult to justify except from a formal or expressive point of view. But computer fabrication is indifferent to the forms of repetition enforced by conventional production. For a computer milling machine to calculate and cut every member of a curtain wall system to a different length, for example, is no more time-consuming than to cut every member the same. The potential here is that variation can be introduced into the system not as an exception from the outside, fragmenting or breaking down the unity of the whole, but as incremental variation of the parts themselves. By introducing local difference

that accumulates to create variation without destroying the overall coherence, a more complex and fluid notion of the whole can in turn be produced.

third hypothesis: digital fields

Analog technologies of reproduction work through imprints, traces, or transfers. The image may shift in scale or value (as in a negative), but its iconic form is maintained throughout: internal hierarchies are preserved. A significant shift occurs when an image is converted to digital information: a notational schema intervenes. "Digital electronic technology atomizes and *abstractly schematizes* the analogic quality of the photographic and cinematic into discrete *pixels* and *bits* of information that are transmitted *serially*, each bit discontinuous, discontiguous, and absolute—each bit 'being in itself' even as it is part of a system."[11] A field of immaterial ciphers is substituted for the material traces of the object. Hierarchies are distributed; value is evened out. These ciphers differ one from the other only as placeholders in a code. They have no materiality, no intrinsic value. In 1921, Viktor Shklovsky had already anticipated the radical leveling effect of the notational sign: "Playful, tragic, universal or particular works of art, the oppositions of one world to another or of a cat to a stone, are all equal among themselves."[12]

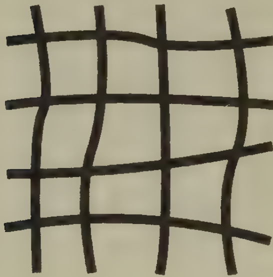
This evening-out of value has implications for the traditional concept of figure/field. In the digital image "background" information must be as densely coded as the foreground information. Blank space is not empty space; there is empty space throughout the field. If classical composition sought to maintain clear relations of *figure on field*, which modern composition perturbed by the introduction of a complicated play of *figure against figure*, with digital technologies we now have to come to terms with the implications of a *field/field* relation. A shift of scale is involved, and a necessary revision of basic compositional parameters is implied.[13]

A moiré, for example, is a figural effect produced by the superposition of two regular fields. Unexpected graphic effects, exhibiting complex and apparently irregular behaviors, result from the combination of elements that are in and of themselves repetitive and regular. But moiré effects are not random. They shift abruptly in scale, and repeat according to complex but predictable mathematical rules. Moiré effects are often used to measure hidden stresses in

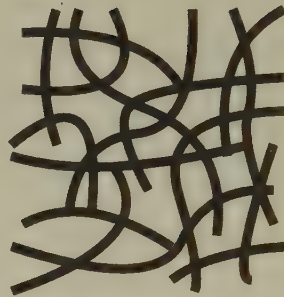
I.2 AXIAL SYMMETRY

II.1 PERIPHERAL COMPOSITION

Classical and Modernist Compositions.



0.3 LOOSE GRID



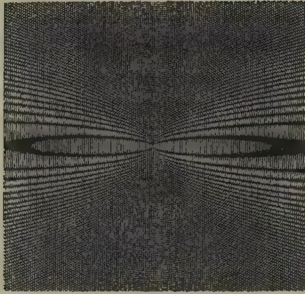
0.7 FELT

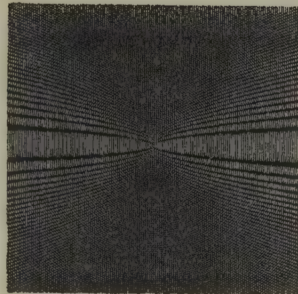
Field Compositions.

continuous fields, or to map complex figural forms. In these cases, figure and field can never be separated out as distinct entities. An uncanny coexistence of regular field and emergent figure is produced.

If we compare these field formations to the organizing principles of classical architecture, it is possible to identify contrasting principles of combination: one *algebraic*, working with numerical units combined one after another, and the other *geometric*, working with figures (lines, planes, solids) organized in space to form larger wholes.[14] In algebraic combination, independent elements are combined additively to form an indeterminate whole. The local syntax is fixed, but there is no overarching geometric scaffolding. Parts are not fragments of wholes, but simply parts. (As Jasper Johns has remarked: "Why take the part for the whole; why not take the part for the part?") Unlike the idea of closed

Field Compositions.





Moiré fringes formed by the superimposition of a circular grating and two linear gratings with periods (a) larger than and (b) equal to the period of the circular grating.

unity enforced in western classical architecture, algebraic combinations can be added onto without substantial morphological transformation.

In the architectural or urban context, the idea of a "digital field" raises questions of surface and depth. The field *is* fundamentally a horizontal phenomenon—even a graphic one—and all of the examples described so far function in two dimensions. Instead of refusing this characteristic, I would suggest examining it more closely. Although certain postmodern cities (Tokyo, for example) might be characterized as fully three-dimensional fields, the prototypical cities of the late twentieth century are characterized by horizontal extension. What these field combinations seem to promise in this context is a thickening and intensification of experience at specified moments within the extended field of the city. The monuments of the past, including the skyscraper—a modernist monument to efficient production—stood out from the

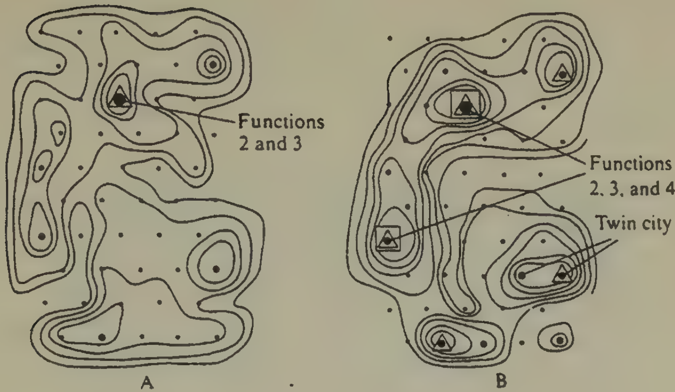
fabric of the city as privileged vertical moments. The new institutions of the city will perhaps occur at moments of intensity, linked to the wider network of the urban field, and marked not by demarcating lines but by thickened surfaces.

fourth hypothesis: the logistics of context

The diagrams produced by the Christaller model (an abstract simulation of urban economic growth that ignores large-scale accidents of history or geography but incorporates fine-grained difference in the form of multiple variables and nonlinear feedback) demonstrate how the interplay between laws and chance produces complex but roughly predictable configurations of a nonhierarchical nature.[15] The whole of the city is never given at once. The city is a place of contingency, a whole that is not bounded and closed, but capable of permutation, open to time and only provisionally stable.

In the late 1980s, artificial life theorist Craig Reynolds created a computer program to simulate the flocking behavior of birds. Reynolds placed a large number of autonomous, birdlike agents (which he called "boids") into an on-screen environment. The agents were programmed to follow three simple rules of behavior: first, to maintain a minimum distance from other objects in the environment (other agents, as well as obstacles); second, to match velocities with other agents in the neighborhood; and third, to move toward the perceived center of mass of agents in its neighborhood. As M. Mitchell Waldrop notes: "What is striking about these rules is that none of them said 'Form a flock'... the rules were entirely local, referring only to what an individual boid could do and see in its own vicinity. If a flock was going to form at all, it would have to do so from the bottom up, as an emergent phenomenon. And yet flocks *did* form, every time."[16]

The flock is clearly a field phenomenon, defined by precise and simple local conditions, and relatively indifferent to overall form and extent.[17] Because the rules are defined locally, obstructions are not catastrophic to the whole. Variations and obstacles in the environment are accommodated by fluid adjustment. A small flock and a large flock display fundamentally the same structure. Over many iterations, patterns emerge. Without repeating exactly, flock behavior tends toward roughly similar configurations, not as a fixed type, but as the cumulative result of localized behavior patterns.



Christaller Diagrams of Urban Growth.

One of modern architecture's most evident failings has been its inability to adequately address the complexities of urban context. Recent debates have alternated between an effort to cover over the difference between the old and the new (the contextualism of Leon Krier or the so called New Urbanists) or a forceful rejection of context (deconstruction, and related stylistic manifestations). These two examples—the Christaller model of urban growth and Reynolds' simulations of flocking behavior (though others could be cited)—dissolve the traditional opposition between order and randomness. A logistics of context is suggested here as a way out of this polarized debate, acknowledging on the one hand the distinct capabilities of new construction, and at the same time recognizing a valid desire for diversity and coherence in the city.

Can the specific capacities of computer technology help manage the emerging complexity of the urban field today? In part, the problem of working in the city today implies a rethinking of questions of control. How to engage all the complexity and indeterminacy of the city through the methodologies of a disciple traditionally committed to control, separation, and unitary thinking? Architecture and planning—historically aligned with technical rationality and committed to the production of legible functional relationships—have had a tremendous difficulty thinking their roles apart from the exercise of control. This is all the more true today when the real power of architecture has been eroded everywhere by a swollen bureaucratic apparatus. Architecture and planning, in a desperate attempt to survive, have simply opposed their idea of order

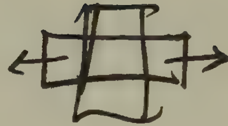
to chaos: planning versus uncontrolled growth. But this is a kind of zero-sum thinking, in which architecture can only be diminished in the measure to which it relinquishes control over the uncontrollable. We thrive in cities precisely because they are places of the unexpected, products of a complex order emerging over time.

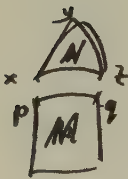
A logistics of context—proposed here as one model for the integration of the capacities of the computer in urban design work—suggests the need to recognize the limits to architecture's ability to order the city, and at the same time, to learn from the complex self-regulating orders already present in the city. Attention is shifted to systems of service and supply, a logics of flow and vectors. This implies close attention to existing conditions, carefully defined rules for intensive linkages at the local scale, and a relatively indifferent attitude toward the overall configuration. A logistics of context is a loosely defined working framework. It suggests a network of relations capable of accommodating difference, yet robust enough to incorporate change without destroying its internal coherence. Difference—social, spatial, or political—is not so much smoothed over as localized, shifted to a more perceivable and manageable scale. Permeable boundaries, flexible internal relationships, multiple pathways, and fluid hierarchies are the formal properties of such systems.

New technologies can offer new ways to work within the complex interplay of indeterminacy *and* order at work in the city. "This place, on its surface, seems to be a collage. In reality, its depth is ubiquitous. A piling up of heterogeneous places," writes Michel de Certeau. These "heterologies" are not arbitrary and uncontrolled, but instead "managed by subtle and compensatory equilibria that silently guarantee complementarities."[18] As the Christaller diagrams suggest, there are available models for conceiving order, repetition and type that do not respect traditional notions of hierachy or classical symmetries. Field conditions and a logistics of context reassert the potential of the whole, not bounded and complete (hierarchically ordered and closed), but capable of permutation: open to time, and only provisionally stable. They recognize that the whole of the city is not given all at once. Consisting of multiplicities and collectivities, its parts and pieces are remnants of lost orders or fragments of never realized totalities. Architecture needs to learn to manage this complexity, which, paradoxically, it can only do by giving up some measure of control. A logistics of context proposes a provisional and experimental approach to this task.

1995

Tokyo Street at Night, 1993.





Sergei Eisenstein. Diagrams after G. B. Piranesi's *Dark Prison*.
From: "Piranesi, or the Fluidity of Forms" (1946–47).

9

representation as articulation between theory and practice

diana agrest

"That architectural criticism finds itself, today, in a rather difficult situation is not a point that requires much understanding. To criticize, in fact, means to catch the historical scent of phenomena, to put them through the sieve of strict evaluation, show their mystifications, values, contradictions, and internal dialectics, and explode their entire charge of meanings....

Today as never before, there is a need for stricter use attitudes, for a deep sense and knowledge of history, as well as for a watchful eye, in order to sort out, in the vast context of historical movements, broad research or single projects, the influences dictated by fashion—and even cultural snobism—from the forces of renewal.

—Manfredo Tafuri, *Theories and History of Architecture*

Representation, theater of life or mirror of the world.

—Michel Foucault, *The Order of Things*

Reading these texts of Stan Allen, which intensely explore questions of representation in architecture, it became clearer than ever to me that representation as part of the production of architecture is one of the most important operations that articulates theory and practice. This occurs in different ways and around different questions throughout the history of architecture. One of the most important issues in this articulation is the place of the subject and the most fertile field for this exploration today is that of the urban condition. It is around these two issues and some of the interrelationships that I will develop this drift (*dérivé* in French), using as my point of departure Stan Allen's texts.

Architecture is produced in three different registers, through three different texts: drawing, writing, and building.[1] The production of each implies different problems concerning the question of representation. Allen explores throughout his book this most important question concerning architecture. Drawing, historically the key moment in the architectural production, occupies a major place in his work. Allen himself has developed projects exploring questions of representation in what I would call a theoretical practice of architecture. Writing and "redrawing" are for Allen operations for the critical reading of the various modes in which drawing operates.

Drawing—technical drawing—performs as a notational system. It presents us both with processes of coding that are partly analogical and partly digital. Yet drawing also opens the question of the nature of its symbolic production in relation not only to the building that it represents, but to other referents, as in Piranesi's engravings or in Le Corbusier's drawings for the Carpenter Center, where he represents his own paintings and even projects. The relationship between drawing and building in this case exceeds its purely notational function to open the question of overdetermination in architectural representation.

Since the Renaissance, the written text that touches upon the discursive dimension of architecture may act as a narrative for action and/or a mediator between architecture and other practices: philosophical, political, and economic. It is in the text that we see representation as an ideological operation. For instance, text creates the illusion of a "natural" relationship between program and form. The effect of this naturalizing of form makes the symbolic dimension of the production of form

invisible. A representation always stands, in a symbolic relationship, for something else. In this sense the text is a close relative of the unconscious in the production of dreams, since dreams are representations that can give the clues to the articulation between those two levels, that of the representation and that of what really is being represented, disguised if not repressed.

Building raises still other questions. There is a codified representation between drawing and building, yet the building—the built architecture—is not only a representation of the drawing but also of other referents. Representation, which has a crucial role in the articulation of the texts of architecture, sometimes becomes an end in itself. As such, it detaches itself from the represented object to become self-referential. These moments are an indication, a symptom, that a transformation and restructuring is taking place. Throughout architecture's long history, representation is one of the first areas in which ideological changes manifest themselves.

The exploration of modes of seeing and development of perspective during the Renaissance—with the subject's static eye at the center—generated not only a mode of architectural representation but also of architectural production. During the Renaissance, the understanding of the world was based on establishing similarities between things, images, and words—in short, representation worked by establishing analogies. Analogy is the prevailing figure in the treatises on painting and architecture of the period: urban space, the space of perspectival painting, and the space of the theater are constructed and understood as analogous of one another. Representation and its theories and techniques assume a major role in every aspect of culture.[2]

One could say the same for the explorations of various modes of perspectival construction during the late sixteenth and seventeenth centuries, which are distinct from those in the Renaissance, where space escapes the boundaries of the perspectival box and from which theatrical space could be generated as in the work of the Da Bibbiena family, an exploration that is displaced later to architecture. Piranesi's critical work, in particular through the extraordinary drawings of the *Dark Prisons* series, and of the *Campo Marzio*, occupies a neuralgic point in the beginning of a modern conception of architecture and the city.

The self-referential behavior of axonometric projection characterizes the initial moments of the modernist project, where it became a preeminent mode of visualization, decentering the subject from the perspectival model. Allen cites El Lissitzky: "Perspective limits space; it has made it finite, closed. The world is put into a cubic box, which creates a static facade view of the world." On the other hand Suprematism, Lissitzky claims, "has extended the apex of the finite visual cone of perspective into infinity. . . . It has broken through the blue lampshade of the heavens." As Allen observes, In Lissitzky's irrational space, viewpoint and vanishing point are both located at infinity. The infinite extension in depth coincides with the suspension of the subject's privileges of self-location."

With the development of modern architecture, several important changes occur. The perception of image becomes part of a different system of thought: no longer is an object related to the problem of representation or imitation; it becomes a mental construct. Historical discourse is replaced as a referent by the mechanisms of the mind—that is, the mechanisms of perception and of the unconscious described by the psychological or psychoanalytic discourses. The classical language of architecture is negated in favor of a more abstract, "non-representational," visual, formal system. As a result of the development of this abstract thought not only have styles been banished but also the need for figuration; thus, on the one hand the image is related to the new theories of perception postulated by the Gestalt psychology while on the other hand it relates to abstract notions of geometry and physics. Axonometric takes a leap from the surface of the plan to the surface of the globe. It implies a world in space outside, reflecting not just the limits of Cartesian perspectivalism but the perception of "another" space: a space "other" as a preview of more recent theories of the universe.

architecture and other practices

Representation in architecture results from a displacement. In modernism, for instance, painting becomes a tool of architectural production. Cubism and neoplasticism are the most obvious examples where painting came to act as a mode of representation for an architecture that did not yet exist. While questions of representation and form were explored in painting, questioning the traditional

models of visualization, they were transferred into architecture not as an equivalent mode of architectural representation, but of architectural production.

Architecture has always related to other practices: painting, scenography, and theater in the Renaissance; photography and film, in the modernist era. Techniques of representation such as drawing, model-making, photography, cinematography, or videography allow for different modes of interpretation and production of architecture . Other systems that are not visual, such as music and literature, are transposed into architectural form through the different mechanisms at play in the process of representation (such as metaphor or metonymy) in a purely symbolic manner. Architecture often works metaphorically, trying to emulate other fields, in particular philosophy and science. In this case, architectural representation (through experimentation in drawing and other media) works as a shifter that allows codes of one system—science, geometry, mathematics, or physics—to be switched to another, culture, painting, or architecture.[3] While new vocabularies are developed in this process generating stylistic changes, the mechanisms of production of form remain untouched, as can be seen in very recent examples of practice. Allen has pointed this out in his examination of the indexical sign and the trace in the process of architectural representation.[4]

What makes representation a crucial field in the understanding of architecture is the mediated character of representation itself. There is rarely representation of a "reality," or even of an idea or a belief. What representation represents is another representation in a chain of signifiers that circulate from one medium to another all the while believing, or letting us believe, that there is a direct referent. Thus in the Renaissance theories of architecture such as Alberti's, representation became one with the text. In his definition of the essential attributes of architecture, an elaborate system of translation/representation takes place. In his definition of beauty, for example, a chain of signifiers that goes from nature to the human body, to man's body, to proportion, and then to geometry allows for a particular concept of beauty to be transposed to architecture.[5] It becomes clear that a system of representation such as perspective is not just a technique (or even science), as one would think, but also an ideology that allows for a rationale to be developed that would make the representation seem natural and thus invisible as such.

drawing and building

"Representation," says Allen in his discussion of the trace, "is an active middle term in a complex transaction involving matter, ideas, and the social body, and it seems worthwhile to pay closer attention to the form and manner in which it leaves its (sometimes indecipherable) traces on the built work."

The moment of separation between the field of construction and that of drawing (as a tool) that occurs during the Renaissance is crucial. This separation allowed abstract thought to guide the process of design as separate from the process of construction. It is at this juncture that the mode of representation, while developing its own discourse, becomes a part of the process of production of architecture and that the development of the techniques of drawing and design have an impact as important, if not more, as building techniques themselves.

Representation can thus be thought of as the place of articulation between architectural practice and theory. It is precisely in such moments of change where critical thought and new theories are produced and practice is radically restructured. It is in Alberti's *The Ten Books on Architecture* that theory and practice are for the first time articulated through representation. Other examples of this process are the subversion of syntax in Piranesi's *Dark Prisons* or in his large plans for the *Campo Marzio*; the use of styles and figuration in Lequeux, and in Ledoux and Boulée, the use of geometry and scale, constructing the narrative and figural dimensions of architecture.

At the core of this construct that articulates theory and practice we find the subject. This is what allows for this shifting articulation to exist, the subject projecting the imaginary and symbolic dimension through techniques or tools for representation and regimes of visualization. In the mode in which those two relate lies the articulation between the creative subject and the social as the particular constitution of the self and the particular formation of the imaginary.

subject/vision/body

The subject is at the core of these historical transformations and ideologies , as the perceiving or creative subject. The apparatus of representation constructs a

subject by defining the position of the eye and the body. The plane of perspective representation, for instance, separates/articulates the two points of the perspective mechanism—the vision point and the vanishing point—while the frame connects two cones of vision: that of the architect as creative subject and that of the observer.

The body, which stands metonymically between the world and representation through the eye, is either repressed through numerical relationships or reduced to an eye/mind mechanism. In this context, no matter what the technique of representation may be, framing is an ever-present operation. Framing is an operation that has existed as long as perspective(in fact, perspective is impossible without framing). Not only perspective but also other types of drawings, such as a section or even a plan, require the process of framing.

While the viewing subject is producing the act of framing, the framed "other" is looking back, thus establishing the *gaze* as different from the *eye.* "In our relation to things, in so far as this relation is constituted by the way of vision, and ordered in the figures of representation, something slips, passes, is transmitted, from stage to stage, and is always to some degree eluded in it—that is what we call the gaze."[6] While the eye is that of the perceiving subject (the architect), the gaze is that of architecture looking back at every stage of the design process: approving, censoring, or repressing the system of rules to be thus followed, avoided, or subverted. "The eye and the gaze—this is for us the split in which the drive is manifested."[7] More important, visual perception implies a selective eye/mind connection that will simultaneously exclude and include, in or out of a frame and in the conflict between these exclusions and inclusions. In the space of the conflict between the eye and the gaze, architecture is written.

Referring to the relationship between drawing and building Allen writes that practice disrupts the easy characterization of drawing as the disembodied indexes of absence and building as presence, as "tangible proof." In fact, another concept is necessary to expose the complexity of the symbolic transactions that take place in that relationship, that is, the concept of overdetermination.

The symbolic dimension is not only always at play in the process of representation as ideology but also in the process of representation as psychoanalytic

projection and of vision as desire. This double action is emblematic of the overdetermined character of representation in architecture. The Carpenter Center is one of the most potent examples of that condition.

Representation in architecture has the added complexity that the doubling of architecture as drawing and building has in itself a double representation, one we would call notational and another that occurs in the symbolic domain. In building, one mode of representation does not override the other, rather, they are both condensed (in the psychoanalytic sense of the term).

The most apparent feature of the Carpenter Center, as Allen shows, is the strong part *movement* plays in its configuration; movement is not only induced, literally, but also represented. The ramp is not only a path to move through; it is also a representation of the highway access. By generating—and not only representing—movement it is representing time and space together. Elaborating on this question, Allen recalls to us John Hejduk's reading of the eye as a camera in the sectional treatment of the ramp.[8] In movement, these sections create a sequence of framings as the spectator moves through the space. While architecture here is representing another mode of representation, photography and film, we are in fact in the presence of a case where representational media have been instrumental in the generation of architecture, much in the same way that perspective allowed for the urban spaces of the Renaissance to be conceived.

The *plan* in the Carpenter Center refers to movement not in the way the building does, being a mode of representation that is not perceived in time in a successive manner, but rather simultaneously, much like painting. The plan that generates the project is incorporating a hidden representation of a different kind, the body of a woman. The thighs of Le Corbusier's many drawings of women are clearly there and it is between them that the ramp penetrates the building. The reference to the highway and movement takes place at the imaginary level. A chain of representational mechanisms helps in hiding the uncontrollable desire—for various unreachable objects, painting, woman, city—underlying it all. This building offers a vivid example of the overdetermined nature of representation in architecture. While the notational dimension of drawing in the Carpenter Center has a symbolic relationship outside of the project, in the passage from the two-dimensional quality of the plan through the

section to the three-dimensional quality of the building it acquires a different symbolic representation. In the Carpenter Center the city traverses architecture in a condensation of all of Le Corbusier's previous work, urban and architectural. A shifting boundary separates the enclosed world of architectural representation from an "outside," from the city, a world where a different formal production takes place .

imaginary dimension in the representation of the modern city

Representation allows for the negotiation of the subject (architect) in her articulation with the social, between the pleasure principle and the reality principle between fantasy and reality.[9] In this process, representation exercises a fulfilling or a filtering function: a fulfilling function when it becomes itself the end, reifying the pleasure principle, a filtering function as the reality principle takes over. The confrontation between the fantasy and the real is a characteristic feature in the representation of the city. Two typical operations in this process to confront the city with its past through the representation of reality (present or historical), or to confront it with the future through the representation of imaginary scenarios and fantasies. This is a complex operation of projection, of which the drawings and texts of visionary projects such as *Plan Voisin* by Le Corbusier are exemplary.

The relationship between the American city and European modernist urbanism at the beginning of the century—around issues concerning the past and projections towards the future—is one of the most poignant examples of the question of representation in the modern city. While modernity in European architecture, and visionary urbanism, meant the denial of the figural and the predominance of abstraction, in America the dream in which modernity was developed made—as all dreams do—strange associations, symbols, condensations, and displacements. America represented the scene of future life and the scene of modernity. "An architecture of desire in a city of desire was developed."[10] America represented for Europe, the possibility of a new beginning , the future, a place of projected utopias. In this process of realizing the dream, through a process of representation/projection the city

is also the place where the pleasure principle and the reality principle are reified.[11] It is the pleasure principle at play in the realization of the dream (or many dreams) the city is made of, but it is in the *realization* that the principle of reality will appear.

What Le Corbusier found to be a catastrophe in America was just the modern operating on a different register. The city could only be thought as a grid, which was both an instrument and a representation of democracy, that provided a matrix where all orders are possible. The skyscraper is emblematic of this in its many different incarnations and various combinations of type and styles.[12] Here architecture is re-representing itself. The representation of the gothic, classical, and Beaux Arts styles serves to link the old and the new, imposing the new by representing the familiar. Architecture becomes self-referential and buildings are representing other buildings, thus transferring their history and myths to the new. In this process of inventing modern types and re-representing styles, we could say that representation is at the core of the American negotiation between the pleasure principle and the reality principle. Representation is also at the core of the European design of utopias and invention of a modern vocabulary based on the pleasure principle.

urban readings

The most pertinent subject of study in terms of representation in the production of architecture at this moment in history is the city, or what might better be called urban configurations.

The production of urban form also occurs in the space between the eye of the architect and the gaze, as we said earlier, but a gaze that is not that of architecture now, but that of the city itself looking back at what our eyes have seen, where the rules are to be discovered or made. The gaze makes of the *subject* an *object.*[13] The eye establishes the imaginary dimension, while the gaze implies the symbolic dimension, in this case the urban condition, the unconscious of architecture: "the city as an object of desire."[14]

This is best exemplified with photography, particularly photographing the city. Eugéne Atget photographing Paris a hundred years ago, produced both a record

and a very particular presentation of the city with its places and buildings, its nostalgic emptiness, its stillness and suspension in time and space. As a kind of archaeologist he saw what no other eye would see in the everyday life of the city. He was constantly framing, cutting, and framing in an act of fragmentation and appropriation of the real, and as such was a constant source of readymades. He saw himself being looked back at by the city, and thus emphasized presentation and perception rather than representation in the mode of relating to reality—an opposition important not only for photography but also for architecture.[15]

The articulation between the subject (and his production, as reader or writer) and the city requires a different approach to the questions of perception and representation. In it there is a loss of the totality of a unified vision and of the domination of vision. There is a change in the position of the subject, and thus in the mechanisms of representation. The center (of perception) is displaced from the subject and the purely visual. Most important, the representation *of* the city, and the city *as* representation, are superimposed.

The city represents itself and is, in itself, a mechanism of representation in constant change and transformation, where chance has a major role in its unavoidable condition of incompletion and imperfection. The city is the place of permanent representation without limits, existing beyond those boundaries established by a perceptual framing that is determined by a theoretical or ideological one. The city, the space of myth, is simultaneously the record of the myth, a presence and an absence, as well as a reality and an abstraction. For the present urban condition, the symbolic inefficiency of the metaphor as a representational mechanism—typical in architecture and in urban projects from the Renaissance to the present day—is obvious.

representing the contemporary city

Allen questions the legibility of the modern city, asking whether it has gone beyond legibility.[16] Reading the city supposes a subject and the articulation of her subjectivity to the social, or to history. Reading discovers, selects, and generates configurations that—while not in the books of architecture—will in turn be realized as projection/project.

This implies a reading from a particular vantage point. A reading does not try to describe the *objective* qualities of a city, but rather the articulation of a *subjective* vantage point from which to read the historical and the social reified in the city.

This (cultural) reading does not see the city as conceived in the traditional modernist urbanism as a whole, complete, and finished entity, made of static functions clearly and hierarchically divided, but rather as a complex and constantly changing phenomenon of shifting relationships, always incomplete and imperfect, and subject to one major force: chance. The contemporary city requires a repositioning of the subject because it is now also the scene of the projection of the fantasies it inspires. The Urban scene is a representation of itself, with the subject as both performer and producer.

The city now questions the dominance of the visual. Other senses beyond the limits of the visual and the spatial, such as audition, and metonymically the entire body through time, rhythm, movement, and speed become relevant as part of representation. Speed, a dimension inseparable now from space-time, is perceived with the entire body and in particular through the "vestibular," a sixth sense that, named after the inner ear, accounts for balance, motion sickness, dizziness, and vertigo.

Given the nature and the characteristics of the contemporary city, and urban culture, the mode of its representation needs to be rethought. There need to be different modes of representation in order to account for the multiplicity of the contemporary city, the complex and fragmentary quality of the urban realm. Some aspects can be represented by a drawing, or even a model or a particular notation; other aspects require transcending the exclusivity of the visual, so that other media, like film and video, become necessary. Film is one of the most, if not *the* most, pertinent of the media in the exploration of the present conditions of the place and non-place in urban culture. If this is the case, then the implications of the relationship between film and (urban) architecture are more complex than the usual assumption that architecture is merely a background or formal support for a film's content.[17]

Urban form relates to film form as two texts. Film, analogous to the city, is a continuous sequence of framed spatial situations organized through narrative in

time. The city, more than architecture requires the incorporation of the narrative and the figural. Issues of representation of the city open up the questions of narrative, of verisimilitude, and thus of the figural. These terms—narrative, figural, and verisimilitude—address different mechanisms of representation in architecture that transcend the oppositions between abstraction and figuration since abstraction is a mode of the figural with a system of reference (i.e modernism) that is already historical.

The narrative is an essential element of film, whether continuous or fragmented. One could speak of an informational space that has the power to include a rather complex symbolic dimension of constant displacements and condensations. The question of verisimilitude is particularly interesting here, specially in the modes of representing the city as part of other narratives. Realism and utopia in science fiction become one and the same: the most unreal situations from a narrative point of view are portrayed with complete realism. Fantastic cinema is possible because of the irrefutable realism of the cinematographic image, (and, of course, special effects). What appeals to people in that film genre is its realism, the objectivity of the photographic image together with the feeling of the incredibility of the events portrayed. This reminds me of the British sixties television series *The Prisoner*, in which a secret agent is imprisoned in a picturesque seaside village, but the technologies of surveillance, control, and operation (where even dreams are projected onto a screen as they develop) are more sophisticated than what is in use at the present time.

cybernetics

The computer, cybernetics in general, and television have created a dystopian and disembodied urban culture. The networks of information and communication take place in an "other" space where the major parameters are speed, time, and movement, a space that represents urban culture and not necessarily the physical city. It may represent other forms, mutations of cities, suburbia and exurbia. In Melvin Webber's 1963 work "Urban Space and the Nonplace Urban Realm" this was already clearly presented as on one hand communities based on place and on the other hand communities based on common interest such as banking, corporations, and the like. Visually, the mode of representing the nonplace urban realm was a fantasy of abstraction where the image was very similar

to the glitch of the TV screen. However, while cybernetics—information, communication—is a result of extreme functional abstraction paradoxically, it provides the extreme of verisimilitude, in the simulacra that the computer makes possible.

Two paradoxical situations have resulted from the use of the computer in architecture: one is that of the resurgence of perspective, facilitated by computer programs; the other, and more important, is the reunification of the process of representation in the production of design and the process of construction. As Allen says, "The same system that lays out the grid of the surface in the design process can in turn drive the machine that cuts those elements. Design and fabrication are linked together. . . ."[18]

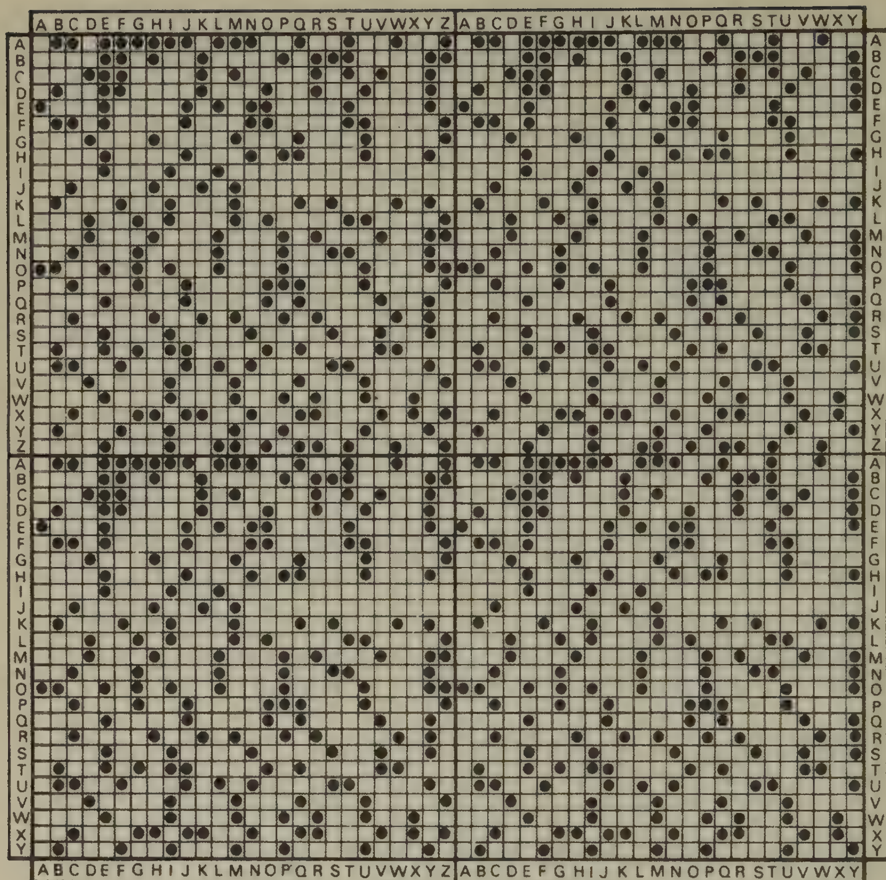
It is difficult to negate the impact of the computer as a tool for production. One of the obvious impacts is in the proliferation of projects based on forms that would have been more difficult to produce or visualize without the computer. That there is a certain naiveté in this type of production is clear, as is evident in the work expressionist architects such as Erich Mendelsson, Hans Finsterlin, Bruno Taut, Hans Scharoun, or later Friedrich Kiesler, whose original conception only required a fertile imagination. But what is the meaning of this neoexpressionism now? It seems that the computer only operates as a tool in the production of an architecture that in terms of its mechanisms of representation is not very different from previous historical periods.

The effect of the computer and cybernetics can be better seen in the mode of conceptualizing urban architecture. It is here where the impact is the greatest. It is through this technology that cities, or more precisely urban agglomerations, are reshaping themselves. Exurbia is to the computer what suburbia was to the highway. The open ended nonhierarchical original grid of the American city could be seen as a preannouncement of the communication networks that were to come.

The world of business, finances, and megacorporations are the ones that have a major impact in this process, since business and production can now operate and communicate independently of place. The city itself historically grew as a place of exchange, an economic machine where physical contact was an

indispensable component of every transaction. Two situations develop as a result of cybernetics. One is that corporations no longer have to be placed in proximity to develop business, and therefore leave the city for places where they have more economic advantages, lower taxes, lower rents, etc. . . The other is that the work force that was a left-over from the development of suburbia, the female population, is already there and all they need to produce is information of one kind or another.[19] Control is not a problem, since the same technology has allowed for the creation of a world in which we are the subject of surveillance twenty-four hours a day, no matter where we are.

An extraordinary parallel phenomenon, a side effect, happens in relation to cities. Cities—downtowns—have generated what we could call urban culture, a culture of place, from the mass-oriented to the most exclusive elites, that is independent from any other economic transaction. It has generated a symbolic domain called "the city" and as thus is physically being transformed into a theme park version of itself. The city has finally produced another city, which is its own representation.



Method of Perforated Sheets. (W.W.II British Code-breaking Technique.)

notes

notes to introduction

1 This distinction from Gilles Deleuze and Félix Guattari, *A Thousand Plateaus* (trans. Brian Massumi [Minneapolis: University of Minnesota Press, 1987]), chapter 12, "1227: Treatise on Nomadology—The War Machine": "A distinction must be made between two types of science, of scientific procedures: one consists in 'reproducing,' the other in 'following.' The first involves reproduction iteration and reiteration; the other, involving itineration, is the sum of the itinerant, ambulant sciences. . . . Reproducing implies the permanence of a fixed point of view that is external to what is reproduced: watching the flow from the bank. But following is something different from the ideal of reproduction. Not better, just different. . . . *There are itinerant, ambulant sciences that consist in following a flow in a vectorial field across which singularities are scattered like so many 'accidents'* (problems)." (372; emphasis in the original); "In the nomad sciences, as in the royal sciences, we find the existence of a 'plane,' but not at all in the same way. The ground level plane of the Gothic journeyman is opposed to the metric plane of the architect which is on paper and off site." (368).

2 Michel de Certeau, *The Practice of Everyday Life*, trans. Steven F. Rendall (Berkeley: University of California Press, 1988), (66).

3 Ibid., 66–67.

4 There would appear to be two dominant positions today with regard to this question of architecture's limits, and the regulating power of the discipline. On the one hand, a conservative position that says that architecture's fundamental questions of space, structure, materials, and the rituals of inhabitation change little over time. Issues that

cannot be solved by reference to a known repertory of techniques or forms are understood to be outside of, or beyond architecture. The most thoughtful of these "conservative" positions would appear to be that of Giorgio Grassi. See his *L'architettura come mestiere* (Milan: CLUVA, 1980) or the essay "Avant-Garde and Continuity," *Oppositions* 21 (Winter 1981): 24–33. On the other hand,there is a neo-avant-garde position that sees the structure of the discipline as a limit to be interrogated. Working on the basis of ideological criteria, or in response to technological changes, neo-avant-garde practices set out to transgress or reform disciplinary limits.The opposition of these two positions approaches parody in the issue of *ANY* that documents the confrontation of Peter Eisenman, representing the neo-avant-garde, and Andreas Duany and Elizabeth Plater-Zyberk, representing the neoconservative "New Urbanists" *(ANY* 1: *Seaside and the Real World,* 1993). But both of these positions share a similar notion of the fixity of architecture's limit; they simply situate themselves on opposite sides of its boundary. By contrast, a radically pragmatic position would maintain an indifference with regard to the perceived limits of architecture. It feels itself under no obligation either to affirm limits from within nor transgress them from without. Instead it would propose to work opportunistically, operating within the catalog of known solutions if productive techniques could be found, and outside it as necessary. The dilemma of architecture's limit is faced by choosing not to choose.

5 ". . . the space of doubt differs from the space of certainty in that doubt narrows the distance between theory and the world. If theoretical reflection entails being at a certain remove from the world, doubt returns thought to openness before the world; it involves a loss of mastery and control which places thought in a more vulnerable relation to the world than before." Norman Bryson, "The Erotics of Doubt" in *New Observations* 74, *The Erotics of Doubt*, ed. Jeremy Gilbert-Rolfe and John Johnston, (1990): 11.

6 What I mean here could also be explained by another reference. Robin Evans, in discussing the supposed "rationality" of Mies van der Rohe's Barcelona Pavilion, contrasts the ad hoc structure of the Barcelona Pavilion to Antonio Gaudi's Güell Chapel: "There are two reasons why we may think the Barcelona Pavilion is a rational structure: Mies said it was, and it looks as if it is. It looks rational because we know what rationality looks like: precise, flat, regular, abstract, bright and above all rectilinear. This image of rationality is unreliable, however. The Güell Chapel has none of these attributes, yet it is consistent and logical in its structure. The entire chapel was to have been scaled up from an inverted funicular model made of wires draped with paper and fabric. . . . The model was wholly in tension. Turned upside down, it would produce a structure wholly in compression, thus avoiding persistent tension, against which masonry has little resistance. This is a rational structure. By contrast, the structure and construction of the Barcelona Pavilion is piecemeal and inchoate" (Robin Evans, "Mies van der Rohe's Paradoxical Symmetries, in his *Translations from Drawing to Building*" [London Architectural Association, 1997], 243–44. In Mies, there is a "project" of rational construction, which is given visual expression by means that do not always coincide with its performative realities.

7 The claim that the practice of architecture has the capacity to transform reality is not a claim lightly extended to the conventional exercise of professional practice. Reality is only changed when something new is created. To build yet another suburban office building, for example, is not to transform reality. The stock of existing reality may have been added to, but not transformed; a certain piece of real estate may have been rearranged, but materially, nothing new is created. To give a counter-example from the context of these essays, for example, Frank Lloyd Wright's Guggenheim Museum innovates at every level—in form, space, program, construction, and context—and it does so not only in relation to normative practice, but also in relation to Wright's previous buildings.

8 For an extended argument for the impact of image culture on architectural modernity, see Beatriz Colomina, *Publicity and Privacy: Modern Architecture as Mass Media* (Cambridge, MA: MIT Press,1994). For Colomina, the engagement with mass media is precisely what defines modern architecture as such. While Colomina's arguments are convincing (indeed unanswerable at a certain level) at times she presents her case in extreme either/or terms that are for me less than productive. See for example her "Mies Not," in Detlef Mertins, ed., *The Presence of Mies* (New York: Princeton Architectural Press, 1994), 193–222.

9 de Certeau, 100.

10. See Deleuze and Guattari, *Plateaus*, chapter 2: "1914: One or Several Wolves?", 33. Their notions of multiplicity could be read as a useful supplement to de Certeau's tendency to idealize individual freedoms against collective disciplines; see for example their discussion on pages 33–34 of Elias Canetti's *Crowds and Power* (trans. Carol Stewart [New York: Viking, 1963]). De Certeau's distrust of the visual—which he links to the power and geometry, and his suspicion of technical instrumentality (including architecture)—all indicate some caution.

11 There are also relationship here to Deleuze and Gauttari's concept of a minor literature. See their *Kafka: Toward a Minor Literature*, trans. Dana Polan (Minneapolis: University of Minnesota Press, 1986); through the example of Kafka, the Czech Jew writing in German, Deleuze and Guattari develop the concept of a minor literature, the "deterritorialization" from within of the dominant language. A minor practice constructs a line of flight with the materials at hand—the impoverished elements of the dominant language, rather than resisting by retreat or confrontation: "A minor literature doesn't come from a minor language; it is rather that which a minority constructs within a major language" (16).

12 de Certeau, 96.

13 de Certeau, 101.

14 de Certeau, 93.

15 This too in Deleuze and Guattari, where walking figures as the privileged trope of mobility and disruption. In *A Thousand Plateaus*, the perpetual movement of the random walk collapses the binary structures of identity and blurs the boundaries of institutional ideologies. They recommend: ". . . be on the edge, . . . take a walk like Virginia Woolf ('never again will I say *I am this, I am that*')" (29; emphasis in the original).

16 Written over the course of seven years (1990–1997) there have been some changes in my thinking. Briefly, the position of the earlier essays, which concern representation, has to some degree been rethought. Today, I would tend to insist even more rigorously on the instrumentality of representation in architecture, rather than see it as an end in itself. This is to some degree the result of the speculations advanced over the course of the essays on specific buildings. However, in the final essay, I return to some of the questions of representation, suggesting that in trying to understand the implications of new media in architecture, the already well-developed discourse on representation is one place to start.

notes to chapter 1

1 Leon Battista Alberti, *On the Art of Building in Ten Books*, trans. Joseph Rykwert et al. (Cambridge, MA: MIT Press, 1988), book I, 7.

2 "What connects thinking to imagination, imagination to drawing, drawing to building, and buildings to our eyes is projection in one guise or another, or processes that we model on projection"; Robin Evans, The Projective Cast (Cambridge, MA: MIT Press, 1994), xxxi. The first version of this chapter owed a great deal to Robin Evans's "Translations from Drawing to Building," *AA files* 12 (Summer, 1986): 3–18, where Evans first proposed the idea of architectural drawing as a medium of exchange that leaves very specific traces on the built work itself. Evans elaborated and clarified these ideas in *The Projective Cast*, which appeared after the first version of this essay was published. I have subsequently drawn upon the essays of *The Projective Cast* a great deal in reworking this chapter.

3 See Robert Rosenblum, "The Origin of Painting: A Problem in the Iconography of Romantic Classicism," *Art Bulletin* 39, no.4 (December 1957) : 279–90.

4 Evans, "Translations Between Drawing and Building."

5 At the risk of over simplifying, it might be possible to clarify the difference by referring to contrasting pedagogical traditions. A fine arts student stands before the model in a life drawing class. If the instructor comments, for example, in regard to the student's drawing that "the right arm is too long" it is always possible to compare the represented arm with the actual arm. On the other hand, if a design student presents a drawing of a proposed building, the critic may say something like "the window on the right is too large." What is intended here is more complex. The window (which, as "window" does not yet exist) can only be said to be "too large" first, in its syntactical relation to the other elements in the drawing, and second, in the context of some shared set of proportional conventions. The relation of object to representation is fundamentally different, and more abstract in the case of the architectural example. Judgments about architecture in drawing are on the one hand projective in that they imply something unspoken like "If this building were constructed, that window would appear too large"; and on the other hand self referential—implying something like, "In relationship to the other windows, this one is out of proportion."

6 Vitruvius, *Ten Books on Architecture*, trans. Morris Hicky Morgan (New York: Dover, 1960), 5; emphasis in the original.
7 "There are those who want a text (an art, a painting) without a shadow, without a 'dominant ideology'; but this is to want a text without fecundity, without productivity, a sterile text. . . . The text needs its shadow: this shadow is a bit of ideology, a bit of representation, a bit of subject: ghosts, pockets, traces, necessary clouds: subversion must produce its own chiaroscuro." Roland Barthes, cited by Jorge Silvetti in "The Beauty of Shadows," *Oppositions* 9, (Summer 1977): 43–61.
8 "Daniel Barbaro . . . who accepted the Vitruvian definition of "architectura est scientia" like no one before him, attempted for this very reason to link architecture and mathematics in order to have it partake in the universal principles and 'truth' itself by basing it on geometry and arithmetic." Werner Oechslin, "Geometry and Line: The Vitruvian 'Science' of Architectural Drawing," in *Diadalos* 1, (1981): 21.
9 Erwin Panofsky, *Perspective as Symbolic Form*, trans. Christopher S. Wood, (New York: Zone Books, 1991), 45.
10 Norman Bryson, "The Gaze in the Expanded Field," in Hal Foster, ed., *Vision and Visuality* (Seattle: Bay Press, for the Dia Art Foundation, 1988), 88.
11 Ibid.; Note that this "decentering" occurs not in the context of modern fragmentation of vision or postmodern "dislocation," but in normative perspectival representation. Bryson cites the 1504 Raphael *Sposalizio della Madonna* as an example in his text.
12 I am well aware of the irony here, that the small mechanical device through which the string passes, and which stands in for the "eye" of the observer is called an "eyelet," or an "eye hook." Without making too much of it, it might be possible to point out that in this case the use of language confirms Bryson's observation: In this case, like the eye of a needle or the eye of the hurricane, the opening in the mechanical "eyelet" forms a void, an empty space through which the thread representing the vector of sight passes.
13 Jacques Lacan, *Four Fundamental Concepts of Psychoanalysis*, ed Jaques-Alain Miller; trans. Alan Sheridan (New York: Norton, 1978), 86. John Whiteman first called my attention to these chapters in Lacan on optics and the gaze. Elsewhere, Descartes says that the lines of sight are like the canes with which a blind man feels the contours of an object. René Descartes, Optics, in *The Philosophical Writings of Descartes* (Cambridge: Cambridge University Press, 1985), 170.
14 Lacan, *Four Concepts*, 86.
15 The other aspect of persepctival construction—the reduction of light and shadow to lines—is of course superseded by modern understanding of light as waves or particles, which is capable of explaining more complex visual phenomena.
16 Lacan himself introduces numerous diagrams, with greater complexity, in the attempt to describe the workings of vision. However, as Miller comments, "Such a precaution reveals the inadequation in principle between the graphic representation and its object (the object of psychoanalysis). Moreover, all the constructions gathered here have no more than a didactic role: their relation with the structure is one of analogy." Jacques-Alain Miller, "Commentary on the Graphs," in Jaques Lacan, *Ecrits*, trans. Alan Sheridan (New York: Norton, 1977), 332.

17 Panofsky, *Perspective as Symbolic Form*, 41.

18 Rudolf Wittkower, "Brunelleschi and 'Proportion in Perspective'," *Journal of the Warburg and Courtald Institutes* 16 (1953): 275ff.

19 "If interpretation were the slow exposure of the meaning hidden in an origin, then only metaphysics could interpret the development of humanity. But if interpretation is the violent or surreptitious appropriation of a system of rules, which in itself has no essential meaning, . . . then the development of humanity is a series of interpretations." Michel Foucault, "Nietzsche, Genealogy, History," in *The Foucault Reader*, ed. Paul Rabinow (New York: Pantheon, 1984), 87.

20 Massimo Scolari, "Elements for a History of Axonometry," *Architectural Design Profile* 59: *The School of Venice* (1985): 73–78.

21 John P. Snyder, *Flattening the Earth: Two Thousand Years of Map Projections* (Chicago: University of Chicago Press, 1993); see especially chapter 2, "Map Projections in an Age of Mathematical Enlightenment, 1670–1799," 55–94.

22 El Lissitzky, "A. and Pangeometry" (1925), trans. Eric Dluhosch, (Cambridge, MA: MIT Press, 1970), 142, 145; emphasis in the original. Note also Malevich's earlier formulation: "Analyzing the canvas, we see, primarily, a window through which we discover life. The suprematist canvas reproduces white, not blue space. The reason is obvious: blue does not give a true impression of the infinite. The rays of vision are caught in a cupola and cannot penetrate the infinite." Kasimir Malevich, "Suprematism": (1920), in K.S. Malevich, *Essays on Art 1915–1928*, ed. Troels Andersen (Copenhagen: n.p., 1971), n.p. Here, too, the preoccupation with rendering visible the infinite coincides with an assertion of painting's essentially realist character.

23 "A technique which shows how an object works, becomes, with modernism, not merely a useful tool for the construction of something, but an example and a metaphor for the idea of construction itself. The work of art is now seen not as the outward form of beauty (*schein*) but as a kind of 'working drawing' of reality." Alan Colquhoun, "Axonometry: The Primitive and the Modern"; page 11 of the manuscript copy of a text published in Italian as "Assonometria: Primitivi e Moderni," in Alberto Abriaini and Jacques Gubler, eds., *Alberto Sartoris* (Turin: Mazzotta, 1992), 13—23. Although I had consulted the Italian version while developing this text, I only obtained the original, English version—which allowed a closer reading—after the text was more or less complete. It now becomes apparent to me that a number of Colquhoun's points were fundamental in developing this discussion of axonometric projection.

24 My discussion of the redeployment of the axomonetric by the twentieth-century avant-garde substantially follows the schema laid out by Yve-Alain Bois in "Metamorphoses of Axonometry," *Diadalos* 1(1991): 41–58. Both Scolari and Alan Colquhoun are somewhat critical of Bois—see note 33, below.

25 Scolari, "Elements," 73.

26 Robin Evans has underlined the relation between cubism and technical drawing practices: "Technical drawing was an analogy, not an explanation, and as such it

proved its worth. It . . . provided a precedent showing that overlaid multiplicity added up to a unified picture." Evans, *The Projective Cast*, 63.

27 Edmund Husserl, *Origin of Geometry*, trans. John P. Leavey Jr. (Lincoln: University of Nebraska Press, 1978), 160.

28 See Derrida's Introduction to Husserl's *Origin of Geometry*: "In other words, ideal formations are rooted only in language in general, not in the factuality of languages and their particular linguistic incarnations" (66). Husserl, Derrida argues, constructs this ideal objectivity against the grain of the actual practice of language and the movement of history. "And what is thematic here is precisely ideal objects, and quite different ones from those coming under the concept of language." Husserl, *Origin of Geometry*, 161.

29 In a close parallel with the passage cited at the beginning of this section, Husserl asserts that "language itself, in all its particularizations (words, sentences, speeches), is, as can easily be seen from the grammatical point of view, thoroughly made up of ideal objects; for example, the word *Löwe* occurs only once in the German language; it is identical throughout its innumerable utterances by any given persons." Ibid. Needless to say, this description is completely at odds with theories of linguistic difference developed by Ferdinand de Saussure.

30 Ibid., 160.

31 He continues: "We can always presuppose some measuring technique, whether of a higher or lower type, in the essential forward development of a culture, as well as the growth of such a technique, thus also including the art of design of buildings, of surveying fields, pathways, etc." Ibid., 178.

32 Ibid., 178.

33 "These [non-Euclidean] theories were taken up by El Lissitsky as a theoretical explanation of his pictorial conception, which was in fact perfectly Euclidean." Scolari, "Elements," 76.

34 "[El] Lissitsky, [Theo] van Doesburg, [Erich] Mendelsohn, [László] Moholy-Nagy, and [Siegfried] Giedion all approached science in awe of its inconceivable discoveries. Attaching the metaphysics of classicism, they cobbled together a new metaphysics out of the mysteries of nineteenth-century mathematics. Thus they gave the new an underlying structure just like the old. And thus they sustained a covert but strong strain of Christian Platonism beneath a denial of other worldliness." Evans, *The Projective Cast*, 348. In arguing this way, I am in substantial agreement with Bois, and Alan Colquhoun, and partial disagreement with Scolari, over the notion of axonometric projection as "symbolic form" in the work of the twentieth-century avant-gardes. Colquhoun notes that advanced scientific concepts could only be employed metaphorically in early modernism, and thus operate at a symbolic level. However, inasmuch as axonometric in both early modernism and in contemporary practice constitutes something of a marginal phenomenon, Colquhoun does not see it functioning in Panofsky's sense of "symbolic form." Alan Colquhoun, "Assonometria," 23. Scolari makes a broader claim for axonometric as a synthesis of the rational knowledge of the geometer, the physical properties of vision and the metaphysical space of

the philosopher, a ". . . place of exact knowledge where measurement shatters the seduction of the gaze." Scolari, "Elements," 77.

35 "Today [1981] it is exactly this fundamental ambivalence, this play on '+/-', which dominates the architectural use of axonometry." Bois, "Metamorphoses," 57.

36 Bryson, "The Gaze," 91–92.

37 Michel de Certeau, "The Laughter of Michel Foucault," in his Heterologies: Discourse on the Other, trans. Brian Massumi (Minneapolis: University of Minnesota Press, 1986), 192.

notes to chapter 2

1 See, for example, Werner Oechslin, "From Piranesi to Libeskind: Explaining by Drawing," *Diadalos* 1 (1981): 15–36.

2 Gilles Deleuze and Félix Guattari, *A Thousand Plateaus* (trans. Brian Massumi [Minneapolis: University of, Minnesota Press, 1987]): "Abstract machines know nothing of forms and substances. This is what makes them abstract, and also defines the concept of a machine in the strict sense. They surpass any kind of mechanics. They are opposed to the abstract in the strict sense" (511). "Thus the black hole/white wall system is, to begin with, not a face but the abstract machine that produces faces according to the changeable combinations of its cogwheels. Do not expect the abstract machine to resemble what it produces, or what it will produce" (168).

3 "Whereas translation excludes all particulars in favor of a general equivalent, the transposition of media is accomplished serially, at discrete points. . . . Because the number of elements and the rules of association are hardly ever identical, every transposition is to a degree arbitrary, a manipulation. It can appeal to nothing universal and must therefore leave gaps." Friedrich A. Kittler, *Discourse Networks, 1800/1900*, trans. Michael Metteer with Chris Cullens (Stanford: Stanford University Press, 1992), 265.

4 Nelson Goodman, *Languages of Art* (New York: Hackett, 1976), 99–174.

5 Ibid., 121

6 Ibid., 218

7 It might be objected that it is false and inadequate—at least since the late nineteenth century—to describe painting and sculpture as devoted to the imitation of reality. Two points might be made here. First is that for Goodman, as a philosopher devoted to the precise categories, those modern and postmodern projects that work across disciplinary boundaries are of less interest than the more traditional works that serve to establish the identifiable characteristics of a discipline. From my point of view, Goodman's distinctions are interesting in that once the categories, however rigid, are established, they become a useful means of describing the nature of the transgression. Thus László Moholy-Nagy's nonobjective "telephone paintings," for example, could be described as a reworking of painting's autographic codes according to the allographic operations of a more abstract discipline such as music or architecture. On the other hand, it is also interesting to note the degree to which these modernist procedures—from early-twentieth-century abstraction through to minimalism and installation art in the late twentieth century—tend as a whole to bring painting and

sculpture closer to the "mixed and transitional case" of architecture. The terms used in Leo Steinberg's famous comparison of recent painting practice to the "flatbed" printing press are instructive: "It was suggested earlier that the Old Masters had three ways of conceiving of the picture plan. But one axiom was shared by all three interpretations, and it remained operative in the succeeding centuries, *even through cubism and abstract expressionism*: the conception of the picture as representing a world ..." [my emphasis] For Steinberg, even the abstract expressionists were "nature painters" to some degree, producing visual analogues to the space of the world. By contrast, works by Jasper Johns, Jean Dubuffet or Robert Rauschenberg conceive the picture plane as a horizontal surface where materials, impressions and information collect: "The flatbed picture plane makes its symbolic allusion to hard surfaces such as tabletops, studio floors, charts, bulletin boards—any receptor surface on which objects are scattered, on which data is entered, on which information may be received, printed or impressed—whether coherently or in confusion. The pictures of the last fifteen to twenty years insist on a radically new orientation, in which the painted surface is no longer the analogue of a visual experience of nature but of operational processes." To add the drafting table, or even the flat ground of the building site to Steinberg's catalogue of "receptor surfaces" does not seem far fetched, and confirms this drift toward architectural paradigms within the visual arts. Leo Steinberg, "Other Criteria" in his *Other Criteria: Confrontations with Twentieth-Century Art* (Oxford: Oxford University Press, 1972), 82ff.

8 Goodman, Languages, 219.
9 Ibid., 220–21; emphasis mine.
10 This section incorporates material from a text written jointly with Marc Hacker for the catalog of the 1986 exhibition *The London Projects*, an experimental project where we explored the consequences of representing the unreadable complexity of the modern city by means of a graphic score. See Stan Allen and Marc Hacker, "Scoring the City: The Hollargraph," in *The London Project* (New York: Princeton Architectural Press, 1988), section 7.
11 Steven Marcus, "Reading the Illegible: Some Modern Representations of Urban Experience," in William Sharpe and Leonard Wallock, eds., *Visions of the Modern City* (Baltimore: Johns Hopkins University Press, 1987), 254.
12 See Marc Hacker, "Notes on a Changed World," *Perspecta* 21, Yale University/MIT Press, 1984, 100–109.
13 Paul Virilio, "The Overexposed City," *Zone 1/2* (1986): 18. ed. Paul Rabinow (New York: Pantheon, 1984), 244.
14 Michel Foucault, "Space, Knowledge, and Power," in *The Foucault Reader*, 244.
15 Frederic Jameson, "Postmodernism or the Cultural Logic of Late Capitalism," New Left Review 146 (1984): 53–92.
16 For suggestive example of this cross-disciplinary use of the score in the architectural/urban context, see Diana Agrest, "Design versus Non-Design," *Oppositions* 6 (Fall, 1976).
17 Paul Virilio and Sylvere Lotringer, *Pure War* (New York: Semiotext(e), 1983), 60.
18 Goodman, *Languages*, 171.
19 Jacques Derrida, "The Parergon," trans. Craig Owens, *October* 9 (1979): 22.

20 "We confront the apparent paradox of the situation defined by: the impossibility of language/ the inevitability of language./ 'Apparent' because, in fact, this is not a simple contradiction. The term 'language' that appears in the two phrases names two different referents. When we speak of the impossibility of language, we refer to the specific notion of a natural language, language in the strict sense. When we note this impossibility we criticize the utopian belief in the possibility of creating a totally structured architectural language and the objective rationalism that presupposes the possibility of a diaphanous communication between the architect and the public. When we speak of the inevitability of language, we refer to the more general notion of language as a system of rules institutionalized through history. Language in this sense is unavoidable and reveals the belief in the possibility of a purely subjective architecture, ecstatically expressing itself, as an idealist illusion." Diana Agrest and Mario Gandelsonas, "On Practice," *A+U* 114 (March 1980): 35–36.

notes to chapter 3

1 "**vestigium** ii n. **I**. Act. = *the part of the foot that treads, the sole of the foot*; . . . **B**. Meton., **1**, *a footstep, track, foot-mark*; . . . **b**, a *trace, mark, a sign*; [...]**II**. *Pass., that which is trodden upon, a position, post, station*; . . . **b**, *the position of a destroyed town, ruins*; . . ." Cassell's Latin Dictionary (New York: Funk and Wagnalls, 1955). 615.

2 Charles Sanders Peirce, *Philosophical Writings of Peirce*, ed. Justus Buchler (New York: Dover, 1955), 102; capitalization and emphasis is in the original. For a further discussion of the index see Thomas A. Sebok, "Indexicality," *The American Journal of Semiotics* 7, no. 4 (1990): 7ff.

3 Peirce, *Writings*, 104.

4 See Carlo Ginzburg, "Clues: Roots of an Evidential Paradigm," in his *Clues, Myths and the Historical Method* (Baltimore: Johns Hopkins University Press, 1989): 96–125. Ginzburg compares the methods of Sigmund Freud, Sherlock Holmes, and Giovanni Morelli, a nineteenth-century Italian physician and writer on art, inventor of a technique for authenticating works of art based on the study of small, often overlooked details: earlobes, fingernails, the shapes of toes.

5 Susan Sontag, *On Photography* (New York: Delta, 1973), 154.

6 Gilles Deleuze, "Plato and the Simulacrum," trans. Rosalind Krauss, *October* 27 (Winter 1983) 48.

7 Rosalind Krauss, "Notes on the Index: Seventies Art in America," *October* 3 (Spring 1977): 68–81.

8 See also Daniel Barbaro's comment on the passage from Vitruvius: "If writing is the sign of speaking, and so speaking the sign of the mind, so geometric shapes are the sign of their concepts." Cited in Werner Oechslin, "Abstraction and Architecture," *Rassegna* 9 (1979): 21.

9 "A sign is either an *icon*, and *index*, or a *symbol*. An *Icon* is a sign which would possess the character which renders it significant, even though its object had no existence; such as a lead-pencil streak as representing a geometrical line. . . . A *symbol* is a sign which would lose the character which renders it a sign if there were no interpretant.

Such is any utterance of speech which signified what it does only by virtue of its being understood to have that signification." Peirce, *Philosophical Writings*, 104. Architectural drawings, which combine geometrical information and written language, consist primarily of iconic and symbolic signs.

10 Robin Evans, "Not to be Used for Wrapping Purposes," *AA Files* 10 London, (1985); reprinted in his *Translations from Drawing to Building and Other Essays* London: The Architectural Association, 1997, 119–52.

11 Evans, "Not to be Used," 138.

12 Evans, "Not to be Used," 138–39; emphasis in the original.

13 Benjamin, cited in Jacques Derrida, "A Letter to Peter Eisenman," *Assemblage* 12 (1990); 9–10. Note that *Verwisch die spuren!* could also be translated as "cover your tracks."

14 Wolf Prix/Coop Himmelblau, "The Tower of Babel Revisited," *ANY* 0: *Writing in Architecture*, (1993), 27.

15 Jacques Lacan, cited in Gregory L. Ulmer, *Applied Grammatology* (Baltimore: Johns Hopkins University Press, 1985), 214.

16 Jacques Derrida, *Margins of Philosophy*, trans. and annot. by Alan Bass (Chicago: University of Chicago Press 1982), 66.

17 Jacques Derrida, *Cinders*, trans. Ned Lukacher (Lincoln: University of Nebraska Press, 1991), 43.

18 Derrida, Margins, 65.

19 Leon Battista Alberti, *On the Art of Building in Ten Books*, trans. Joseph Rykwert et al. (Cambridge, MA: MIT Press), book I, 7.

20 Herbert Damisch, *Traité du Trait* (Paris: The Louvre, 1995), 67.

21 Catherine Ingraham, *Architecture and the Burdens of Linearity* (New Haven: Yale University Press, 1988) and also "The Burdens of Linearity," in Jeffrey Kipnis, Richard Burdett, and John Whiteman, eds., *Strategies in Architectural Thinking*, (Cambridge, MA: MIT Press, 1991), 130–47.

22 Félix Guattari, "Space and Corporeality," *D: Columbia Documents of Architecture and Theory* 2 (1992): 145.

23 Le Corbusier, *Towards a New Architecture*, trans. Frederick Etchells (New York: Praeger, 1972), 71.

24 In these and other examples from the postwar work of Le Corbusier it is also possible to identify one of the few direct instances of indexical signs in architecture. I am thinking of the use of concrete as *béton brut*, where the crude wooden formwork leaves its imprint on the finished building.

25 See chapter 7, "Comic Lines," in Robin Evans, *The Projective Cast* (Cambridge, MA: MIT Press, 1994).

26 In its mathematical/analytical basis, and its possible instrumentalities, the notion of the trace proposed here is quite close to that proposed by François Dagonet in *Etienne-Jules Marey: A Passion for the Trace* (New York: Zone Books, 1992); at one point Dagonet refers to Marey's chronophotography as "a working drawing of movement" (132).

27 Cecil Balmond, "New Structure and the Informal," *Architectural Design* 67, nos. 9/10 (September/October 1997), 89; emphasis in the original.

28 Guattari, "Space and Corporeality," 146.

29 I have in mind a number of contemporary practices: Toyo Ito and Kazuyo Sejima in Japan, Herzog and de Meuron in Switzerland, Rem Koolhaas in The Netherlands, among others. See my "Minimalism: Architecture and Sculpture," *Art and Design* (Sculpture: Contemporary Form and Theory issue, ed. Andrew Benjamin, 1997, or "Artificial Ecologies: The Work of MVRDV," *El Croquis* 86 (1997): 26–33.

30 Christian Metz, "Trucage and the Film," in W. J. T. Mitchell, ed. *The Language of Images* (Chicago: University of Chicago Press, 1980), 151ff.

31 Metz, "Trucage," 154; emphasis in the original.

32 It might be objected that this leads to a theory of architecture as virtual reality. That is to say, if it is effects that we are after, we have no use for building's physicality. Here too I would apply a pragmatic standard. So far, in my experience, the physicality of buildings is still a much more fluid and convincing field for the deployment of effects than any virtual environment yet constructed in cyberspace.

33 The question of surface in early modernism has been thoroughly explored by Mark Wigley in *White Walls* and *Designer Dresses: The Fashioning of Modern Architecture* (Cambridge, MA: MIT Press, 1995).

34 Robin Evans, "Mies van der Rohe's Paradoxical Symmetries" in his *Translations*, 247; see also my essay on Mies's Berlin National Gallery, this volume.

35 Matthias J. Schnell, et al., "Construction of a Novel Virus that Targets HIV-1–Infected Cells and Controls HIV-1 Infection," *Cell* 90 (September 5, 1997): 849–57.

36 NIAID News, National Institute of Allergy and Infectious Disease, Office of Communications, National Institute of Health Press Release, September 4, 1997.

37 Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1970), 68.

notes to chapter 4

1 José Quetglas, "Fear of Glass: The Barcelona Pavilion," in Beatriz Colomina, ed., Architectureproduction (New York: Princeton Architectural Press, 1988); K. Michael Hays, "Critical Architecture: Between Culture and Form," *Perspecta* 21 (1984): 14–29.

2 Fritz Neumeyer, *The Artless Word*, trans. Mark Jarzombek (Cambridge, MA: MIT Press, 1991).

3 Robin Evans, "Mies van der Rohe's Paradoxical Symmetries," *AA Files* 19, (1990): 56–68.

4 Detlef Mertins, *The Presence of Mies* (New York: Princeton Architectural Press, 1994).

5 Frampton, Kenneth, "Modernism and Tradition in the *Work of Mies van der Rohe, 1920–1968*," in John Zukowsky, ed., *Mies Reconsidered: His Career, Legacy and Disciples* (Chicago: The Art Institute of Chicago, 1986), 37.

6 Neumeyer, *Artless Word*, 76.

7 Cited in Neumeyer, *Artless Word*, 76.

8 Kurt W. Foster, "Schinkel's Panoramic Planning of Central Berlin," *Modulus* 16 (1983): 63–77.

9 Ibid., 67.

10 In *Techniques of the Observer* (Cambridge, MA: MIT Press, 1991), Jonathan Crary charts the emergence of the body as a "productive psychological apparatus" at the center of the visual experience. A paradigm of vision as nonveridical—lodged in the body—and a corresponding epistemological shift produces an "observer effect" distinct from classical models of vision as well as from twentieth-century abstraction. Among the optical devices of mass visual culture studied by Crary are the stereoscope, the kaleidoscope, the phenakistiscope, the zoetrope, the diorama and the panorama. Crary suggests that the radical abstraction and reconstruction of optical experience in the nineteenth-century is a necessary "fore-history," allowing certain notions of autonomous vision to emerge in the twentieth century.
11 Foster, "Schinkel's Panoramic Planning," 67.
12 Ibid., 74.
13 Ibid., 75.
14 Ibid., 67.
15 Alan Balfour, *Berlin: The Politics of Order 1737–1989* (New York: Rizzoli, 1990), 228–29.
16 Fritz Neumeyer, "Space for Reflection: Block versus Pavilion," in Franz Sculze, ed. *Mies van der Rohe: Critical Essays* (New York: The Museum of Modern Art, 1989), 196. Neumeyer suggestively juxtaposes a photograph of the works of Alberto Giacometti displayed in the New National Gallery (an image that on the face of it answers Balfour's claim that the National Gallery "diminishes all art and the people placed within its area of influence") with the following quotation from Nietzsche: "One day, probably soon we shall need some recognition of what above all is lacking in our big cities: spaces quiet and wide, spacious places for reflection, places with long high ceilinged galleries that keep us from the bad weather or from too much sun, that protect us from the noise of carriages and street vendors . . . buildings and cities that as a whole express the sublimity of contemplation and aloofness. We wish to see *ourselves* translated into stone and plants; we want to take walks *within ourselves* when we stroll around those buildings and gardens," (196–97) emphasis in the original.
17 The argument for Berlin's New National Gallery as a carefully calibrated reframing of context is on the face of it directly contradicted by the complicated genealogy of the New National Gallery's form. From 1957 to 1958, Mies developed designs for an office building for Bacardi in Santiago, Cuba, a project that was never realized due to the Cuban revolution. "In simplest terms, the Berlin National Gallery is Bacardi in steel," writes Franz Schulze. There was, however, and intermediate step. From 1960 to 1963, Mies recycled the fundamentals of the design, now in steel in another unrealized project, for the Schaefer Museum in Schweinfurt, Germany. However, while it is true that the pavilion form of the three buildings remains essentially the same, precisely what does change from building to building is the treatment of podium, siting, and surround—in other words the architectural frame for the pavilion itself. I would argue that as a result of the ready-made character of the pavilion, the work of design is displaced to the level of the site and to the space between the pavilion and the city. See Franz Schulze: *Mies van der Rohe, A Critical Biography* (Chicago: University of Chicago Press, 1985), 301–11.

18 The connection between Schinkel's deployment of panoramic strategies and Mies's New National Gallery was first suggested to me by John Whiteman. Note also Mark Jarzombek's characterization: "These buildings turn Mies's platform into an urban stage, with the buildings and their reflections in the glass as proscenium, like a modern cinematic panorama offering a view of the surrounding urban destruction." Mark Jarzombek, "Mies van der Rohe's New National Gallery and the Problem of Context," *Assemblage* 2, (1987): 36.

19 This would seem to me to be reinforced by the sequence of construction: the entire assembly of the roof/space frame was constructed and erected first. The columns, like props, were placed only after the roof was lifted into place by the cranes, thus inverting the conventional priority of the columns in a post and lintel type construction.

notes to chapter 5

Most of the photographs published here were taken by William Short, Wright's clerk of works, during the construction of the museum in 1958 and 1959, and are supplemented by photographs of the restoration and addition taken in 1990 and 1991 (taken by Lee Ewing). Thanks to Glory Jones and Julie Zander for assistance with photographic documentation.

1 Gilles Deleuze and Félix Guattari, *A Thousand Plateaus*; trans. Brian Massumi (Minneapolis: University of Minnesota Press, 1987), 373.

2 "Space enclosed by space" is Edgar Kaufman's formulation, cited in William H. Jordy: *American Buildings and their Architects* (Garden City, NY: Anchor Books, 1972), 280.

3 Jordy, *American Buildings*, 312–13.

4 Frank Lloyd Wright, "In the Nature of Materials: A Philosophy," in his *The Natural House* (New York: Bramhall House), 1954, 55.

5 Jordy, *American Buildings*, 314.

6 "However, as ingenious as this design is, it is not so pretentious as his original design for the museum. In order to overcome objections of the local building department he was compelled to compromise many of his ideas and to abandon such items as plastic skylights, expanded metal for reinforcing and cork for surfacing the ramp wall." Anonymous, "Spiral Art Museum is Built Like a Work of Art," *Engineering News Record*, December 5, 1957, 42–43.

7 Colin Rowe, "Chicago Frame," in his *The Mathematics of the Ideal Villa and Other Essays*, (Cambridge, MA: MIT Press 1976).

8 *Engineering News Record*, 44–45; see also the description by the contractor, George N. Cohen, "Frank Lloyd Wright's Guggenheim Museum," *Concrete Construction*, March 1958, 12, and Jordy, *American Buildings*, 317.

9 The descriptions in technical journals of the time give some sense of the complexity of these operations: "The inside edge of the spiral ramp, which carries a 3-foot high plaster parapet, turns on a smaller and smaller radius as it rises upward. Similarly the outside edge which carries the gunite curtain wall turns on a greater and greater

radius as it rises upward. The relationship between these constantly changing radii and the gradually rising plane of the ramp is so arranged that at any point in the height of the structure a horizontal plane will always intersect a true circle. This is the result of a basic pattern of shapes. It is a conception of a large cone (whose apex is theoretically some 180 feet below datum zero) into which is fitted an inverted smaller cone whose apex is theoretically some 270 feet above datum zero." George N. Cohen, "Guggenheim Müseum," 11–12; "Spiraling up with the walls, the ramp circles around an inner court of decreasing radius and thus widens as it rises. A 3 ft. high plaster parapet along the inner edge of the ramp lies on the surface of a cone with apex 270 feet above the main gallery floor. At first floor level, the inner radius of the ramp is 32 ft and the outer radius 48 ft; at the fifth level, the inner radius is 25 ft and the outer, 57. A 6 ft wide, steeply inclined slab joins the ramp with the outer wall." *Engineering News Record*, 44.

10 Jordy, *American Buildings*, 317.

11 Frank Lloyd Wright, cited in Jordy, *American Buildings*, 281.

12 From Frank Lloyd Wright, *The Guggenheim Correspondence*, ed. Bruce Brooks Pfeiffer. (Carbondale, IL: Southern Illinois University Press, 1986), 207.

13 For detailed descriptions of the construction techniques see: *Engineering News Record*, especially page 44 and Cohen, "Guggenheim Museum."

14 Jordy, *American Buildings*, 314.

15 Peter Blake, "The Guggenheim: Museum or Monument?" *Architectural Forum* (December 1959): 88.

16 Wright made a specific claim for a complementary relationship between his "flowing" space and the works to be exhibited within: "The building was intended by Solomon R. Guggenheim to make a suitable place for the exhibition of an advanced form of painting wherein line, color and form are a language in themselves. . . . This advanced painting has seldom been presented in other than the incongruous rooms of the old static architecture. Here in the harmonious fluid quiet created by this building interior the new painting will be seen for itself under favorable conditions." Wright, cited in Jordy, *American Buildings*, 330–31. This did not prevent the protest registered in a letter signed by many prominent painters of the New York school who decry a "callous disregard for the fundamental rectilinear frame of reference necessary for the adequate visual contemplation of works of art" (Wright, Correspondence, 242). In my view, the Guggenheim works quite well for the works that originally formed the nucleus of the Guggenheim collection—early-twentieth-century abstraction, "nonobjective" works by artists such as Paul Klee and Wassily Kandinsky—abstract but still easel-sized paintings. Its limits are reached with large scale abstract paintings, and the display of sculpture is obviously nearly impossible on the sloped floor. On the other hand, the space provides a challenging and active frame for installation works.

17 Wright, *Correspondence*, 62.

18 Early schemes showed the exterior in a kind of Tucsan red; after construction there were extended discussions with the curator James Johnson regarding the colors of the walls: see Wright, *Correspondence*, 194ff.

notes to chapter 6

1 Cited in Eduard S. Sekler and William Curtis, *Le Corbusier at Work* (Cambridge, MA: Harvard University Press, 1978), 242.
2 Gilles Deleuze and Félix Guattari, *A Thousand Plateaus*, trans. Brian Massumi (Minneapolis: University of Minnesota Press), 1987, 298.
3 Le Corbusier is said to have spoken of the north wall of the Fog Library (the next building to the north) as "his wall." Sekler, *Le Corbusier at Work*, 50.
4 See, for example, Rudolf Arnheim, "Notes on Creative Invention," cited in Sekler and Curtis, *Le Corbusier at Work*: "The second type of building is conceived as an aggregate of volumes, which reach all the way through its inside and whose nature can only be inferred from the partial shapes they exhibit on the outside. Overriding the distinction between inside and outside, this sort of conception strains spatial imagination. The Carpenter Center belongs in this category. It involves a fully three dimensional complexity, which can not be grasped by either plan or section" (264).
5 This observation, made much earlier, and often repeated in classes and lectures, found its way into print in Slutzky's "Aqueous Humor," *Oppositions* 19/20 (Winter/Spring 1980): 39; note however that for Slutzky, the ramp was "a painterly solution to an architectural problem and a reaffirmation of frontality," whereas I would argue that at the Carpenter Center no such frontality exists.
6 John Hejduk, "Out of Time and Into Space," in his *Mask of Medusa* (New York: Rizzoli, 1985), 72.
7 Hejduk, *Mask of Medusa* 71.
8 Cited in Manfredo Tafuri, "Dialectics of the Avant-Garde: Piranesi and Eisenstein," *Oppositions* 11 (Winter 1977): 74.
9 Sergei Eisenstein, "Piranesi, or The Fluidity of Forms," *Oppositions* 11 (Winter 1977): 98.
10 Sergei Eisenstein, "Montage and Architecture," in *Assemblage* 10 (December 1989): 116.
11 Ibid., 117.
12 Cited in Yve-Alain Bois, "A Picturesque Stroll around Clara Clara" *October* 29 (1984): 33–62.
13 Eisenstein, cited by Bois in the introduction to Eisenstein's "Montage and Architecture," 111.
14 See François Dagonet, *Etienne-Jules Marey: A Passion for the Trace* (New York: Zone Books, 1992).
15 Gilles Deleuze, *Cinema 1: The Movement-Image*, trans H. Tomlinson and B. Habberjam (Minneapolis: University of Minnesota Press, 1986), 1.
16 Ibid, 2.
17 With Bergson as a point of departure, it is not surprising that this sounds suspiciously like another return to phenomenology. Deleuze describes a movement which, while similar, reverses the trajectory of the phenomenological gaze: "What phenomenology sets up as a norm is 'natural perception' and its conditions. Now these conditions are existential co-ordinates which define an 'anchoring' of the per-

ceiving subject in the world, a being in the world, an opening in the world which will be expressed in the famous 'all consciousness is consciousness of something.' [...] But the cinema has perhaps a great advantage: just because it lacks a center of anchorage and of horizon, the sections which it makes would not prevent it from going back up the path that natural perception comes down. Instead of going from the acentered state of things to centered perception, it could go back up towards the acentered state of things, and get closer to it." Deleuze, *Cinema 1*, 57–58.

18 Deleuze again cites Bergson: "Modern science must be defined pre-eminently by its aspiration to take time as an independent variable." Ibid., 4.

19 Ibid., 6.

20 Ibid., 4; emphasis in the original.

21 Ibid., 5; emphasis in the original.

22 Thomas Pynchon, *Gravity's Rainbow* (New York: Penguin Books, 1987),159; "pornographies of flight" appears on page 567.

23 Paul Frankl *Principles of Architectural History* (Cambridge, MA: MIT Press, 1968), 74–75; See also Siegfried Giedion, in *Space, Time and Architecture* (Cambridge, MA: Harvard University Press, 1967), writing about Guarino Guarini: "Thus the integral calculus, taking definite shape at the end of the seventeenth century, found its architectural equivalent in the complicated treatments of space that appeared at the same time" (122). Note that this notion of introducing movement into architectural structure is entirely different from Giedion's "space-time" idea, developed by analogy to cubism: "The presentation of objects from several points of view introduces a principle which is intimately bound up with modern life-simultaneity" (436).

24 Le Corbusier, "Ineffable Space," in Joan Ockman, ed., *Architecture Culture 1943–68* (New York: Columbia University Press/Rizzoli, 1993), 66; emphasis in the original.

25 Sekler and Curtis, *Le Corbusier at Work*, 50.

26 Ibid., 51.

27 Cited in Helen Dudar, "Mobile Architecture," *Art in America* 54, no.4 (July/August 1966): 77.

28 See the photo comparison on page 38 of *Oppositions* 15/16 (Winter/Spring 1979), edited by Kenneth Frampton.

29 Sekler and Curtis, *Le Corbusier at Work*, 165; emphasis in the original.

30 Ibid., 166.

31 Ibid., 167; emphasis in the original.

32 Sonotubes were eventually used at the insistence of Sert, although they had to be fabricated to special dimensions to accord with to Le Corbusier's proportions. See Sekler and Curtis, *Le Corbusier at Work*, 194.

33 Ibid.

34 Ibid., 168; emphasis in the original.

35 Ibid., 196.

36 Ibid., 165; emphasis mine.

37 Eleanor Gregh, "The Dom-ino Idea," *Oppositions* 15/16 Winter/Spring): 64.

38 Barry Maitland, in "The Grid," Oppositions 15/16 (Winter/Spring 1979), notes similar deformations. Referring, for example to the Pavilion Suisse, he notes that "One

can hardly speak here of the play of walls against the column grid, for both are warped in the same manner" (112).

39 Sekler and Curtis, *Le Corbusier at Work*, 208.

40 Fred Koetter, Review of *Le Corbusier at Work*, *Oppositions* 19/20 (Winter/Spring 1980): 221.

41 Hejduk, *Mask of Medusa* 75.

note to chapter 7

1 José Llinas, *On the Photograph of a Young Girl in the Farnsworth House* (Barcelona: *Quaderns*, 1982).

notes to chapter 8

1 In a casual survey of just one popular media source, a special "Technology" issue of the *New York Times Magazine* (September 28, 1997), the following references were found: "Addicted to Speed," article by James Gleick; advertising copy for Nortel: "speed of light vs. the bullet/In 0.0043 seconds, the entire works of William Shakespeare translated into 200 languages sent from New York to Omaha, Nebraska without skipping a verse"; comments of Patrick Nauton: "Tomorrow's higher-speed connections will bring 'commerce to the Net in a strong way.' Faster access and full motion video will erode the distinctions between Web surfing and TV channel hopping"; "The Wizard: Surfing at the Speed of Light," title of profile of engineer Alan Huang, whose abiding passion is "making things go really fast"; statement by artist Gary Hill: "It's rather a given that speed, virtual reality, cloning and immortality are issues right now"and so on. Interestingly enough, a few weeks later later an article entitled "Speed has Hit the Wall" appeared in the *New York Times*. On the occasion of a British team breaking the world land speed record (the first time that the sound barrier had been broken with a land vehicle), the article noted that while it is theoretically possible to travel at higher and higher speeds today, in reality the volume of traffic has actually *slowed down* the speeds of both air and land travel in recent decades. *New York Times*, October 19, 1997, sec. 4, 1. In a more specific architectural context, a recent marketing brochure for a graphics CD-ROM, under the heading "Changing the *speed* of architecture" notes that "You could spend hours on a drawing. . . or just minutes." *Architectural Graphic Standards CD-ROM*, promotional material, 1998.

2 *New York Times*, September 24, 1997, B1.

3 "Taylorist" refers to the implementation of the concepts of Frederick Winslow Taylor (1856–1915), in which scientific principles of time and motion study were employed to produce a more efficient workplace. Our tendency to privilege the new and the optimal, along with the popular idea that every new form of technology renders existing technologies obsolete needs to be rethought. It is instructive to look at the development of high-speed trains in Europe and Japan. As airports and airspace grow crowded, a nineteenth-century technology, supposedly made obsolete long ago by air travel, emerges as a logical alternative from an ecological and urbanistic

point of view. AM radio, a technology supposedly made obsolete by television, the Internet, and other "advanced" forms of communication has acquired extraordinary political power in recent years in the United States. In the music industry, overly elaborated production values have spawned a "low-tech" alternative: do it yourself production, mixed in a garage and released on vinyl.

4 Many examples could be cited; see for example the collection edited by Michael Benedikt, *Cyberspace: First Steps*, (Cambridge: MIT Press, 1991), as well as the more recent emergence of numerous academic and popular books on the subject. Scott Bukatman has coined the term "cyberdrool" for this kind of terminal identity fiction; he cites Vivian Sobchak's observation of the "peculiar oxymoronic cosmology" linking "high technophilia, 'new age' anamism, spiritualism, and hedonism, and Sixties counter-cultural 'guerrilla' political consciousness." Scott Bukatman, *Terminal Identity: The Virtual Subject in Post-Modern Science Fiction* (Durham, NC: Duke University Press, 1993), 189.

5 Paul Virilio and Sylvere Lotringer: *Pure War* (New York: Semiotext(e), 1983), 69.

6 Virilio and Lotringer, *Pure War*, 33.

7 Saskia Sassen, "Analytic Borderlands: Economy and Culture in the Global City," *D: Columbia Documents of Architecture and Theory* 3 (1993): 9.

8 Brian Eno has proposed a simple formula: "If you want to make computers that really work, create a design team composed only of healthy, active women with lots else to do in their lives and give them carte blanche. Do not under any circumstances consult anyone who a) is fascinated by computer games b) tends to describe silly things as "totally cool" c) has nothing better to do except fiddle with those damn things night after night." Brian Eno, interviewed by Kevin Kelly in *Wired*, May 1995, 150.

9 "I ask myself, What is pissing me off about this thing? What's pissing me off is that it uses so little of my body. You're just sitting there, and its quite boring. You've got this stupid little mouse that requires one hand, and your eyes. That's it." Eno, *Wired* interview, 149.

10 Visualization is a product of software. If we accept the radical assertion of Friedrich Kittler that "there is no software" it would also seem to point in the direction of abstraction: "... this means that we use digital computers whose architecture is given to us in the form of a physical piece of machinery, with all its artificial constraints." Brosl Hasslacher, cited by Kittler in his "There is no Software," Lusitania 8, *Being on Line: Net Subjectivity*, ed. Alan Sondheim (1997): 44.

11 Vivian Sobchak, "The Scene of the Screen: Towards a Phenomenology of Cinematic and Electronic Presence," *Post-Script* 10 (1990): 56; emphasis in the original.

12 Viktor Shklovsky, cited in Manfredo Tafuri, "The Dialectics of the Avant-garde: Piranesi and Eisenstein," *Oppositions* 11 (Winter1977): 79.

13 In this context it is interesting to note that the Turing machine (the hypothetical computing machine that is the conceptual basis of the modern digital computer) is capable of performing complicated relational functions (in fact of performing any computation) by means of serially repeated operations with only two symbols, conventionally 1 and 0. Paradoxically, it is only when the individual operations are simplified as far as possible that the incredible speed of the modern computer is achieved. For a description of the working of the Turing machine and its related

mathematical theorems see John L. Casti, *Five Golden Rules: Great Theories of 20th Century Mathematics—and Why They Matter* (New York: Wiley, 1996), chapter 4.

14 The term "algebra" derives from the Arabic *al-jebr*, "the reunion of broken parts," and is defined as "the branch of mathematics that uses the positive and negative numbers, letters, and the systematized symbols to express and analyze the relationship between concepts of quantity in terms of formulas, equations, etc.; generalized arithmetic." "Geometry" on the other hand is a word of Greek origin, and is defined as "the branch of mathematics that deals with points, lines, planes, and solids, and examines their properties, measurement, and mutual relations in space." Word origins and definitions from *Webster's New World Dictionary* (Cleveland: World Publishing, 1966).

15 Discussion of the Christaller model taken from Ilya Prigogine and Isabelle Stengers, *Order out of Chaos: Man's New Dialogue with Nature* (New York: Bantam Books, 1984), 197ff.

16 M. Mitchel Waldrop, *Complexity: The Emerging Science at the Edge of Order and Chaos* (New York: Simon and Schuster, 1992), 240–41; emphasis in the original.

17 "One of the essential characteristics of the dream of multiplicity is that each element ceaselessly varies and alters its distance in relation to the others. . . . These variable distances are not extensive quantities divisible by each other; rather, each is indivisible, or 'relatively indivisible,' in other words, they are not divisible above or below a certain threshold, they cannot increase or diminish *without changing their nature*." Gilles Deleuze and Félix Guattari, *A Thousand Plateaus*, trans. Brian Massumi (Minneapolis: University of Minnesota Press, 1987), 30–31; emphasis in the original.

18 Michel de Certeau, "Indeterminate," in his *The Practice of Everyday Life*, trans. Steven F. Rendall (Berkeley: University of California Press, 1984), 201.

notes to essay by diana agrest

1 We could count four, if we consider models.

2 See for example Jonathan Crary, *Techniques of the Observer* (Cambridge, MA: MIT Press, 1996).

3 Diana Agrest, *Architecture from Without* (Cambridge, MA: MIT Press, 1991), 111.

4 Stan Allen, "Plotting Traces: On Process."

5 Leon Battista Alberti, *The Ten Books of Architecture* (1485). Reprint of the Leoni Edition of 1755, ed. Joseph Rykwert (London: Alex Tiranti, 1965), 12.

6 Jacques Lacan, *The Four Fundamental Concepts of Psycho-Analysis*, trans. Alan Sheridan (New York/London: Norton, 1981), 73.

7 Ibid.

8 Stan Allen, "Le Corbusier and the Modernist Movement."

9 Hubert Damisch, *Skyline: La Ville Narcisse* (Paris: Editions du Seuil, 1996), 164.
10 Damisch, Ibid.
11 Damisch, *Skyline*, 115. Diana Agrest, "The Return of (the Repressed) Nature," in *The Sex of Architecture*, ed. Diana Agrest, Patricia Conway, and Leslie Kanes Weisman (New York: Abrams, 1996), 50, 58.
12 Damisch, *Skyline*, 108. Agrest, *Architecture from Without*, 83,109.
13 Jacques Lacan, *Psycho-Analysis*, 84.
14 Mario Gandelsonas, *X-Urbanism* (New York, Princenton Archictureal Press, 1999), p. 68.
15 This is developed in more detail in Agrest, *Architecture from Without*, 162, 167.
16 Stan Allen, "Mapping the Unmappable: On Notation."
17 Diana Agrest, "Design versus Non-Design," *Oppositions* 6 (Fall, 1976).
18 Stan Allen, "Terminal Velocities: The Computer in the Design Studio."
19 Gandelsonas, "X-Urbanism," p. 38.

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Director of Graduate Studies, SciArc, Los Angeles

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