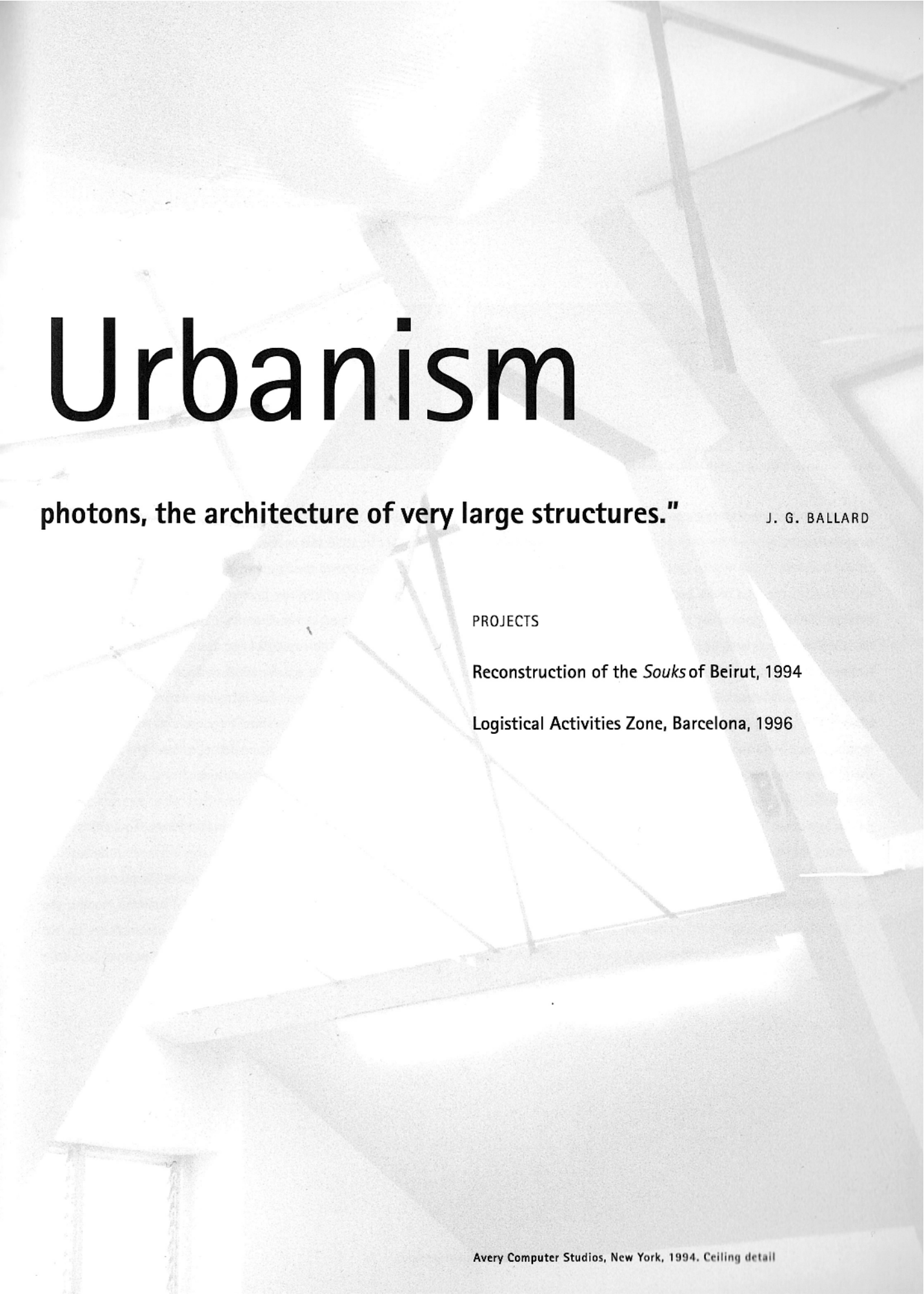


Infrastructural

"Think only of essentials: the physics of the gyroscope, the flux of



Urbanism

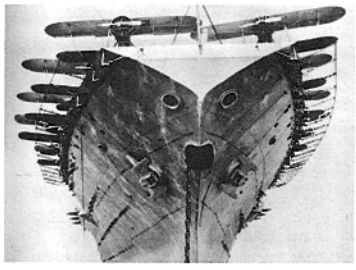
photons, the architecture of very large structures."

J. G. BALLARD

PROJECTS

Reconstruction of the *Souks* of Beirut, 1994

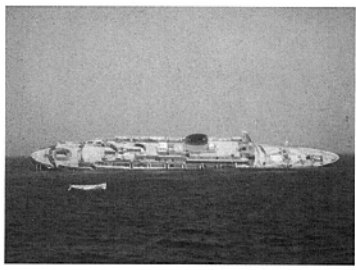
Logistical Activities Zone, Barcelona, 1996



Aircraft Carrier USS Lexington

I start with a sequence of three images spanning six decades of the twentieth century:

FIRST IMAGE: the bow of an aircraft carrier, shot from below. The bulk of the craft looms over an invisible horizon, a blank open-mouthed face stares back at the viewer. Published in 1935, in a collection edited by Le Corbusier, the caption reads: "Neptune rises from the sea, crowned with strange garlands, the weapons of Mars."¹ This photograph of the American aircraft carrier *USS Lexington* stands for a moment in which the technical and the aesthetic formed a unified whole. It presents the instrumentality of advanced engineering design and the organization of the forces of production that made construction at this scale possible—processes inescapably linked to the war machine—as fully integrated into a meaningful cultural and aesthetic framework, even to the point of establishing continuity with classical mythology.



Liner Andrea Doria aground off Nantucket, 1956

SECOND IMAGE: the liner *Andrea Doria* foundering off the coast of Nantucket in 1956 (taken over twenty years after the first image, still closer in time to the heady world of prewar modernism than to our cynical end-of-century postmodernism). Recalling the iconic status of the liner in the theories of modern architecture, this image could be emblematic of the foundering of the modernist project in the postwar era. By 1956, under the shadow of the Cold War, the modernist dream of an integration of technology and aesthetics was no longer believable. The social and technical forces of modernity were about to become detached from the production of images, both in popular and high culture.

THIRD IMAGE: B-24 bomber factory in Fort Worth, Texas. This aerial view of the factory floor documents the implementation of the modernist dream of rational production under the pressures of the wartime economy: the precise calibration of material, bodies, and time that allowed such incredibly efficient production—"on the front line, and on the production line," as the promotional copy



B-24 Bomber Factory, Fort Worth, Texas, 1944

says. "One B-24 Bomber every four hours": a mechanical ballet performed in this limpid space of production. The space is the exact counterpart to the rational machines produced within it, organized by the infinite perspective of a perfect panoptic transparency, sheltered by the rational tectonics of the factory structure itself. However, it is important to note that this image appears not in its original 1940s context, but in the early 1990s, illustrating an advertisement to raise money for the reconstruction of a *single* B-24 bomber for exhibition purposes. As such, it marks a shift from technologies of production to technologies of reproduction and display. If the factory floor is the ideal space of early modernism, then the museum is the emblematic space postmodernity.

It is this perceived failure of the modernist project that serves to legitimate the subsequent turn toward a postmodern culture of abstract signs and surfaces without depth. In architecture, the consequence of the shift from technologies of production to technologies of reproduction was given expression as an architecture that produced meaning by the grafting of conventional signs onto a

neutral technical frame. These images mark a shift from models of formal organization and meaning that work with transparency and depth, to a condition of shallow surfaces, in which meaning resides in graphic information lying on the surface.

But is it not equally plausible to conceive of this shift not as modernism's failure, but as a paradoxical success? Modernity tended toward abstract systems of exchange and serial production. The passage from concrete, material things to ephemeral signs—the dissolution of objects into flows of information—was in many ways already anticipated by the abstract logics of modernity itself. However, the particular form that this transformation takes is not anticipated, nor can it ever be fully controlled from within modernism. Some reassessment is required.

Postmodernism in architecture is usually associated with a rediscovery of architecture's past. However, an equally important shift preceded and in many ways underwrote the postmodern turn to history at the end of the sixties.² Postmodernism responded not only to a call to re-inscribe architecture into history, it also

responded to a contemporary demand for *meaning* in architecture. History provided a ready-made catalog of "meaningful" forms, but in order for the past to be appropriated and utilized, it had to be detached from its original context and converted into a sign. More than historical reference, it is the presence of this semiotic/structuralist model that identifies postmodernism in architecture. But once architecture's signifying capacity had been opened up, no limit could be placed on signified content. "History" is but one of the many things that a semiotic architecture can signify.

This turn toward a semiotic architecture at the end of the sixties and the beginning of the seventies has itself been subject to intense critical scrutiny—from both a formal and an ideological point of view. But even the most radical critiques have left the fundamental assumption that architecture behaves like a discursive system intact. Deconstruction's radical claim to contest the very possibility of meaning in architecture, for example, was a claim carried out over the territory of meaning and representation, and pays little attention to architecture's instrumentality, or to the complex traffic between representation and materiality. Meaning today may be multiple, contested, contaminated, and partial, but meaning is still the issue.

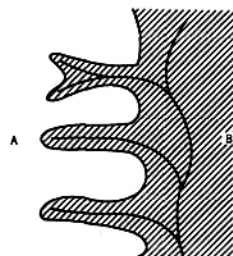
Nevertheless, an architecture that works exclusively in the semiotic register and defines its role as critique, commentary, or even "interrogation" (laying bare of the intricacies of architecture's complicity with power and politics) has, in some fundamental way,



Intercoastal Waterway, Fort Lauderdale, Florida, 1956–57

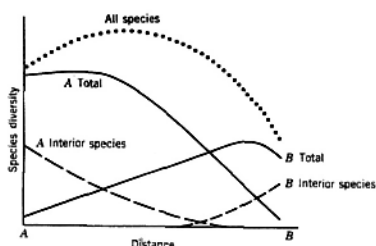
given up on the possibility of ever *intervening* in that reality. Under the dominance of the representational model, architecture has surrendered its capacity to imagine, to propose, or to construct alternative realities. As Robin Evans has remarked, a building was once "an opportunity to improve the human condition;" now it is conceived as "an opportunity to express the human condition."³ Architecture is understood as a discursive system that expresses, critiques, or makes apparent the hard realities of a world that is held safely at arm's length.

One effect of this shift toward images and signs is that architecture's disciplinary frame shifts. It finds itself in competition with other discursive media—painting, film, literature, the Internet, performance art—a field in which architecture often seems to come up short. What these other media lack, of course, is architecture's powerful instrumentality—its capacity not only to critique, but also to actually transform reality. Architecture's relationship to its material is, however, indirect. Unlike activities such as gardening or woodworking, where something concrete is made by direct contact



RIGHT: Richard T. T. Foreman, landscape ecology diagrams

BELOW: Watauga Dam (Tennessee Valley Authority), proposed location, 1946



with the material, the architect (like the engineer, the urbanist, or the ecologist) operates on reality at a distance, and through the mediation of abstract systems such as notation, projection, or calculation. Indirect contact is the necessary counterpart to the larger scale of intervention. Architecture works simultaneously with abstract images and with material realities, in complex interplay. It is a *material practice*.

It is not entirely coincidental that the twenty-five year period coinciding with the rise of postmodernism in architecture has seen a massive defunding of urban infrastructure. In the United States, public investment in civic works—highways, railroads, water supply and control, land reclamation, mass transit—is at an all time low. While architects cannot logically be held accountable for these complex political and economical shifts, it might be argued that by the production of a theoretical framework to justify an architecture of surface and sign, architects have, consciously or not, participated in their own marginalization. If architects assert that signs and information are more important than infrastructure, why would bureaucrats or politicians disagree? As much as they have been excluded from the development of the city, architects themselves have retreated from questions of function, implementation, technique, finance, and material practice. And while architects are relatively powerless to provoke the changes necessary to generate renewed investment in infrastructure, they *can* begin to redirect their own imaginative and technical efforts toward the questions of infrastructure. A toolbox of new and existing procedures can be

expanded by reference to architecture's traditional alliance with territorial organization and functionality.

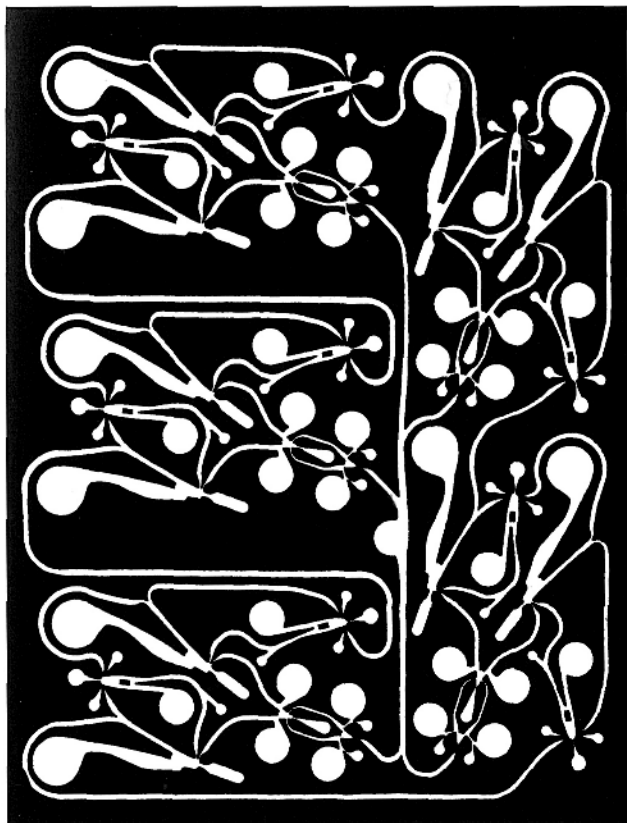
This is the context within which I want to situate the shift in recent practice toward infrastructure. Going beyond stylistic or formal issues, infrastructural urbanism offers a new model for practice and a renewed sense of architecture's potential to structure the future of the city. Infrastructural urbanism understands architecture as *material practice*—as an activity that works in and among the world of things, and not exclusively with meaning and image. It is an architecture dedicated to concrete proposals and realistic strategies of implementation and not distanced commentary or critique. It is a way of working at the large scale that escapes suspect notions of master planning and the heroic ego of the individual architect. Infrastructural urbanism marks a return to instrumentality and a move away from the representational imperative in architecture.

This does not imply a simple return to the now discredited certainties of modernism. Two claims can be made: first, that architecture's instrumentality can be reconceived—not as a mark of modernity's demand for efficient implementation but as the site of architecture's contact with the complexity of the real. By immersing architecture in the world of things, it becomes possible to produce what Robin Evans, paraphrasing Lyotard, has referred to as a "volatile, unordered, unpoliceable communication that will always outwit the judicial domination of language."⁴ The second claim is for a practice engaged in time and process—a practice not devoted

to the production of autonomous objects, but rather to the production of directed fields in which program, event, and activity can play themselves out.

In an interview conducted fifteen years ago, Michel Foucault noted that "Architects are not the engineers or technicians of the three great variables: territory, communication and speed."⁵ While it is hard to argue Foucault's point as an assessment of the current condition, it deserves to be pointed out that historically this has not been the case. Land surveying, territorial organization, local ecologies, road construction, shipbuilding, hydraulics, fortification, bridge building, war machines, and networks of communication and transportation were all part of the traditional competence of the architect before the rise of disciplinary specialization. Territory, communication, and speed are properly *infrastructural* problems, and architecture as a discipline has developed specific technical means to deal effectively with these variables. Mapping, projection, calculation, notation, and visualization are among architecture's traditional tools for operating at the very large scale. These procedures can be reclaimed for architecture, and supplemented with new technologies of design and simulation now available.

But rethinking infrastructure is only one aspect of a larger move away from the representational model, one of the many implications of architecture understood as a *material practice*. Material practices (ecology or engineering for example) are concerned with the behavior of large scale assemblages over time. They do not work primarily with images or meaning, or even with



Computer flow diagram

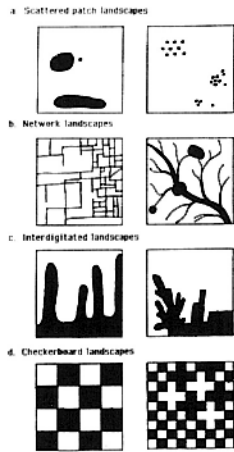
objects, but with *performance*: energy inputs and outputs, the calibration of force and resistance. They are less concerned with what things look like and more concerned with what they can do. Although these material practices work instrumentally, they are not limited to the direct manipulation of given material. Instead they project transformations of reality by means of abstract techniques such as notation, simulation, or calculation. Material practices organize and transform aggregates of labor, materials, energy and resources, but they work through necessarily mediated procedures—operations of drawing and projection, for example—that leave their trace on the work. Material practices deploy an open catalog of techniques without preconceived formal ends.

53

In architecture and urbanism, technique does not belong to an individual but to the discipline as a whole. As Foucault has reminded us, techniques are social before they are technical. Hence, to think of architecture as a material practice does not mean leaving questions of meaning entirely behind. Architecture works with cultural and social variables as well as with physical materials, and architecture's capacity to signify is one tool available to the architect working in the city. But material practices do not attempt to control or predetermine meaning. Instead, they go beyond the paradoxes of the linguistic to examine the effects of signifying practices on performance and behavior. Material practices are not about expression—expressing either the point of view of an author or of the collective will of a society; rather they condense, transform, and materialize concepts.⁶

RIGHT: Richard T. T. Foreman, landscape ecology diagrams

BELOW: Carquinez Bridge Approach, Crockett, California, 1958



Architecture is uniquely capable of structuring the city in ways not available to practices such as literature, film, politics, installation art, or advertising. Yet because of its capacity to actualize social and cultural concepts, it can also contribute something that strictly technical disciplines such as engineering cannot. When Walter Benjamin writes that "construction fulfills the role of the unconscious," he articulates the capacity of certain structures to act as a scaffold for a complex series of events not anticipated by the architect—meanings and affects existing outside of the control of a single author that continuously evolve over time.

SEVEN PROPOSITIONS

In retrospect, I really think that we are now dealing with the same issues again, after the "semantic nightmare."

REM KOOLHAAS, 1991

1. Infrastructure works not so much to propose specific buildings on given sites, but to construct the site itself. Infrastructure prepares the ground for future building and creates the conditions for future events. Its primary modes of operation are: the division, allocation, and construction of surfaces; the provision of services to support future programs; and the establishment of networks for movement, communication, and exchange. Infrastructure's medium is geography.

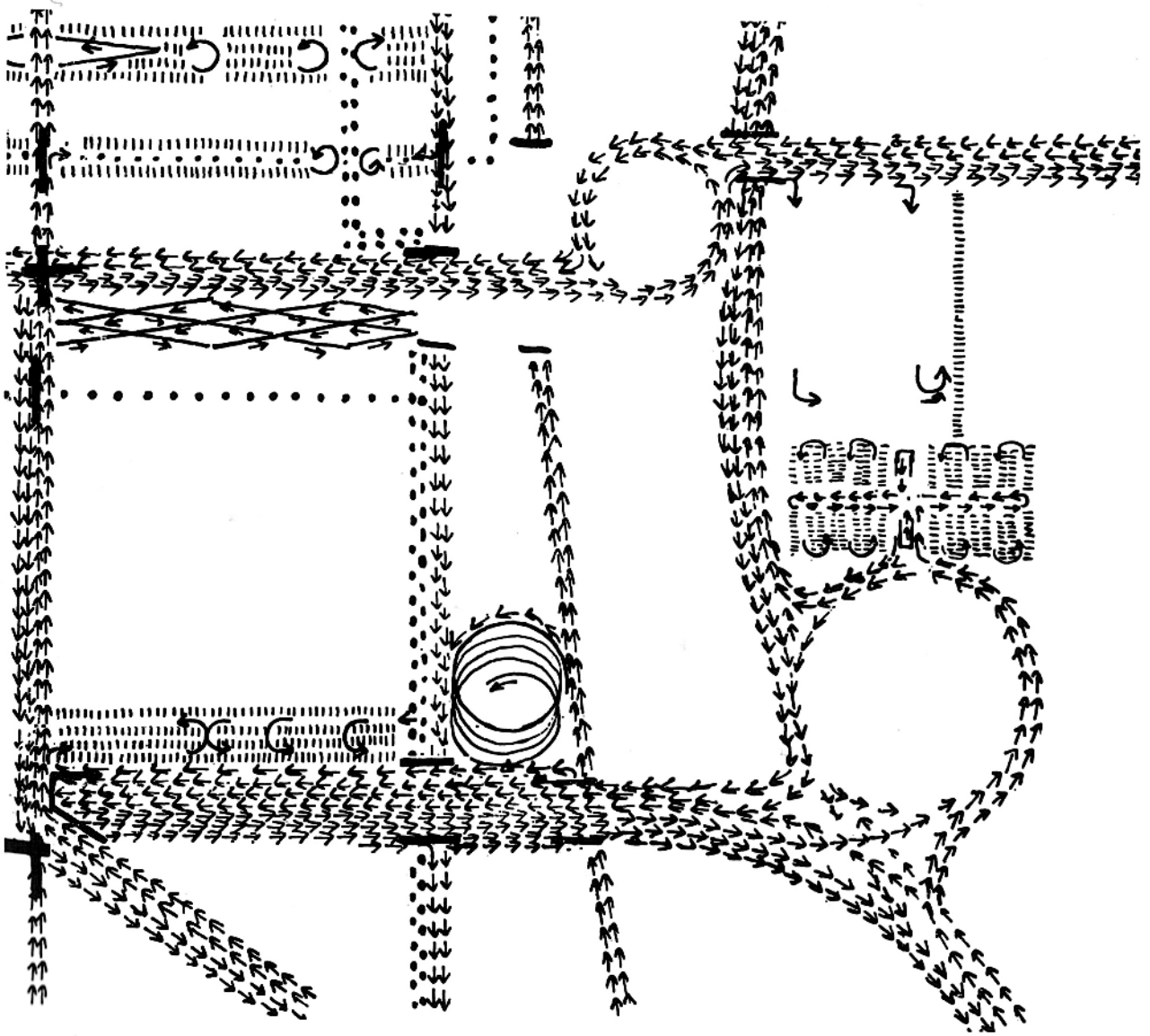
2. Infrastructures are flexible and anticipatory. They work with time and are open to change. By specifying what must be fixed and what is subject to change, they can be precise and indeterminate at the same time. They work through management and cultivation, changing slowly to adjust to shifting conditions. They do not progress toward a predetermined state (as with master planning strategies), but are always evolving within a loose envelope of constraints.

3. Infrastructural work recognizes the collective nature of the city and allows for the participation of multiple authors. Infrastructures give direction to future work in the city not by the establishment of rules or codes (top-down), but by fixing points of service, access, and structure (bottom-up). Infrastructure creates a directed field where different architects and designers can contribute, but it sets technical and instrumental limits to their work. Infrastructure itself works strategically, but it encourages tactical improvisation. Infrastructural work moves away from self referentiality and individual expression toward collective enunciation.

4. Infrastructures accommodate local contingency while maintaining overall continuity. In the design of highways, bridges, canals, or aqueducts, for example, an extensive catalog of strategies exist to accommodate irregularities in the terrain (doglegs, viaducts, cloverleaves, switchbacks, etc.), which are creatively employed to

accommodate existing conditions while maintaining functional continuity. Nevertheless, infrastructure's default condition is regularity—in the desert, the highway runs straight. Infrastructures are above all pragmatic. Because it operates instrumentally, infrastructural design is indifferent to formal debates. Invested neither in (ideal) regularity nor in (disjunctive) irregularity, the designer is free to employ whatever works given any particular condition.

5. Although static in and of themselves, infrastructures organize and manage complex systems of flow, movement, and exchange. Not only do they provide a network of pathways, they also work through systems of locks, gates, and valves—a series of checks that control and regulate flow. It is therefore a mistake to think that infrastructures can in a utopian way enable new freedoms, that there is a possibility of a net gain through new networks. What seems crucial is the degree of play designed into the system, slots left unoccupied, space left free for unanticipated development. This also opens the question of the formal description of infrastructural systems: infrastructures tend to be hierarchical and tree-like. However, there are effects of scale (a capillary effect when the elements get very numerous and very small) and effects of synergy (when systems overlap and interchange), both of which tend to produce field conditions that disrupt the overall tendency of infrastructural systems to organize themselves in linear fashion.



Louis Kahn: movement diagrams, Philadelphia Planning Study.

6. Infrastructural systems work like artificial ecologies. They manage the flows of energy and resources on a site, and they direct the density and distribution of a habitat. They create the conditions necessary to respond to incremental adjustments in resource availability, and modify the status of inhabitation in response to changing environmental conditions.

7. Infrastructures allow detailed design of typical elements or repetitive structures, facilitating an architectural approach to urbanism. Instead of moving always down in scale from the general to the specific, infrastructural design begins with the precise delineation of specific architectural elements within specific limits. Unlike other models (planning codes or typological norms for example) that tend to schematize and regulate architectural form and work by prohibition, the limits to architectural design in infrastructural complexes are technical and instrumental. In infrastructural urbanism, form matters, but more for what it can do than for what it looks like.

"The time has come to approach architecture urbanistically and urbanism architecturally"⁷

NOTES:

1. Le Corbusier, *Aircraft* (1935; reprint New York: Universe Books, 1988), illustration 18.
2. Robert Venturi, *Complexity and Contradiction in Architecture* (New York: The Museum of Modern Art, 1966); Colin Rowe and Fred Koetter, *Collage City* (Cambridge, MA: MIT Press, 1978). Note that the text to *Collage City* was completed in 1973 and widely circulated before the publication of the book.
3. "Words like investigation, enquiry and interrogation, used much in describing what designers do, suggest that designing is a way of finding out, as if the process of design were conducted in some kind of mental laboratory in which the boundaries of knowledge were being pushed slowly but surely forward." Robin Evans, "Bad News," paper delivered at the Conference on Theory and Practice in the Work of John Hedjuk, Canadian Centre of Architecture, Montreal, 15 May 1992.
4. Robin Evans, *The Projective Cast* (Cambridge, MA: MIT Press, 1995), 91–2.
5. Michel Foucault, "Space, Knowledge, and Power," in *The Foucault Reader*, ed. Paul Rabinow (New York: Pantheon Books, 1984), 244.
6. In the terms of the distinction proposed by Gilles Deleuze, material practices are more concerned with the actualization of the virtual than with the realization of the possible. See Gilles Deleuze, *Bergsonism*, trans. Hugh Tomlinson and Barbara Habberjam (New York: Zone Books, 1989), 97. On the subject of virtuality, and on a number of other points, I have referred to Michael Speaks, "Redirecting the Global Space of Flows," paper given at the Berlage Institute, Amsterdam, 28 October 1997.
7. Alison Smithson, ed., *Team 10 Primer* (Cambridge, MA: MIT Press, 1968), 73. While an entire section of the *Primer* is devoted to "Urban Infrastructure," the primary subject is the problem of large-scale motorways. Nevertheless, Team 10's attention to questions of scale, use, movement and flow, and the evolution of the urban landscape over time make their thoughts an exemplary and obligatory starting point in any discussion of architecture and infrastructure.