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McHarg's Entropy, Halprin's Chance: Representations of Cybernetic Change in 1960s Landscape Architecture

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McHarg's entropy, Halprin's chance: representations of cybernetic change in 1960s landscape architecture

MARGOT LYSTRA

Introduction

The ideas and representational practices of Ian L. MchHarg and Lawrence Halprin fostered innovative relationships between landscape architects and the temporalities of landscape. But such innovations were not MchHarg's and Halprin's alone. On the contrary, their works illustrate how new approaches to landscape architectural design often emerge and develop through the influence of other disciplines. The following text considers the 1960s influence of cybernetics on MchHarg's and Halprin's conceptual and representational work, illustrating how cybernetic tensions between uncertainty and control were introduced into landscape architecture.

Two drawings open this investigation. [Figure 1](#), originally part of MchHarg and David A. Wallace's 1963 Greater Baltimore 'Plan for the Valleys', warns against rampant urban sprawl. It is a portrait of systematic development whose complexity has dangerously eluded the grasp of wise planning. [Figure 2](#), a sketch by Halprin of a California waterfall's structure and flow, captures and distills material interrelations within a complex environment. These two depictions of systematic complexity are of different kinds: one a plan-view polemic, the other a sketch of a natural feature. They also reveal situations in which different futures were at stake. MchHarg was concerned with the threat of environmental devastation. The MchHarg/Wallace drawing associated ecologically destructive suburban development with an inability to constrain growth and change over time — a failure to control landscape change. In contrast, Halprin was concerned with experiential interrelations between

humans and the natural world. His sketch investigated the aesthetics of landscape complexity, thereby celebrating the indecipherability of landscape change. These drawings both represent systems so complex that they challenge legibility. Yet this complexity was understood in different ways, and towards different ends. Such differences — and the drawing practices that reinforced them — point to a range of new strategies for representing landscape change developed by landscape architects throughout the 1960s.¹

The interdisciplinary concepts and methods of cybernetics — the study of communication and control in living and mechanical systems — were notably influential during this decade. As environmentalism, technological advancement, and new levels of citizen involvement influenced how landscape architects engaged sites, landscape change over time became a particular point of concern. Acknowledging this change altered how landscape architects understood landscape, and spurred new methods for representing and engaging it. As landscape architects developed these new methods, they drew on practices and approaches from a wide range of influences, from the sciences to the arts. Often, the fields from which landscape architects drew had incorporated cybernetic perspectives; thus when landscape architects borrowed from other disciplines, their work inherited cybernetic ideas and methods. With cybernetics came new ideas and methods regarding the agency of humans in relation to shifting and unpredictable environments.

Thus, influenced by cybernetic concepts of change, MchHarg and Halprin manifested two similarly systematic, yet notably contradictory, ways of relating to landscape. They explored the same tension between landscape's temporality



FIGURE 1. 'Spectre of Uncontrolled Growth', detail. Published in McHarg and Wallace's 'Plan for the Valleys vs. Spectre of Uncontrolled Growth' (*Landscape Architecture*, April 1965, pp. 179–181), this image was used to represent the worst-case scenario for development in the greater Baltimore area. Ian L. McHarg Collection, *The Architectural Archives*, University of Pennsylvania. Permission to reuse must be obtained from the rightsholder.

and the landscape architect's control, yet they developed significantly different attitudes regarding the ability to predict and manage landscape change over time. Through McHarg, Halprin, and others like them, cybernetics bequeathed the field of landscape architecture with a question: to what degree can — or should — the landscape architect control a rapidly changing natural world?

McHarg and Halprin are particularly useful figures for tracking this tension. Both wrote extensively, seeking to create coherent models of landscape change and the landscape architect's role within it. Both experimented with new representational practices, exploring their potential to define, constrain, and release different aspects of landscape change. Finally, both were influential in

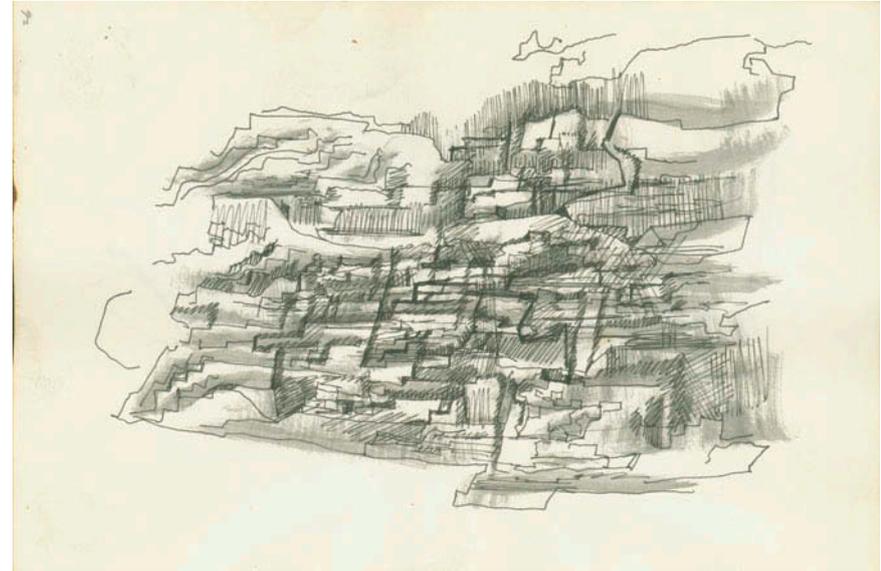


FIGURE 2. Lawrence Halprin, creek sketch, 1964. This is one of many free-form sketches of California creeks in which Halprin explored relationships between geology and water flow. Lawrence Halprin Collection, *The Architectural Archives*, University of Pennsylvania. Permission to reuse must be obtained from the rightsholder.

the development of their field.² Their 1960s writings and drawings embody disciplinary themes and tensions that would become familiar in later decades — and for many landscape architects, are still familiar today.³

Understanding how cybernetics influenced McHarg's and Halprin's work involves two key cybernetic concepts — entropy and chance. These are temporal terms — they engage mobility, uncertainty, and change. They are also systematic and relational, involving connections and interactions among parts of a whole. McHarg adopted the term 'entropy' and Halprin embraced 'chance' in order to construe and define relationships between the designer and the temporal uncertainty of landscape change. Tracking these two concepts through text and image reveals how each landscape architect characterized the temporality of natural systems; how he perceived his role relative to landscape; and how the drawing practices he promoted both enacted and reinforced this role. Both McHarg's and Halprin's applications of these concepts assumed the

fluctuation of landscape. At the same time, they brought another form of fluctuation into question — that of the relationship between landscape and designer. Should the designer's drawing practices enact this relationship as something stable, or shifting?⁴

The 1960s: landscape architecture and cybernetics

The 1960s was a decade of transformation for the field of landscape architecture. Federal funding for highway infrastructure and related increases in suburban development led to large-scale landscape projects. As a result, many landscape architects began cultivating strategies for designing and planning at the regional scale. At the same time, a rapid rise in popular environmentalism brought new opportunities and expectations to the field, creating novel roles for landscape architects who could incorporate systematic, scientific approaches into their work. Materials, technologies, and availability of site data also changed rapidly during this period, due in part to wartime inventions. The use of computers in design, while still rudimentary, was on the rise: by the late 1960s some landscape architects were experimenting with their applications in data management and representation.⁵

Responding to these changes and seeking to capture new clients and opportunities, landscape architects embraced experimentation and innovation. New sub-fields began to emerge, such as environmental design and community design.⁶ Both these areas were concerned with unpredictable landscape conditions: one sought to protect dynamic ecosystems from rapid development, while the other sought to respond to shifting political negotiations regarding urban land use. The profession's focus shifted away from modernist site design towards stewardship, planning, mediation, and land management.

In order to generate new working methods, some landscape architects looked to other fields for inspiration, including some disciplines that borrowed from cybernetics. The field of cybernetics emerged out of World War II weapons engineering. Conducting research for the US military, MIT mathematician Norbert Wiener sought to build an anti-aircraft machine intended to improve firing accuracy by anticipating the movements of enemy airplanes. Wiener and others continued to research the use of dynamic feedback loops to direct and control multi-part electrical and communication systems after the end of the war. Studies of feedback in complex systems continued to be

supported by a robust military-industrial complex, and saw enormous development in the postwar USA. Cybernetic ideas and methods were disseminated through conferences and publications, becoming popular in a wide variety of fields, including biology, anthropology, and the arts.⁷

Wiener's work promoted a concern that would become central to cybernetics: using feedback to direct and control complex systems. Diagrams representing such systems used boxes to depict parts of a whole, with arrows representing the movement of information or electricity between the parts. Such diagrams displayed feedback — a doubling back through which the interaction of aggregated parts generated a responsive, dynamic system.

In order to maintain control over a given system, cyberneticians often sought to manage that system's entropy — its tendency towards disorder and uncertainty. Entropy was understood to be inherent to dynamic systems. Entropy also thwarted control, because it introduced unpredictable interactions. How to manage entropy thus became a central cybernetic concern, prompting extensive debate regarding tensions between entropic complexity and user control. A pair of diagrams (figure 3) by early cyberneticians Gregory Bateson and Margaret Mead exemplifies these very tensions, focusing on a classic cybernetic conflict between management and participation. The diagram above places the engineer outside the system. This position enables the engineer to exercise complete knowledge of the system, and thereby reliably practice containment and management. The diagram below, by placing the engineer within the system, disables their ability to see the whole — positioning them in a role of reciprocity and uncertainty relative to the system they observe. These two models compare the degree to which humans can — or should — control complex systems. For many cyberneticians, this question was not thought to be a mere matter of engineering. On the contrary, owing to the field's early interdisciplinarity, cybernetic debates often addressed broader relationships among humans, machines, and the natural world.

Cybernetics reached McHarg and Halprin through two very different interdisciplinary migrations: one via scientific ecology, the other via the arts. Through these two distinct paths of cybernetic influence, each landscape architect would find new models for their approaches to landscape change. These influences were manifested in McHarg's and Halprin's writings and representational practices.

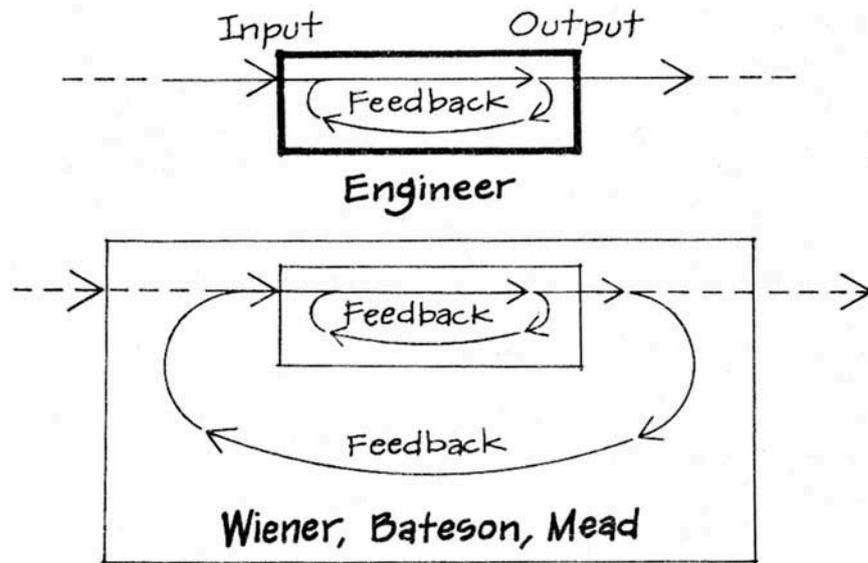


FIGURE 3. Gregory Bateson and Margaret Mead, cybernetic diagram. The diagram above represents a 'closed system', in which the system engineers believe that their actions do not necessarily influence the system; the diagram below represents an 'open system', in which the system engineers believe their actions are inevitably interrelated with the system. Reproduced from Stewart Brand, Gregory Bateson and Margaret Mead, 'For God's Sake, Margaret: Conversation with Gregory Bateson and Margaret Mead', *CoEvolutionary Quarterly*, 6/10, 1976, pp. 32–44. Permission is given by the Bateson Idea Group. Permission to reuse must be obtained from the rightsholder.

Cybernetic ecology and McHarg's entropy

From the postwar years through the 1960s, cybernetics became highly influential in scientific ecology. One of the early members of the influential Macy Cybernetic Conferences was ecologist G. Evelyn Hutchinson, whose paper 'Circular Causal Systems in Ecology' modeled the cycling of nutrients through a living ecosystem. Elaborating on Hutchinson's approach, his student Howard (H. T.) Odum integrated cybernetic notions of feedback and communication into ecological models. H. T. Odum practiced data based ecosystem modeling, creating distilled, diagrammatic, manipulable representations of ecosystem activity. These models drew extensively from cybernetic theories: they referenced relationships between entropy and order, often directly borrowing from

cybernetic diagrams of electrical circuits in order to describe ecosystem dynamics. Depicting highly complex ecologies with circuit metaphors, well-defined frames, and closed cycles, H. T. Odum sought to understand ecosystems as precise, contained, and directable entities. In this way he became an advocate for the 'management and control' side of the cybernetic debate illustrated by Bateson and Mead.⁸

The collaborative research of H. T. Odum and his brother Eugene also emphasized the predictability and control of natural systems. Their projects were well funded, receiving economic support from the Atomic Energy Commission and a newly emergent National Science Foundation. They also published extensively, producing what became the primary ecology textbook for more than a decade. In short, Eugene and H. T. Odum would eventually become two of the most influential figures in the field of ecology.⁹ Together they knitted a cybernetic tension between uncertainty and control into their field.

The Odums' work was also influential in the development of environmental design.¹⁰ Beginning in the 1960s and continuing in the following decades, environmental design ideas increasingly circulated through the profession and teaching of landscape architecture, disseminated through research, writing, and drawings.¹¹ Finding inspiration and precedent in the late nineteenth-century works of Frederick Law Olmsted and Charles Eliot, landscape architects developed environmental design approaches that integrated planning techniques and ecological principles in order to illustrate and address environmental aspects of large-scale development projects.¹² These landscape architects often collaborated with ecologists, foresters, hydrologists, and geologists to collect and array data. They explored a wide range of representation methods that could capture complex interactive phenomena, such as ecosystem types, rates of flow, wildlife distributions, and land uses. The results were measurable, action-oriented data sets that provided abstract representations of complex, changing natural systems. Plan-view overlay drawings were often used as proxies for shifting landscape conditions, and analyzed in order to make decisions regarding a site's ideal management and modifications.¹³

In the 1960s, many landscape architects felt that environmental design methods were nothing short of revolutionary.¹⁴ Ian L. McHarg was perhaps the most outspoken on this matter. In writings, presentations, and teaching he repeatedly argued that ecology offered a new conceptual framework and motivation for design. In his 1965 article 'An Ecological Method for

Landscape Architecture' McHarg proposed that with the arrival of ecology, 'the caprice and arbitrariness of "clever" designs can be dismissed forever. In short, ecology offers emancipation to landscape architecture'.¹⁵ According to McHarg, ecology's systematic method provided a means for completely reforming landscape architectural design, for it had the potential to simultaneously provide 'the perception of form, an insight to the given form, [and] implication for the made form'.¹⁶ Indeed, McHarg's discourse was packed with references to ecological ideas. He cited the Odums in his books, and their texts were required reading in many of his courses.¹⁷

The influence of cybernetics via ecology is apparent in McHarg's abundant use of the term 'entropy'. Susan Herrington has noted that McHarg used biologist Lawrence Henderson's notion of 'fitness' to argue that stability was an ecosystem's optimal condition.¹⁸ In addition, McHarg often used the term 'entropy' in opposition to 'fitness' — posing it as a threat to the healthy, balanced functioning of a living system. McHarg's use of 'entropy' reveals a chain of cybernetic influence, for Wiener, Odum, and McHarg all made recurring use of the term, and they all linked it to destruction.

For Wiener, entropy was a threat to a system's organization: 'in control and communication we are always fighting nature's tendency to degrade the organized and to destroy the meaningful; the tendency ... for entropy to increase'.¹⁹ For Odum, entropy was an inherent part of any system, but one whose limitation was essential to ecosystem success. He wrote: 'a patch of forest is a mysterious thing ... holding itself against dispersion, oscillating in a low entropy state, getting its daily quota of free energy from the sun. It is an ecosystem'.²⁰ McHarg not only echoed Odum's sentiments regarding entropy, but also amplified them, associating entropy with destruction as Wiener had done. For McHarg: 'creation involves the raising of matter and energy from lower to higher levels of order. Retrogression and destruction consist of reduction from the higher levels of order to entropy'.²¹ According to all three men, a system was inevitably entropic — but entropy was also a danger to the system's stability, and stability was associated with wellbeing. The individual — whether mathematician, scientist, or landscape architect — had a responsibility to facilitate order by constraining the entropic tendencies of the dynamic system.

The representational methods espoused by McHarg also integrated cybernetic/ecological thinking in a range of ways. Borrowing ecological methods and motifs, the site analyses conducted in his studios collected, arrayed, and

interpreted data in order to make decisions regarding land management and planning. The Odums' diagrams appeared in studio work — one such diagram was directly incorporated into student presentation boards for McHarg's 1967 Delaware River Basin Study II Studio.²² Such emulation was not limited to moments of rote reproduction — on the contrary, the Odums' work appears to have inspired a range of representational strategies. Comparing drawings from McHarg's mid-1960s projects with those from the Odums' 1953 *Fundamentals of Ecology* reveals notable similarities. Both enmeshed spatial references with numerical data; both focused on measurable characteristics; and both elided evidence of the human hand.

In order to resist entropic indeterminacy, McHarg's models embraced the measurable and controllable aspects of landscape systems. In such images (figure 4), demarcated boundaries zoned and parceled land according to different qualities. These drawings were often paired with ecological models that explained interactive significances. As a result, shifting conditions — seasonal flux, recreational uses, animal migrations — become fixed within the space of the drawing. Change over time was measured, marked, and defined as a condition of the past. Though reductive, analyses such as these were also remarkably inclusive, in that they were extraordinarily complex. They compiled a staggering amount of data into a large number of interrelated drawings, so that at a glance, it was impossible to discern the system's underlying logic. Substituting for such comprehension, the actions of measuring, containing, and cataloging were used to transform this complexity into a distilled set of information that could be objectively captured, viewed, predicted, and managed. In this way McHarg's models — like Odum's — simultaneously embraced temporal complexity and applied methods for its control.

McHarg's representational strategies developed most rapidly during the mid to late 1960s, primarily through experimental studio projects based on real-world clients and problems. As McHarg and his students refined environmental design processes, they progressively circumscribed the practice of drawing with requirements of categorization, defined rules of production, and new levels of mechanization. Tracing, cross-referencing, delineating, and coloring increasingly comprised the essential drawing actions in studio projects. When producing plan-view diagrams such as the one excerpted in figure 4, students traced over aerial imagery, reinterpreting fuzzy transitions between patterns as bound, delineated zones. These zones were then coded and colored according to

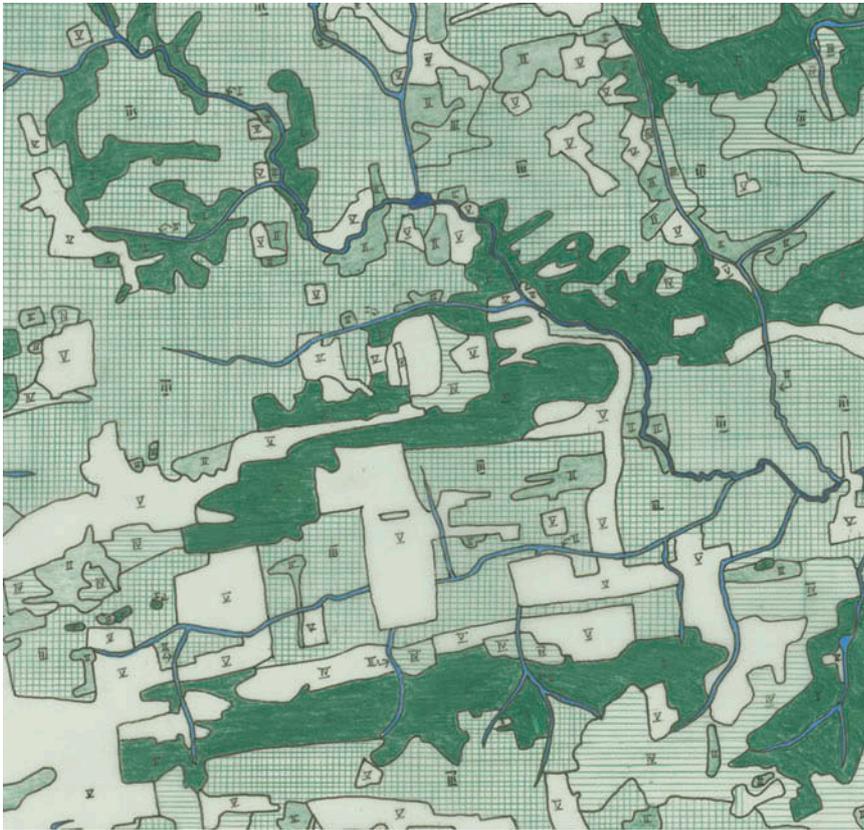


FIGURE 4. Excerpt, 'Unconfined Recreation', detail. Drawn by students in McHarg's 1968 Delaware River Basin III studio, this map rates the value of different demarcated areas for hiking, fishing, and camping. Ranking is based on whether areas contain woods or water, or are considered scenic. Graduate School of Fine Arts Collection, The Architectural Archives, University of Pennsylvania. Permission to reuse must be obtained from the rightsholder.

category, reflecting, for example, recreation activities likely to be associated with particular types of sites. Though some diagrams required calculation, such as when deriving a slope map from contour lines, more often the primary interpretive action was to decide where to locate a line within a narrow gradient. In some cases, government maps — soil maps, for example — already delineated zones, so students simply re-traced the maps. In representations such

as these, the potentially generative or decisive aspects of drawing were reduced to demarcating zones and selecting colors.²³

This reduced role for drawing practices in decision-making processes was accompanied by an amplified role for observation. Increasingly, analysis and design decisions were made not during the drawing process, but rather when analytically viewing compiled drawings after they were made. McHarg vaguely referenced this shift in his writings, when he asserted that the integration of ecology in design enabled 'the perception of form, an insight to the given form, [and] implication for the made form'.²⁴ Perception is clearly primary in this description, while making is put into an oddly ambiguous role — it is unclear here whether 'made form' is something that the designer should actually produce, or merely imply. Though not explicitly, this comment reinforces the prioritization of observation that McHarg espoused in his studios.

In addition to shifting the locus of decision making from drawing to observation, McHarg's approach to environmental design also assigned a particular role to ambiguity. Over time his studios jettisoned the gradients, nebulous edges, and loose shifts of tone seen in earlier environmental design work, replacing them with clearly outlined shapes.²⁵ The drawings themselves — with their specified categories and lack of overlap — elided ambiguity for the sake of visual clarity and apparent certainty. Within the visual document, ambiguity became quite literally invisible: it operated in the unseen interpretive actions and attitudes of the makers, but left no trace. In this way, too, objective seeing was emphasized — the clarity of imagery implied that their information was absolute, reinforcing a notion that the viewer could be certain about the veracity of the visual data they observed.²⁶ In these ways, the McHargian designer operated as if he/she could see — indeed, comprehend — the whole of the site. The designer's vision became associated with an ability to control landscape change, and the potential for the site being drawn to evolve in ways that were unpredictable, open, or evolving was reduced.

Cybernetic arts and Halprin's chance

Shortly after ecologists began employing cybernetic ideas, musicians, artists and dancers also began exploring their potential. This development was facilitated by several art and science collaborations that took place throughout the 1960s.

Events such as *9 Evenings: Theatre and Engineering*, sponsored by Bell Laboratories in 1966, brought artists, choreographers, and composers together with engineers in collaborative experimentation and performance.²⁷

Artists used cybernetic ideas in remarkably different ways than ecologists did: they found that cybernetic notions of indeterminacy offered methods for relinquishing, rather than increasing, control over their works. Many embraced chance as a catalyst for newly participatory and open-ended compositions. Composer John Cage and choreographer Merce Cunningham collaboratively used ‘chance operations’ to integrate uncertainty into the composition process. Cage had begun investigating circuit-based electronic music in the 1950s, recommending Wiener’s books to his students.²⁸ During this time he also worked with a cluster of composers called the New York School. Together they invented the open score, replacing the precision of traditional notation systems with visually evocative approximations that, rather than decisively directing the performer, suggested general intentions and potential interpretations. The open score embraced chance: it reduced the composer’s control and increased the musician’s experimentation, resulting in flexible and unpredictable performances.

Throughout the 1960s open scoring became increasingly popular, particularly through Cage’s influence. Many visual artists studied with him, adapting open scores for happenings and other art events. Influenced by both Cunningham and Cage, the experimental dance collaborative Judson Dance Theater explored open scoring as well.²⁹ Choreographer Anna Halprin was exposed to open scoring through several sources: she knew Cunningham, occasionally worked with Judson dancers, and collaborated with Cage’s former student La Monte Young. She also shared studio space and sometimes collaborated with members of the San Francisco Tape Music Center, a collective of musicians who explored the sound-making capacity of new technologies.³⁰

Lawrence Halprin’s explorations of chance emerged through both his growing interest in community design and his involvement, with his wife Anna Halprin, in the 1960s Northern California arts scene. Community design was taking form in the 1960s, as increasing citizen involvement in public projects brought about a growing demand for landscape architects who could negotiate community desires as part of the design process.³¹ While exploring community design processes, the Halprins also collaborated on experimental outdoor performance projects, building upon improvisational methods used by Anna Halprin’s colleagues. Among such colleagues, cybernetic thinking was certainly

‘in the air’ — but it was also in hand, enacted through new ways of working. Cybernetic ideas became manifest in a mix of technological experimentation, embrace of structures for relinquishing control, and explorative immersion in natural environments. Lawrence Halprin’s experiments in engaging landscape uncertainty often operated at the intersection of these different interests and experiences.

The Halprins’ ongoing collaborations were closely related to the music and visual work of their Bay Area cohort. Artists in the San Francisco Bay Area developed a particularly nature-centric interpretation of improvisation, crafting an intrinsic link between chance, creativity, and nature. Tony Martin, a San Francisco Tape Music Center member and occasional collaborator with Anna Halprin, illustrated this combined interest when he commented: ‘I always felt that I was using “chance plus choice” and that most of my music was generated out of that feeling. It was nature plus me as a piece of nature’.³² We find similar associations in Lawrence Halprin’s writing:

1. Art by accident uses the same processes as exist in natural phenomena
2. Natural phenomena give us the base on which we hang our sense of art organization.
3. Art as Science is a search for this existing natural organization.³³

‘Chance plus choice’, ‘art by accident’: both Martin and Lawrence Halprin associated nature with uncertainty — rather than emphasizing the value of stability, they celebrated unpredictability. Essential to this celebration was the fact that they did not seek to manage such systems, but rather to operate as participants within them. This was manifested in Lawrence Halprin’s drawing practices. The making and viewing of his scores positioned the individual markedly within interactive, living systems, and his sketching practices often reinforced this sense of immersion.

Lawrence Halprin began using scores together with Anna Halprin for her dance projects in the early 1960s. He then began using open scores for a wide range of projects, from sequencing fountain jets to coordinating community workshops. Occasionally scores referenced material conditions, but more often, they focused on instructions for action. These instructions were usually ambiguous, assuming — indeed inviting — uncertainty. In this way, landscape scores were intentionally unfinished representations: relying on action for completion, they were as incomplete as the conditions they engaged. Their visual appearances reflected this temporal openness: some tracked time through

charts reminiscent of musical notations, others were more circuit-like, using bubbles, nodes, and arrows. Halprin himself described the unfinished quality of the score as follows:

These kinds of scores ... allow the activity itself to generate its own results in process. They communicate but do not control. They energize and guide, they encourage, they evoke responses, they do not impose.³⁴

Halprin's notion that scores 'communicate but do not control' clearly echoes the title of Norbert Wiener's 1948 book *Cybernetics, or Control and Communication in the Animal and Machine* — in this way, Halprin's wording suggests an adoption of cybernetic ideas. Yet Halprin's opposition to control reveals a particular modification of Wiener's ideas, in which the open and the indeterminate are embraced. Indeed, Halprin deployed open scores as a means to simultaneously explore composition and relinquish control over outcomes.

Figure 5 illustrates the open score's embrace of uncertainty. Marked on the page are numbers of people, speeds of action, degrees of randomness, and relative locations. Together these symbols and shapes form a diagrammatic directive. The score's 'open' condition is defined by the ambiguity of its instruction. Its performers are the ones who must decide: what constitutes 'random' movement? 'Semi-random' movement? How slow is 'slow'? When should each action occur? In this way, the score is indeed a form of 'chance plus choice': its performers are semi-autonomous participants in a flexible system. Their separate interpretive decisions interrelate, resulting in an emergent performance — a systematically indeterminate composition.

Moreover 'art by accident', as Halprin writes, uses 'the same processes as exist in natural phenomena'. For Halprin, a performance of indeterminate creativity was thus a performance of the natural. Through performative action, nature was enacted as something structured, vital, generative, and fundamentally unpredictable. For Halprin, the open score foregrounded temporal uncertainty, thereby offering a significant departure from traditional plan, section, and perspective drawings, which were spatially explicit and highly prescriptive. Accordingly, scoring appears to have been particularly useful to Halprin as he sought to engage, represent, and reinforce what he understood to be inherent to landscape space: uncertainty, creativity, and spatio-temporal complexity.

However, Halprin's embrace of indeterminacy was by no means equivalent to relinquishing all control. On the contrary, he often constrained

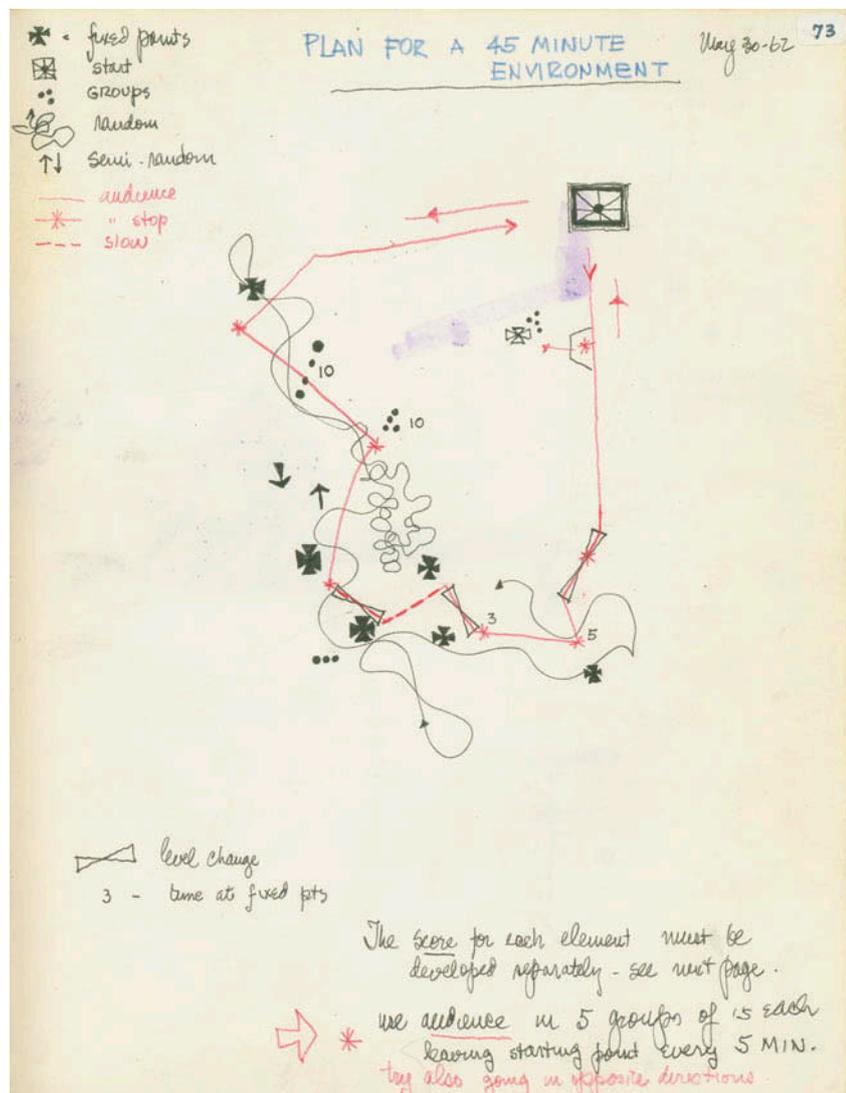


FIGURE 5. Lawrence Halprin, 'Plan for a 45 Minute Environment', 1962. This score guides an outdoor performance/event, directing performers when and where to move in groups and in random or semi-random ways, and directing audience members when and where to move slowly and to stop. Lawrence Halprin Collection, The Architectural Archives, University of Pennsylvania. Permission to reuse must be obtained from the rightsholder.

human action and defined built form, either through score-based directions, the act of design, or, by making unilateral decisions outside of score-based activities. Indeed, a tension between fixity and flexibility has emerged in critiques of Lawrence Halprin's use of scores, with historians questioning whether his scores actually supported open, participatory processes. For example, Eva Jessica Friedberg describes Halprin's book *Taking Part*, noting, 'terms often repeated throughout *Taking Part* with assumed definitions must be properly inspected. "Participation", "community", and "the public" are terms with implied determinations of inclusion, exclusion, borders, limits, and boundaries'.³⁵ Similarly, Alison Hirsch suggests that Lawrence Halprin's scored participatory design processes were often less open than he suggested. According to Hirsch, Halprin 'would assert himself in workshops already well under way, without witnessing first-hand the performance of scores up to that point'.³⁶ He would also ignore participant desires when their desires differed from his. Hirsch writes, 'this disregard for the participatory immersion makes him appear as the "outside expert" he claimed he opposed'.³⁷ Clearly, then, we should not read Halprin's celebration of release as a complete renunciation of control.

Nonetheless, relative to the conventions of design drawing that preceded them, landscape scores did leave a great deal to chance. As in figure 5, they regularly represented material forces and flows loosely, ambiguously, or not at all, therefore leaving them decidedly indeterminate. Furthermore, Halprin's open scores often functioned less as design tools than as creative catalysts: the practice of scoring supported a way of seeing through which one found inspiration. Indeed, perhaps the open score's most unique aspect was its practice orientation, its immersion in action. For composer, performer and participant alike, open scores and their results were only made whole through direct, immediate experience. Supporting just such a perspective, Cage wrote:

The problem is simple: you either stay put until you get an invitation or you make yourself an invitation written in such a way that you couldn't know, when you wrote it, what you were writing, and where it would be sending you going.³⁸

Cage was concerned, not with what to make, but with how to make it — how to initiate the creative process. His solution was to start something

incomplete and elusive, to prompt uncertainty with a proposition and see what happens next. The work of art, from this perspective, was not even a priority — practice was its own outcome. We find a similar prioritization of process in Lawrence Halprin's writings as well, such as when he wrote, 'one of the gravest dangers that we experience is the danger of becoming *goal-oriented*'.³⁹ Such comments describe the open score, not as a means toward an end, but as a medium to live with and in. For Cage and Halprin the score was a radically temporary document, one moment in a tumbling of events, actions, and transpirations through time. The very value of the medium was its ability to set up something fundamentally unachievable, thereby creating a situation in which one could occupy the creative process for its own sake. Open scores thus derived their power from their unfinished structure. They offered partial strategies for exploring the uncertainties of open systems — as such, they were intentionally as incomplete as the conditions they proposed to engage.

While a cybernetics-inflected celebration of chance underlaid the development of Halprin's open scores, the influence of cybernetics emerged in his sketches as well. If open scores were invitations to actions not yet taken, his sketches were records of past actions. Even in loose, quick drawings of dancers and creeks he deployed arrows to mark flows of energy and matter — abstracting action into symbols indicating systems of movement. Such drawings focused so completely on capturing movement and action that they appeared to be scores after-the-fact — records of trajectories, choices, and chance events. Thus Halprin's scores and sketches alike depicted landscapes as unbound, mutable, indeterminate systems whose histories may or may not reflect their futures.

Whether through writing, scores or sketches, Halprin presented the temporality of landscape as something unpredictable and variable, with many possible paths forward. In this way, he positioned himself markedly within a very large cybernetic system. Halprin could document temporality as something discretely systematic, yet like the engineer in Bateson's and Mead's participatory system (lower diagram, figure 3), he did not — by his definition could not — depict the system as a whole. In this sense, Halprin's scores and sketches alike operated as immersions into open systems. They evoked shifting and unpredictable soundscapes and landscapes whose surprises were understood, not as problems, but as sources of aesthetic inspiration and delight.

Seeing entropy, touching chance: comparing the work of McHarg and Halprin

McHarg and Halprin were both concerned with landscape temporality — in particular, with tensions between the site's unpredictability and the landscape architect's ability to exercise control over its future. Their approaches to this tension shared a common systematicity borrowed from cybernetics — but were notably different in how they characterized the landscape architect's relationship to landscape change. This difference was manifested in three ways. First, the writings of each depicted and valued the temporality of natural systems differently. McHarg's association of landscape fitness with stability, and his sense of responsibility to support that stability, is apparent in his writing: 'all of the sciences of the environment agree that things, creatures, places, and people are only comprehensible through the operation of laws and time'.⁴⁰ For McHarg, the workings of time could and should be made comprehensible, for there was an underlying structure — a set of laws — that governed the natural world. The landscape architect's role was an analytical, structuring, and stabilizing one — it was to discern a pre-existing system and make it legible. For Halprin, in contrast:

There are techniques by which the architectural score can be freed from rigidity to permit ... the acceptance of the interaction of time, the necessities of chance and change, and the input of many people.⁴¹

Halprin did not associate time with stability, but with freedom, interaction, and chance. The landscape architect's responsibility was not to make legible a pre-existing structure, but to mobilize a problematically rigid one. Both McHarg and Halprin perceived a tension between temporality and control. However, while McHarg's ecological models sought to make landscape 'comprehensible through the operation of laws and time', Halprin's open scores embraced 'acceptance of the interaction of time'.

Second, each conceived and cultivated their bodily relationship to landscape differently. McHarg sought to enact landscape as a system that could be documented and analyzed as a comprehensive whole. Figure 6, a drawing by H. T. Odum, illustrates this: the landscape architect (or scientist, in Odum's case) is able to remove himself from the site he studies, and can therefore cultivate an impartial and all-seeing understanding of it. In contrast, figure 7, a sketch from Halprin and Jim Burns' book *Taking Part*, targets this very all-

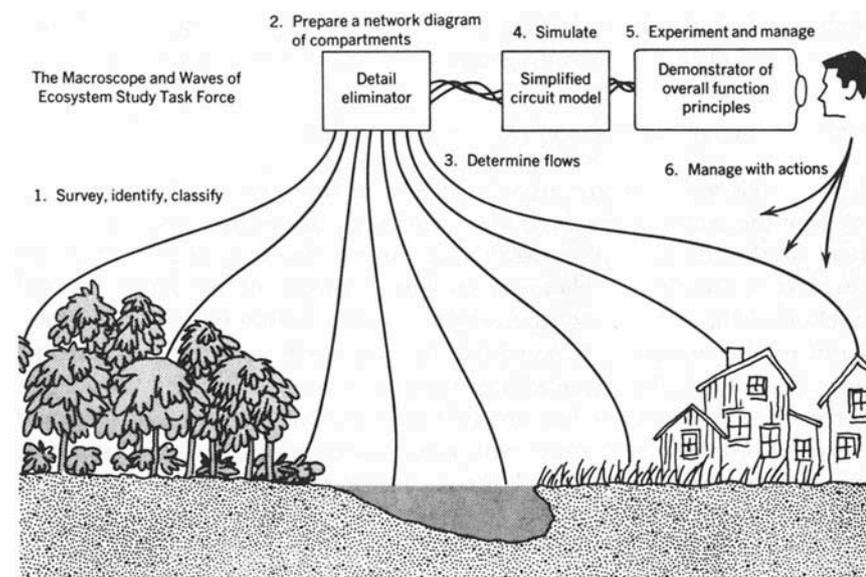


FIGURE 6. Howard T. Odum, 'macroscopic view' of ecosystem study. This drawing describes the relationship between members of an ecosystem task force and the ecosystem they study. Task force members are depicted as independent observers who survey, model, and simulate ecosystem flows in order to devise ecosystem management regimes. Reproduced from H. T. Odum, *Environment, Power, and Society* (New York: Wiley-Interscience, 1971), p. 10. This material is reproduced with permission of John Wiley & Sons, Inc. Permission to reuse must be obtained from the rightsholder.

seeing control as something to be avoided, in favor of taking an immersive and contingent role as a part of the system being explored. McHarg's conception that the landscape architect could be positioned outside landscape enabled him to believe he could comprehend the system as a whole — and this very ability made a perception of landscape stability possible. Halprin conceived of the landscape architect as embedded within the landscape, which meant that he was inherently unable to see the whole — as a result, the relationship between landscape and designer was seen and performed as inherently unpredictable.

Finally, each espoused notably different representational practices — ones that enacted and reinforced their conceptions of landscape time and their roles relative to it. For McHarg, plan-view overlay drawings, a reduced role for hand-drawing, and the cultivation of allegedly objective observation

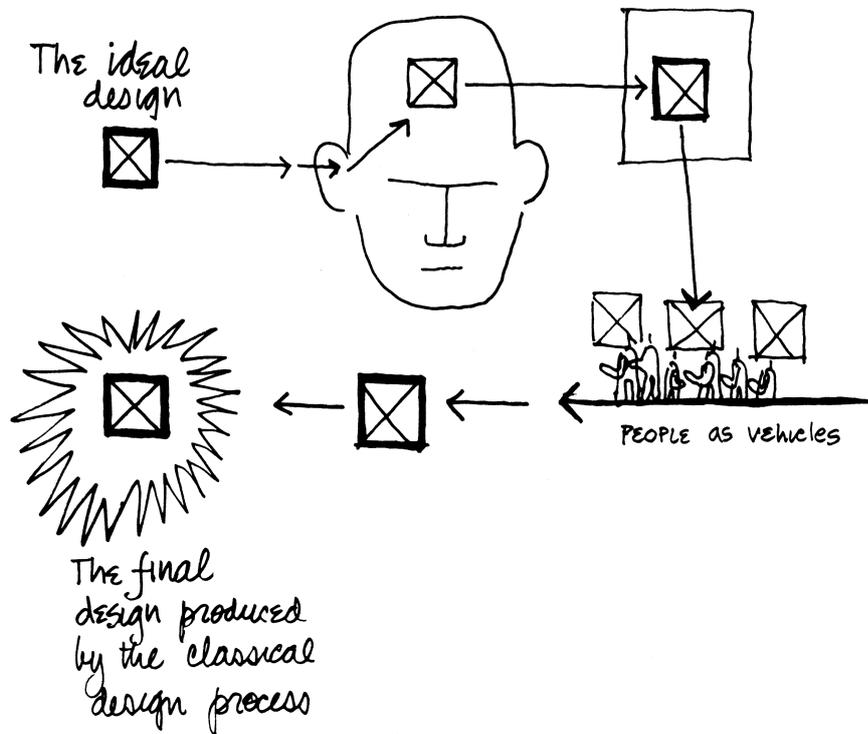


FIGURE 7. Illustration of the 'traditional design approach', published in Lawrence Halprin and Jim Burns, *Taking Part: A Workshop Approach to Collective Creativity* (Cambridge: MIT Press, 1974). This drawing depicts a designer operating with a 'closed score', acting independently from community members and therefore conceiving a design through minimal community participation. Halprin and Burns' use of a floating head and circuit boxes is notably similar to Odum's imagery in figure 6. However, Halprin and Burns give these symbols negative connotations while Odum gives them positive ones. Lawrence Halprin Collection, *The Architectural Archives*, University of Pennsylvania. Permission to reuse must be obtained from the rightsholder.

made it possible to enact, within the design process, a relationship with the drawn site that included perceiving clear rules embedded within the landscape. This approach reinforced a sense that the landscape architect was capable of controlling the site — it made landscape temporality appear predictable, which in turn made management appear feasible. For Halprin,

scores and sketches actively reinforced a contingent, uncertain, and malleable relationship between the landscape architect and the system they engaged. Drawing cultivated a feeling of immersion within process — it amplified a sense of uncertainty, thereby requiring one to be flexible and inventive in response to shifting input.

Conclusion

Both McHarg and Halprin investigated highly complex, shifting landscape conditions; both were concerned with a tension between temporality and control; both borrowed from cybernetics to find new ways of understanding landscapes. Both responded to numerous economic, environmental, and cultural changes in order to engage new levels of complexity within the design process. In cybernetics, both McHarg and Halprin found a systematic temporality: one that divided landscape into components and identified their interactions over time, in order to model a composite, shifting whole. This understanding of landscape as a kit of parts in motion made it possible to incorporate complex interrelational information into drawings. Yet it also introduced a tendency to contrast the indeterminacy of systems against their management and control. For McHarg and Halprin alike, uncertainty and control thus emerged as twinned characteristics of an increasingly complex landscape condition.

Comparing the work of McHarg and Halprin can inform more recent landscape architectural practice. It enables us to ask: how do landscape architects define their position in time — particularly in the time/space of drawing — relative to a shifting, changing site? Put more simply: when encountering a stochastic landscape, how does a landscape architect find a balance between managing it, and dancing with it? This is in part a question of representation, for it is through drawing practices that designers enact specific relationships between themselves and the landscapes they draw. Accordingly, drawing methods determine the very nature of relationship between designer and landscape. Such relationship, in turn, alters the characters, qualities, and capacities of the landscape that is depicted, designed, and constructed.

Issues regarding the open and closed systems of 1960s landscape architecture are particularly relevant to the profession at this moment. With the influence

of landscape urbanism, the profession tilts again towards systematic analysis and a concern for temporal complexity. Unearthing the cybernetic ideas and methods that found their way into landscape architecture in the 1960s thus contextualizes contemporary practice — both its dogmas and its nuances. By revealing the multiple, conflicting influences of cybernetics, the sciences, and the arts on landscape architecture throughout the 1960s, we can better

understand the roles and potentials of systematic measurement and situated experimentation as they continue to unfold in practice today.

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NOTES

1. To illustrate changes that took place in the 1960s, I investigate both writings and drawings as evidence regarding how McHarg and Halprin perceived and cultivated their relationships with the landscapes they engaged. To achieve this, it will be necessary to jettison familiar distinctions between drawings, such as between sketches and site analyses, or between different scales. Indeed, the following inquiry is not about built projects, but rather about the conceptualizations and enactments of landscape that underpin those projects. This somewhat abstracted approach is used in order to articulate how drawings operate as working documents — sites through which landscape architects explore, negotiate, and define their embodied, practicing roles relative to complex, shifting landscapes. Approaching material in this manner enables us to consider certain base assumptions about the roles of humans relative to stochastic natures — assumptions that underpin how landscapes are designed, and therefore how they are built.
2. Both McHarg's and Halprin's approaches have, in fact, cast long shadows on more recent decades of landscape architecture practice and pedagogy. See Elizabeth Meyer, 'The Post-Earth Day Conundrum: Translating Environmental Values into Landscape Design', in Michel Conan (ed.), *Environmentalism in Landscape Architecture* (Washington, DC: Dumbarton Oaks, 2006), pp. 187–244; and Catherine Howett, 'Ecological Values in Twentieth-century Landscape Design: A History and Hermeneutics', *Landscape Journal*, 80, 1998, pp. 80–98.
3. A now familiar rift between ecological and spatial approaches to design had not yet formed in the early 1960s. At that time, many landscape architecture programs integrated environmental design experimentation into their curricula, teaching landscape analysis and spatial design methods side by side. By 1970, however, a highly public debate between Garrett Eckbo and Neil Porterfield took place in the pages of *Landscape Architecture*, illustrating that a rift was beginning to form. Eckbo feared that environmental design approaches suffered from 'analysis paralysis', and that 'the design process is being rationalized out', while Porterfield accused spatial designers of 'fantasy fatigue', warning that they evoked 'mystical, indefinable talents ... to rearrange large land areas under the title of "artistic license"'. Garrett Eckbo and Neil Porterfield, 'Too Much Analysis or Designers' Fantasy? An Eckbo–Porterfield Exchange', *Landscape Architecture*, 60/3, 1970, pp. 201–202. The debate took place over several issues: Neil Porterfield, 'Ecological Basis for Planning a New Campus', *Landscape Architecture*, 60/1, 1969, pp. 31–33; Garrett Eckbo, 'The Designer as Anonymous Transformer', *Landscape Architecture*, 61/1, 1970, p. 16; Peter Walker and Melanie L. Simo, *Invisible Gardens: The Search for Modernism in the American Landscape* (Cambridge, MA: MIT Press, 1994), pp. 305–308.
4. The terms 'drawing' and 'drawing practices' are used with specific intent here, despite the fact that many would consider 'mapping' to be a more appropriate term with which to describe McHarg's work. 'Drawing' and 'drawing practices' hone in on the particular set of relationships that take place when the designer produces representational imagery by hand. Indeed, this investigation rests on underlying assumptions that (1) drawings can be read as evidence of the practices that created them, (2) drawing practices enact and reinforce conceptual frameworks, and (3) through drawing practices, designers enact specific forms of relationship between themselves and the landscapes they draw. For more on this topic, see, for example, Paul Emmons, 'Embodying Networks: Bubble Diagrams and the Image of Modern Organicism', *The Journal of Architecture*, 11/4, 2006, pp. 441–461; Bruno Latour, 'Drawing Things Together', in Michael Lynch and Steve Woolgar (eds), *Representation in Scientific Practice* (Cambridge, MA: The MIT Press, 1990); or James Corner, 'Eidetic Operations and New Landscapes', in James Corner (ed.), *Recovering Landscape: Essays in Contemporary Landscape Architecture* (New York: Princeton Architectural Press, 1999). A summary of this issue is also provided by the author, 'Between Making and Seeing: Overlay Drawing Practices in 1960s–70s Environmental Design', Thesis, Cornell University, 2012.
5. Charles Killpack, 'Computer Mapping, Spatial Analysis, and Landscape Architecture', *Landscape Journal*, 1/1, 1982, pp. 41–42; Carl Steinitz, 'Landscape Resource Analysis: The State of the Art', *Landscape Architecture*, 60/1, 1970, pp. 101–105.

6. Perusing the 1960s issues of *Landscape Architecture Magazine* illustrates these trends towards environmental design and community design. Published projects notably increased in scale during this period, and public projects were increasingly represented. By the late 1960s, such shifts were discussed at length in various magazine editorials. See, for example, Grady Clay, 'Still Gouging Away: That Old Cut and Fill Gang', *Landscape Architecture Magazine*, 59/1, 1968, pp. 20–22; Donald Appleyard, 'Elitists Versus the Public's Cry for Help', *Landscape Architecture Magazine*, 60/1, 1970, pp. 24–25, p. 55. For further discussion of government's influence on 1960s–70s landscape design and planning, see Frederick Steiner, Gerald Young, and Ervin Zube, 'Ecological Planning: Retrospect and Prospect', *Landscape Journal*, 7/1, 1998, pp. 35–36.
7. Peter Galison, 'The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision', *Critical Inquiry*, 21/1, 1994, pp. 254–255.
8. Peter Taylor has identified H. T. Odum's philosophy as a sort of 'technocratic optimism', noting that 'the new theorists of feedback systems conceived of nature as a machine and, at the same time, acknowledged the purposive and regulatory character of that nature-machine'. Peter J. Taylor, 'Technocratic Optimism, H. T. Odum and the Partial Transformation of Ecological Metaphor after World War II', *Journal of the History of Biology*, 21, 1988, p. 221. For more on the influences of cybernetics on ecology, see J. B. Hagen, *An Entangled Bank: the Origins of Ecosystem Ecology* (New Brunswick: Rutgers University Press, 1992).
9. Hagen, *An Entangled Bank*, pp. 109–112.
10. By depicting ecosystems as predictable and therefore controllable, the Odums' models enabled environmental designers to point to scientific causality as a basis for design decisions. Through the 1960s and '70s these models became increasingly problematic for scientific ecologists, whose research increasingly revealed that the very notion of an ecosystem as stable, manipulable, and controllable inaccurately depicted the enormous complexity of ecosystem function. But the evolution of scientific thinking did not stop environmental designers from continuing to adopt and adapt Odum-based ecosystem models for landscape management purposes. On the contrary, even once H. T. Odum's modeling approaches had fallen out of favor with ecologists, environmental designers continued to lean on his texts and models. Taylor, 'Technocratic Optimism, H. T. Odum and the Partial Transformation of Ecological Metaphor after World War II', pp. 242–244. In fact, these models were useful to environmental designers for many of the same reasons that they were deemed inaccurate by ecologists: their inaccuracy was intrinsically tied to their ability to predict, and prediction — however uncertain — was essential to practicing landscape management.
11. Environmental design innovators included Christopher Alexander, McHarg, Carl Steinitz, and the researchers at the Laboratory for Computer Graphics at the Harvard Graduate School of Design. Carl Steinitz, Paul Parker, and Lawrie Jordan, 'Hand-Drawn Overlays: Their History and Prospective Uses', *Landscape Architecture*, 66/5, 1976, p. 448; Nicholas R. Chrisman, *Charting the Unknown: How Computer Mapping at Harvard Became GIS* (Redlands, CA: ESRI Press, 2006). See also Margot Lystra, 'Between Making and Seeing'.
12. McHarg in particular has recognized Charles Eliot as an inspiration for the environmental design approach. Ian L. McHarg, *A Quest for Life: An Autobiography* (New York: John Wiley & Sons, 1996), pp. 358–360.
13. During this period landscape architects explored a wide range of modeling techniques, including matrices, graphs, sectional charts, and plan-view overlay-based land classification. The development of these drawings is summarized by Anne Whiston Spirn, 'Ian McHarg, Landscape Architecture, and Environmentalism: Ideas and Methods in Context', in Michel Conan (ed.), *Environmentalism in Landscape Architecture* (Washington, DC: Dumbarton Oaks Research Library and Collection, 2000), pp. 97–114. See also Susan Herrington, 'The Nature of Ian McHarg's Science', *Landscape Journal*, 29/1, 2010, pp. 1–10.
14. The priority of management greatly skewed environmental designers' approaches to ecology — away from engaging the scientific field's practices, and towards internalizing its ideals. Indeed, most environmental designers did not embrace ecology as conducted by scientists — an experimental, deliberative, often inconclusive endeavor. Rather, with management as their goal, they saw in ecological concepts a means to bring new levels of objectivity and authority into their field. The mantle of science was embraced, not in connection with scientific method, but as a way to support environmental priorities — and as a means for bringing new legitimacy to the landscape architectural profession.
15. Ian L. McHarg, 'An Ecological Method for Landscape Architecture', *Landscape Architecture*, 57/2, 1967, p. 105.
16. Ian L. McHarg, 'An Ecological Method for Landscape Architecture', p. 106.
17. See syllabi, Ian L. McHarg Collection, Architectural Archives of the University of Pennsylvania.
18. Susan Herrington, 'The Nature of Ian McHarg Science'.
19. Norbert Wiener, *The Human Use of Human Beings; Cybernetics and Society* (Boston: Houghton Mifflin, 1950), p. 17.
20. Howard T. Odum, 'Ecological Potential and Analog Circuits for the Ecosystem', *American Scientist*, 48, 1960, p. 1.
21. Ian L. McHarg and Frederick R. Steiner, *To Heal the Earth: Selected Writings of Ian L. McHarg* (Washington, DC: Island Press, 1998), p. 64.
22. Studio Drawings, Delaware River Basin Study II, 1967, Ian L. McHarg Collection, Architectural Archives of the University of Pennsylvania.
23. Ibid.
24. Ian L. McHarg, 'An Ecological Method for Landscape Architecture', p. 106.
25. For an example of earlier, looser environmental design overlay work, see Christopher Alexander and Marvin L. Manheim, *The Use of Diagrams in Highway Route Location: An Experiment* (Cambridge,

- MA: School of Engineering, Massachusetts Institute of Technology, 1962).
26. McHarg's focus on objective seeing was not his alone — similar attitudes can be found in the work of other cybernetics-influenced designers. Two such individuals are the MIT-based Gyorgy Kepes and Kevin Lynch, who in their 1954–59 Rockefeller-funded research project 'Perceptual Form of the City' proposed to analyze the health of the urban environment through visual analysis. For Kepes and Lynch, the eye and the computer were understood to be closely inter-related, in part because new developing technologies invited, and often required, new ways of seeing. Christine Boyer describes how Kepes applied cybernetic ideas in the development of computational notions of vision and the human mind, noting: 'it was Kepes' pedagogical aim to train the artist and the scientist to become sensitive decoders of messages sent and received from a variety of sources in the modern world'. M. Christine Boyer, 'The Two Orders of Cybernetics in Urban Form and Design', in Tridib Banerjee and Anastasia Loukaitou-Sideris (eds), *Companion to Urban Design* (Abingdon, UK: Routledge, 2011), p. 71. The drawing practices espoused by McHarg, though different in many ways from Kepes and Lynch's work, were nonetheless resonant with their characterization of vision.
 27. <http://www.fondation-langlois.org/html/e/page.php?NumPage=572>
 28. Christina Dunbar-Hester, 'Listening to Cybernetics: Music, Machines, and Nervous Systems, 1950–1980', *Science Technology and Human Values*, 35/1, 2010, p. 128.
 29. Manipulating the structural frameworks of performance pieces, East and West coast musicians and artists such as John Cage, La Monte Young, Tony Martin, Fluxus, Judson Dance Theater, and the Halprins all worked extensively with scores. Sally Banes, *Democracy's Body: Judson Dance Theater, 1962–1964* (Ann Arbor, MI: UMI Research Press, 1983), pp. 1–33; David Nicholls, 'Getting Rid of the Glue: The Music of the New York School', *Journal of American Studies*, 27/3, 1993, pp. 335–353.
 30. Janice Ross, *Anna Halprin: Experience as Dance* (Berkeley: University of California Press, 2007), pp. 146–152.
 31. Halprin had experienced this need first-hand when working on the redesign of the Panhandle Freeway in San Francisco. This highly contentious project, generally recognized as the first 'freeway revolt' in the country, centered on conflicts between local citizenry and state government regarding the location of urban freeways. Halprin's attempt to propose a more acceptable design for the freeway failed. Not long after, he began exploring methods for community design workshops. Alison Bick Hirsch, 'Lawrence Halprin: Choreographing Urban Experience', Dissertation, University of Pennsylvania, p. 231.
 32. Martin was a member of the San Francisco Tape Music Center, which shared studio space and occasionally collaborated with Anna Halprin. David W. Bernstein, *The San Francisco Tape Music Center*, p. 154.
 33. Lawrence Halprin, *Notebooks 1959–1971* (Cambridge: MIT Press, 1972), p. 31.
 34. Lawrence Halprin, *The RSVP Cycles: Creative Processes in the Human Environment* (New York: G. Braziller, 1970), p. 19.
 35. Eva Jessica Friedberg, 'Action Architecture: Lawrence Halprin's Experiments in Landscape Design, Urbanism, and the Creative Process', Dissertation, University of California, Irvine, 2009, p. 66.
 36. Alison B. Hirsch, 'Scoring the Participatory City: Lawrence (& Anna) Halprin's Take Part Process', *Journal of Architectural Education*, 64/2, 2011, p. 139.
 37. Ibid.
 38. John Cage, *Silence: Lectures and Writings* (Middletown, CT: Wesleyan University Press, 1961), pp. 201–202. Though it is not the focus of this particular discussion, it should be recognized that there are Buddhist evocations in this quote, as in much of Cage's work.
 39. Halprin, *The RSVP Cycles*, p. 4.
 40. McHarg, *To Heal the Earth*, p. 147.
 41. Halprin, *The RSVP Cycles*, p. 10.