

An Architecture of the Whole

This article offers a history and theory of “whole design” as it emerged through countercultural ecology, by offering a critical reading of the *Whole Earth Catalog* and its affiliate publications, and correlating it with design projects and related philosophies from the 1960s to the present day. The article proposes that the *Catalog* was itself a sort of architecture, a colloquium connecting its participants to design and to the world at large. Despite its determinist, systems-based origins, the article suggests that whole design harbored an ideologically and aesthetically vibrant indeterminism of continuing relevance to sustainability.

Introduction

Is the discourse of sustainability sustainable? Does ecological design inspire the engagement of ever more practitioners and publics, or does it, over time, feel proscriptive and prescriptive, subcultural, overweening in its “naturalness,” apolitical, quasi-theological? I approach such questions here by examining the ecological thinking of the 1960s counterculture, following the historical and theoretical trajectory of the hippie directory the *Whole Earth Catalog*¹ (Figure 1).

It is symptomatic, perhaps, that architectural history and theory rarely follow this trajectory,² which passes through such snares as technophilia, antihumanism, mysticism, lifestyle marketing, and neoliberalism. “The apolitical counterculture,” ran the justifiably skeptical judgment of someone who took part in it, “furnished no coherent ideology for either its social or architectural experiments,”³ a point of view largely confirmed by the New Age consumerism, libertarianism, and technophilia cited as the legacy of the counterculture and its *Catalog* in a slew of recent literature. Countercultural ecology can be condemned as a retreat from Vietnam era protest movements, one that still provides a pious platform from which to survey globalization with little remorse for its deleterious details. Meanwhile, the stature of ecology in design remains uncertain, as though it is a matter of taste or branding, or worse

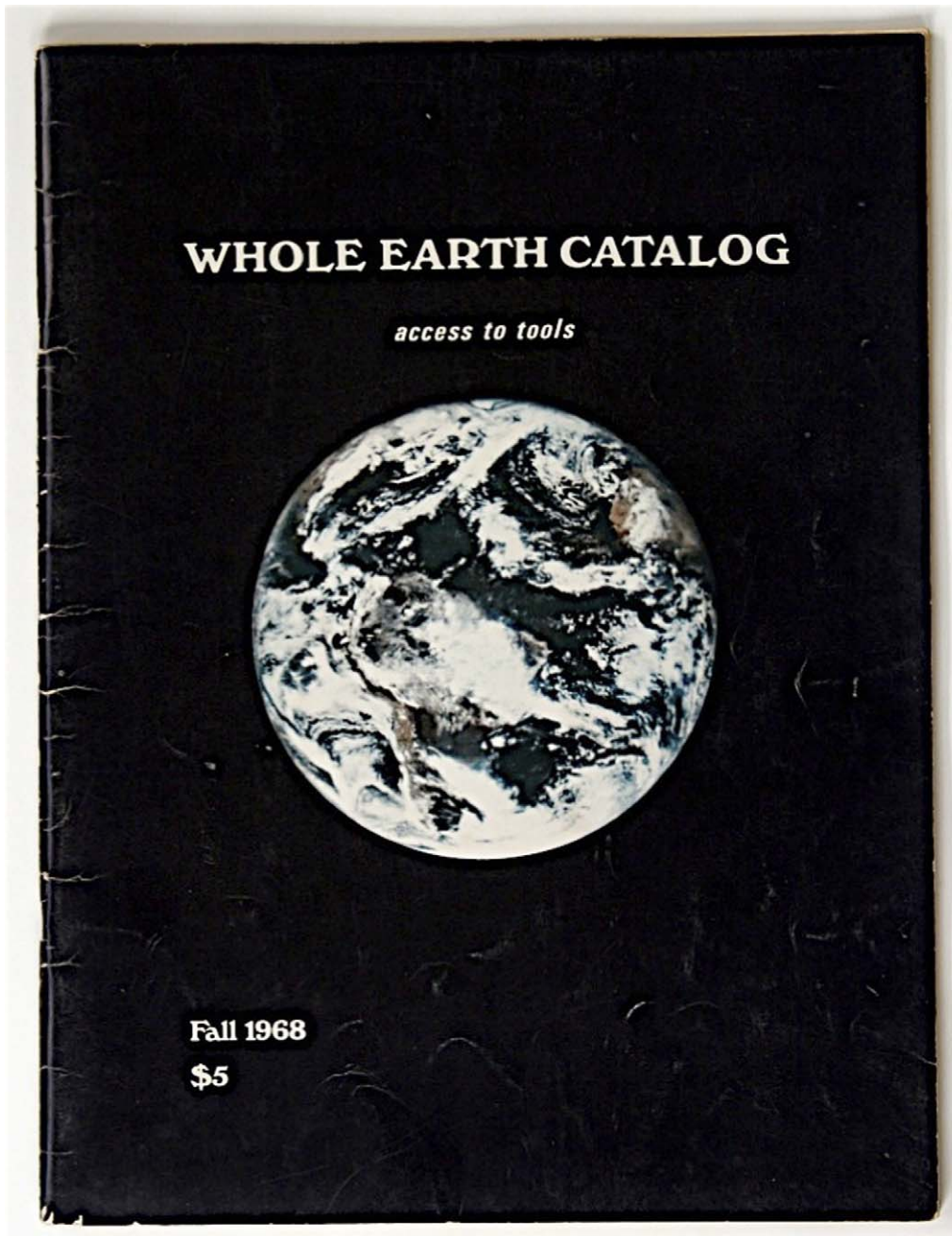
that it answers blindly to laws of energy and biology that may be managed but not altered.

This deterministic air is one reason, perhaps, why architecture should keep its distance from ecology, retaining architecture for the “culture” side of the traditional divide between “nature” and “culture,” remaining guarded against ecology’s moralizing tenor, its nonfiguration, its semantic deficiency, and its deferral to environmental generalization. This article may actually add to doubts about the *Whole Earth Catalog*’s relevance to architecture. Was the *Catalog*’s gambit to address “the whole” a hubristic conceit bound to fail morally, epistemologically, and technically? In the 1970s and 1980s, poststructuralism, and advancing capitalism, rendered suspect the very notions of a dialectically or rationally defined “whole,” “nature,” and “reality” upon which ecological architectures depended.

But this article’s ultimate concern is quixotic: what *could* or *should* countercultural architecture have been? At its inception, the *Whole Earth Catalog* offered to bridge rationality and its poststructural “deterritorialization,”⁴ science and its nemesis in culture, the market economy and its nonmarket alternatives. Rejecting the professionalization of design, the *Catalog* took sustainability to be a concern for the citizenry at large, one best approached as a “design Wiki,” so to speak,

refusing to cede to political and industrial hegemony, or to the supposition that nature is a limiting condition on society.

The *Whole Earth Catalog* was first published in 1968 by the countercultural entrepreneur and journalist Stewart Brand. A raffish offspring of mismatched but upstanding parents—Diderot’s *Encyclopédie* (1751–1765) (Figure 2) and the *Sears’s Catalog* (1888–1993)—the *Catalog* provided an unparalleled resource on ecology, technology, energy, communications, and social experimentation, initially aimed at exurban readers “dropping-out” in the new communalism movement but soon addressing readers looking to effect change from inside the city and suburbs. Filled with its readers’ recommendations for products ranging from books to outdoor equipment, from seeds to electronics, such was the *Catalog*’s cultural footprint that it won America’s 1972 National Book Award and spawned an intellectual, social, journalistic, and technological network which survives today (for convenience only, I refer to this as a “Whole Earth network”). The circulation figures of publications associated with the Whole Earth network easily compare with, and often eclipse, those of staple design literature of the same era. Lloyd Kahn’s *Shelter* (1973) (Figure 3), for example, sold more than 185,000 copies (for comparison, 112,000 more copies to date than a benchmark architectural



treatise published a year earlier, Venturi, Scott Brown, and Izenour's *Learning from Las Vegas*).⁵ Under Stewart Brand's editorship alone, the *Whole Earth Catalog* sold a total of more than 2.5 million copies.⁶

The *Whole Earth Catalog* posited an aesthetic of "whole design" committed to a mediation of people and totality far exceeding that implied in conventional architectural education. But within architectural culture, excitement about the counterculture's rediscovery of ecology all but vanished

following its momentary cachet in France, around Italy's neo-avant-garde Global Tools initiative (1973–1975), and at progressive schools like London's Architectural Association⁷ (Figures 4 and 5). Upon reissue as *Architecture Today*, the entire five-chapter section on counterculture contained in Charles Jencks' book *Contemporary Architecture* (1981) was excised (in favor of postmodern historicism).⁸ Likely reasons for its estrangement from architectural schools and offices were that countercultural design touted an indifference to artistic

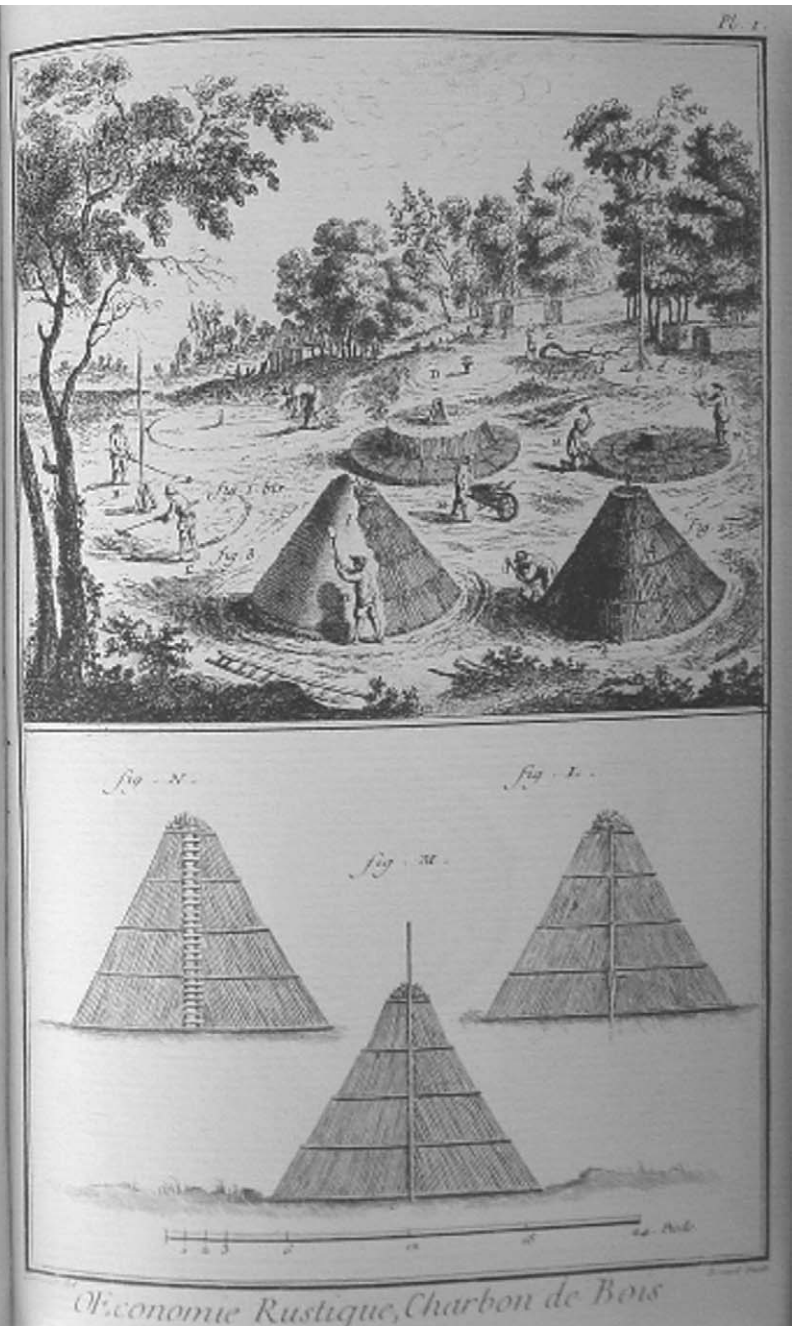
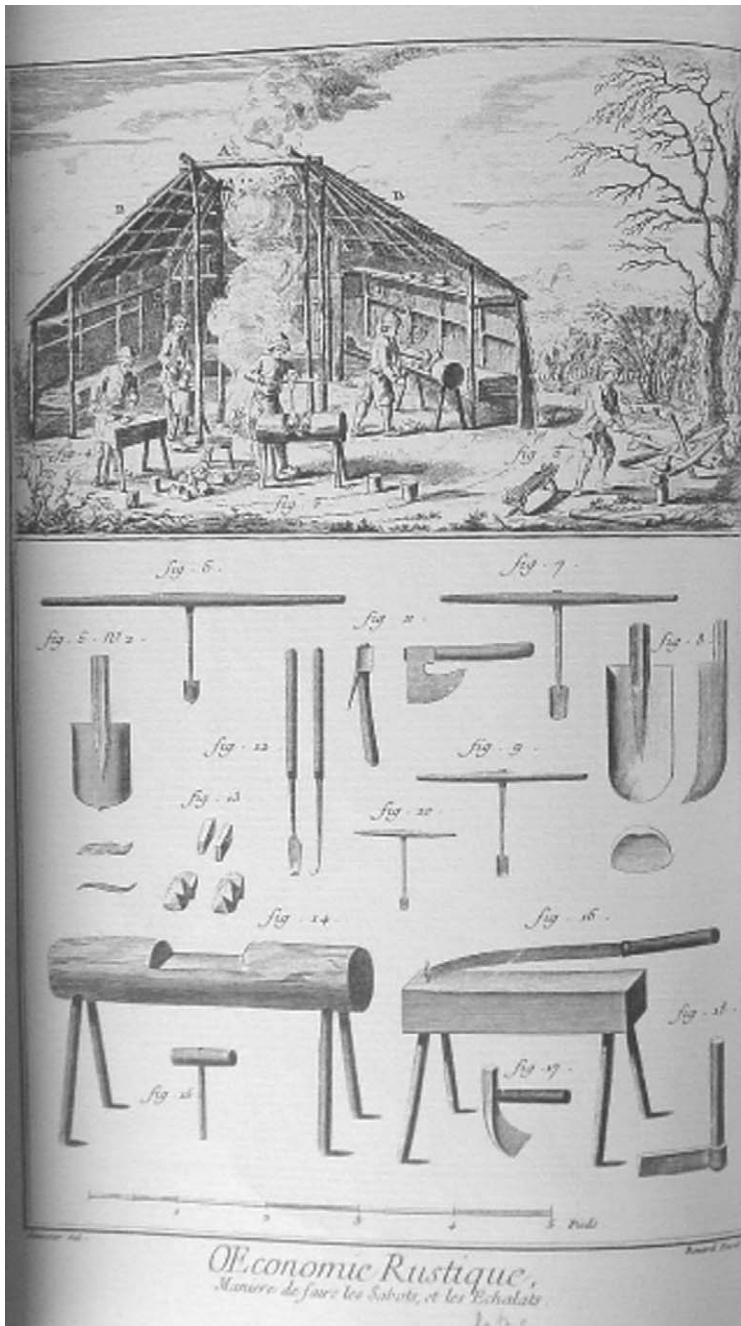
form and had a quizzical approach to modernization itself.

Unremitting advocates of grassroots organization, unfettered scientific enquiry, and technological futurism at one level, the Whole Earth network is so achingly modern as to appear radical, fanatical, and fantastical, almost in the manner of the historical avant-gardes. Underwriting the Whole Earth project were fascinations with evolutionary and systems models that subsumed differences between people, economies, cultures, technologies, and species into one whole. Its inflated reverence for nature, it seemed, was at the expense of a reverence for culture, advocating holistic, and cybernetic evolutionism as an organizational model for society. The *Catalog's* respect for business as a mechanism of social evolution arguably made its project still more suspect, a hippie variant of consumerism and managerialism.⁹

Arrayed against these drawbacks, though, was whole design's advocacy of "coevolution," which I reassess through philosopher Bruno Latour's contention that, at base, ecology *is* cultural. This is demonstrably the case in whole design's immersive, "ecology of mind" proposals that in practice were all too human and far from systematic. The *Whole Earth Catalog* was accordingly a grand mediator of political ecology, an "assembly" that offered a sort of architecture in and of itself—iconic, encyclopedic, pragmatic, and collaged. In every way, whole design encouraged an approach that mediated past, present and future, here and there, individual and society, instilling a sense of long-term responsibility beyond immediate and parochial concerns, and reinstating a Kantian sense of beauty as the transcendent experience of reason. Behind the overexcited positivism, then, was a quest for an ecological metaphysics that asked questions about our being in the world.

Whole Systems

Whole design favored social and technological practices that evolve by continual reconfiguration.

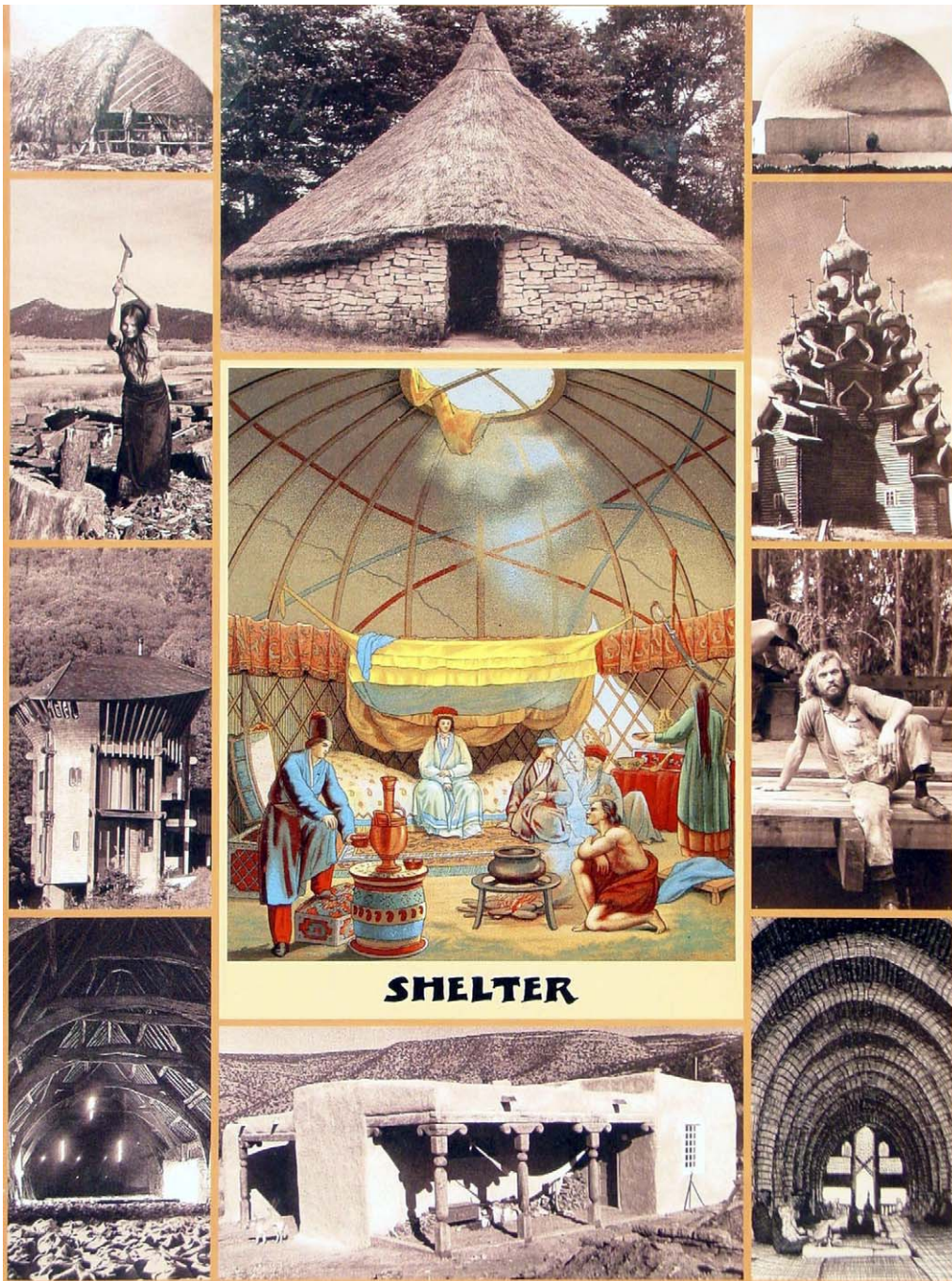


2. "The Rustic Economy," *Encyclopédie*, 1751–1765. (Source: *Encyclopédie*.)

Design was not even specified by the *Whole Earth Catalog* as something existing of itself. Design, it appears from the *Catalog*, is everywhere and nowhere, a practice among practices, a system among systems (Figure 6). The *Whole Earth Catalog* carried prospectuses by Bernard Rudofsky, Christopher Alexander, Ian McHarg, Lewis Mumford, and others for design practices extending beyond personalities and charismatic objects into folk art, pattern finding, environmental restoration, and

technical investigation; but mostly unlike these sources, whole design relished amateurism, welcomed change, and was unerringly optimistic. While a chief interest of several key contributors to the *Catalog* was architectural, formal design training within this hippie intellectual corps was rare. Contributors were typically not professional designers at all, but polymaths—carpenters, ex-servicemen, engineers, mathematicians, photographers, and scientists. Stewart Brand, for example, enjoyed

recreationally building on his land in British Columbia, though he was a Stanford biologist by training. *Whole Earth Catalog* coeditors Lloyd Kahn, Jay Baldwin, and Steve Baer rose to fame as builders of Richard Buckminster Fuller's geodesic domes, but the status of the geodesic domes as architecture remained questionable, particularly following their 1965 civilian premiere at the countercultural Colorado settlement Drop City—the example of which inspired Brand as



3. Lloyd Kahn, ed., *Shelter*, 1973. (Source: *Shelter*.) (Photo courtesy of Lloyd Kahn.)

ques, one mode of praxis arraigned alongside another, coexisting and competing.

The invitation to think at ever more integrative levels had been picked up by the *Whole Earth Catalog* from twentieth-century systems analysis, which used mathematical tools to study how the components of complex systems interact.¹² Outside of its strategic importance in the Second World War, systems analysis found applications in society, technology, and ecology, promising the transformation of environment and society. The inventor Buckminster Fuller, mathematician Norbert Wiener, literary philosopher Marshall McLuhan, and anthropologist Gregory Bateson separately emerged as articulate and imaginative spokesmen for a composite systems theory informing the stance taken by the *Catalog*. Fuller viewed the world as a singular problem overseen through engineering. The figuring of the world's animal and mechanical contents as a single entity acquired rapid scientific development with the 1948 publication at MIT of Wiener's theory of cybernetics.¹³ McLuhan theorized the emergence of a sort of ecology of representation through mass media and electronics, and Bateson speculated on an ecology of mind.

Wielding its systems thinking, whole design threatened to quite supersede the modern movement in design, deeming modernism isolated from wider cultural and natural systems. Whole design replaced modernism's homages to craft and industry with methods taken *directly* from craft and industry, their capacity to yield information about materials and processes transferred intact to the whole designer. Nonetheless, whole design was in some ways attuned to the aims of modernism. In 1968, the *Whole Earth Catalog* assumed sponsorship of an environmental totality that was slipping from modernism's tutelage. All design, it can be claimed, is totalizing in its ambition, whether overtly or covertly. The archetypal twentieth-century instance of this was the Bauhaus under Walter Gropius: "I believe that the New Architecture is destined to dominate a far more comprehensive

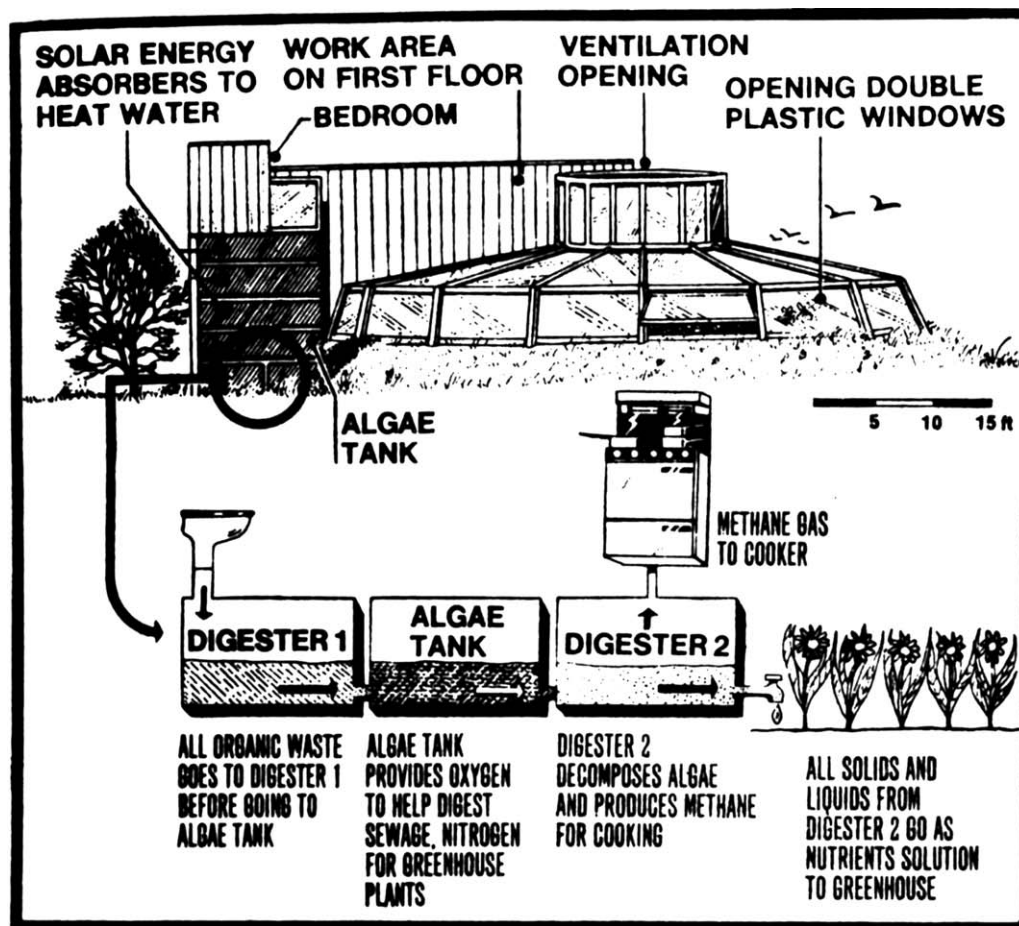
he prepared the first *Whole Earth Catalog*¹⁰ (Figure 7).

The first page of the *Whole Earth Catalog* declaimed its origin in Fuller's whole system ideas, and Fuller's geodesic system was instated as the summary form of the rational use of materials and energy (Figure 8). Since the 1920s, Fuller had called for a new sort of designer—the apolitical "Comprehensive Designer," tackling the world's

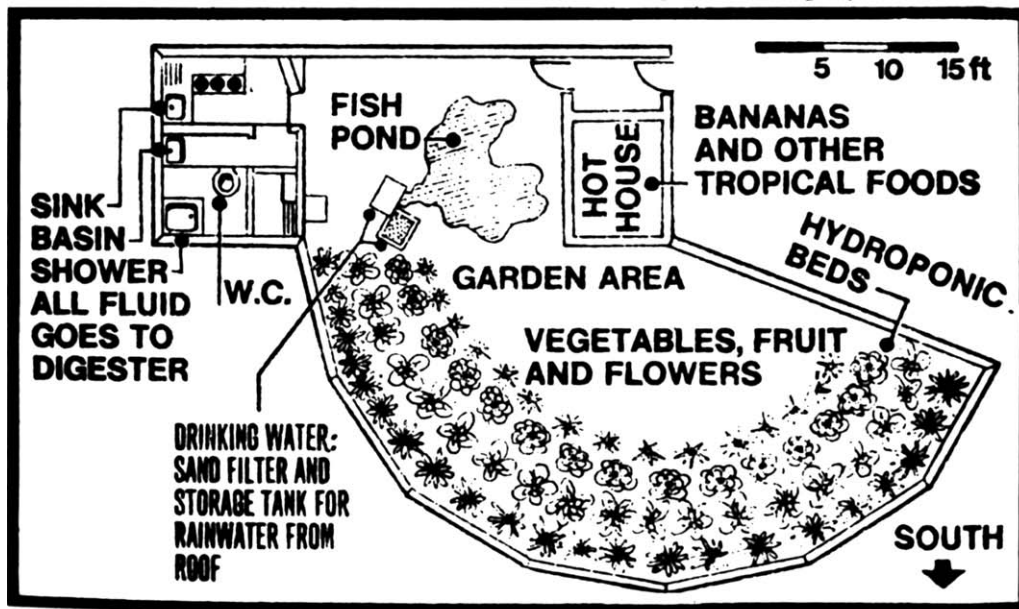
social and ecological imbalances as a technical problem of the grandest sort. Yet, Fuller was a point of *departure* for the Whole Earth network, much as he was for the communards of Drop City, which was no camp for sober Comprehensive Designers but a site for immediate, experimental, even amateurish intervention in reordering lived reality.¹¹ The *Whole Earth Catalog* advertised itself as a point of "access to tools," as an assemblage of ideas and techni-

sphere than building means today; and that from the investigation of its details we shall advance towards an ever-wider and profounder conception of design as one great cognate whole.”¹⁴ Stewart Brand’s complaint, however, was that Bauhaus-style modernism had been *insufficiently* universal (and he came to regard architectural postmodernism with still more disdain for its stylistic superficiality, exaggerated fragmentation, and servility to property development).¹⁵ The *Whole Earth Catalog* was a Bauhaus without walls, design a social contract that encompassed *both* of the key rivals for the soul of modernism, summarized for us by historian Mark Wigley as “the romantic idea of resistance to industrialization through the design of hand-crafted, one-off environments, and the equally romantic idea of embracing progressive machine-age reproduction.”¹⁶

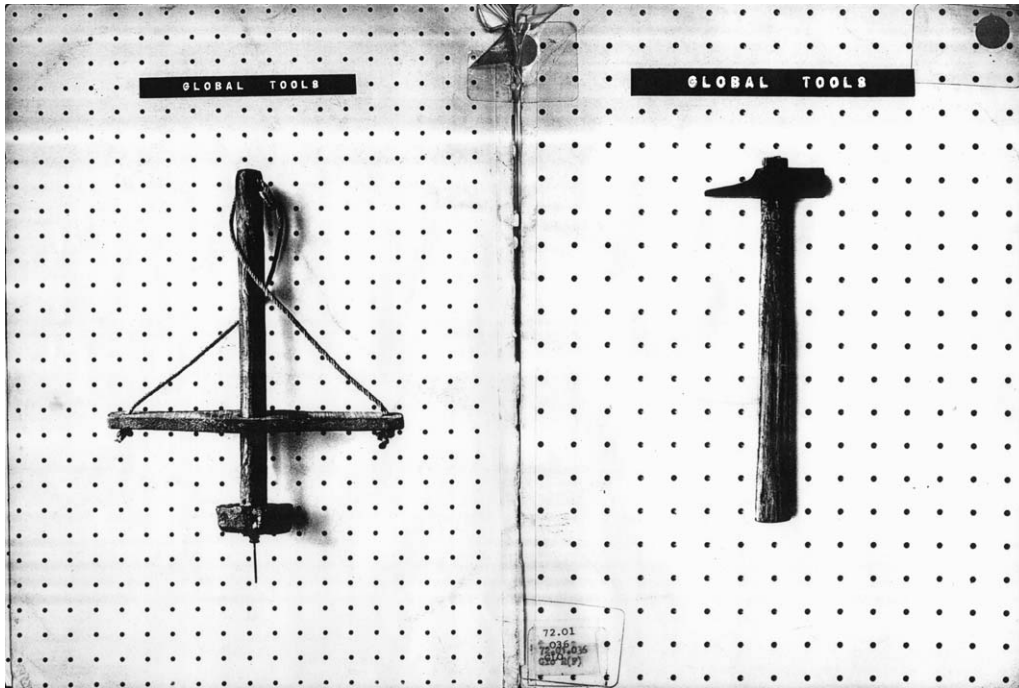
Like modernism, whole design progressed toward an ever more complete unity. It was impelled, though, not by modernism’s Hegelian teleology, but by Darwinian and cybernetic vectors. That is to say, whole design called for an architecture that “operates by hindsight rather than foresight,” “always away from known problems rather than toward imagined goals.”¹⁷ Whole design sought the whole not as a philosophical, future goal to be approached through abstract logic, but as an already present environmental condition with which to align through practice. Much as the Ancient Greeks distinguished theory from practice, “The Darwinian mechanism of vary-and-select . . . doesn’t seek to maximize theoretical fitness; it minimizes experienced unfitnes.”¹⁸ If modernism found “natural selection” in singular “object types” (ball bearings, Bugattis) revered by professional tastemakers, whole design saw natural selection at work in a sort of species diversity of competing technologies and actor networks. Whole design relinquished teleology as unworkable, unnatural, and largely counterproductive in human affairs. Against all programmatic methodologies of design in which form is purportedly dictated by



Ecological house : view of the sunny side. Enlarged detail shows three-stage sewage recycling plant which fits under the living quarters (left) and nourishes the garden (right).



Eco-house plan view : flowers will grow among the vegetables for decoration.



5. Global Tools, *Global Tools*, 1973. (Source: *Global Tools*.)

a priori analyses of function, whole design posited form as a continual state of becoming, ever a posteriori. Only a methodology that rolls with the world (by group effort, connection, and pragmatism) is likely to achieve solid results, whole design implied, as though reiterating Bergsonian intuitions of the evolution of life away from matter and toward “mind.”

Composed of material and energy, human and nonhuman, the mind of whole design embraced more than reason. This is not to say that whole design was only a reactive and systematically stupid servomechanism. Whole design required human decision, learning, speculative logic, and an inevitable, if suppressed, politics: Why else publish the *Whole Earth Catalog*? Systems, I contend, were foremost a culture, a discourse. Certainly, the Whole Earth network believed in certain systematic absolutes—for instance, in a universe governed by scientific laws—but it concentrated on the altogether more relative, all-too-human matter of how to engage with those absolutes, of how to *exist* within them. This was the experience of staring at the *Whole Earth Catalog*’s cover, opening it, turning its pages, ordering an item, and writing an entry.

Coevolution

Over successive issues, the *Whole Earth Catalog*’s understanding of what constitutes a whole system markedly moved away from a unitary system to

something richer, less mechanical, and more differentiated, subsystems “coevolving” within the whole, one with another. This import of “second-order” cybernetics, most closely associated with anthropologist Bateson,¹⁹ held at its most rudimentary that the self is a system *within* a system, a mind within the larger ecology of mind that conjoined humans to one another and to nature. In his introduction to *CoEvolution Quarterly*, a successor journal to the *Whole Earth Catalog*’s *Supplement*, Brand explained that “Evolution is adapting to meet one’s needs. Coevolution, the larger view, is adapting to meet each other’s needs.” With this Brand implied a surprisingly direct, *social* relationship between systems and modernity:

The “co” in coevolution is the mark of the future. In spite of complaints about the steady demise of interpersonal relationships, the lives of modern people are increasingly more codependent than ever. All politics these days means global politics and global politics means copolitics . . . Marshall McLuhan was not quite right. We are not hammering together a cozy global village. We are weaving together a crowded global hive—a coworld of utmost sociality and mirrorlike reciprocation.²⁰

Brand’s emphasis on a decentered, multipart, bottom-up sociality circulated as if to belie contemporary fears of a top-down, controlling, reflex-

ive, informational global village trammeling the individual.²¹ Brand had spent the 1960s and 1970s chasing his dream of an ideal “hive” merging self and whole, looking initially to the communes and multimedia happenings associated with the Western hippie and New York art scenes, including the art/lifestyle collectives to which he belonged—USCO and Ken Kesey’s Merry Pranksters.²² Lose the hyperbolic claims of mergence these experiments made for themselves, though, and at base we are left with interest groups at odds with the norms of political economy and social organization prevalent in their time. This appeal to the American libertarian tradition gained an explicit political critique—“So far,” Brand wrote in the foreword to the *Whole Earth Catalog* in a tone reminiscent of the Enlightenment *philosophes*, “remotely done power and glory—as via government, big business, formal education, church—has succeeded to the point where gross defects obscure actual gains.”²³ Computing and Alternative Technology—means by which a grassroots, coevolutionary economy might access information and energy—steadily superseded Brand’s vestigial interest in communes and happenings.

In his idiosyncratic volume of 1974, *II Cybernetic Frontiers*, Brand claimed that computing was a counterpart to the group mind theories of second-order cybernetics, overlapping recto/verso like a Venn diagram.²⁴ As Brand’s colleague from USCO, Steve Durkee, informed a visitor to the Steve Baer designed Lama Foundation spiritual retreat in New Mexico (1967), “We’ve been talking about putting in a computer terminal here—a kind of group mind to serve as a storage bank of all the minds in all the communes and what they’re learning”²⁵ (Figure 9). To hasten the coevolutionary mergence of architecture and computing, in 1969 Brand introduced Durkee, Baer, Kahn, and communards from Drop City’s successor settlement Libre to computer engineers from the Stanford Research Institute, the contract research institute alleged at the time to be colluding with the military-industrial complex, but

Shelter and Land Use

Edited by Lloyd Kahn.

Geodesics

Finally, a book for dome builders, with good pictures, clear drawings, and introductory text on the basic principles of Fuller's geodesics.

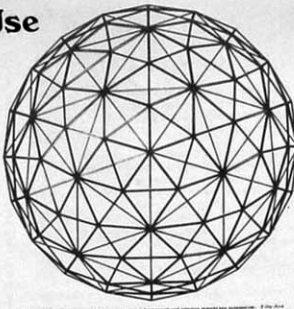
Domes of metal, wood, plastic, canvas, and along with the pictures of various types are detailed sections of hubs, construction methods, and different geometries.

Chord factors—the constants necessary for calculation of different diameter domes—are given, but are a bit more complex than the simple three-frequency Sun Dome (See p. 39).

Dome: Steve Baer adds:

A book about geodesic domes. Half a dozen pages of text and about 90 pages of illustrations. Angles and edge length ratios are given in some instances. The illustrations are beautiful. They are good for a designer's brain—they will show a final form and then also the form's childhood by pinpointing pts. of symmetry from which patterns grow.

[Suggested by ONYX]



Although somewhat basic, it is necessary in our development from polyhedra to spherical structures to point out that spherical bodies may orientate themselves in an infinite number of positions in space. In dealing with domes, however, only three basic conditions are considered: edge, face and vertex zenith. In the combined sphere (icosahedron, dodecahedron, rhombic triacontahedron), the heavy rhombic triacontahedron diamonds, the long axis of which delineates the icosa edge and the short axis the dodeca edge, indicate the basic orientations.

To this point our concern has primarily been with basic icosahedral forms and their related duals. We have chosen to limit ourselves to this category of geometry for this family offers the greatest degree of regularity, when translated into spherical structures of which member length and joinery conditions become factors.

I have found that if the structural members be aligned with the lines of the grid, the resulting framework will be characterized by more uniform stressing of the individual members than is possible with any construction heretofore known.

Also I have found that a very special relationship exists between a geodesic building structure made of interconnected struts and a complementary geodesic building structure made of flexible fabrics or plastic skins where these two structural components are made to conform in structure, pattern or behavior to a mutual three way great circle synergy. My present invention is concerned with an improved geodesic skin or tent construction which gives a new and synergistic stress distribution—synergistic in the sense that the behavior of the skin under stress is unpredicted by its several parts, and that there is imparted to the structure a strength beyond that which would be calculated using accepted values of strengths of materials and usual methods of stress analysis and computation.

Space Grid Structures

A space grid is a means of spanning great distances with little weight, and few intermediate supports. Buckminster Fuller's Octetrustr at the Museum of Modern Art in 1959 was 35' wide and spanned 60' one way, 40' another from one column of supports. It was fabricated of 2" pipe.

Space grids consist of two parallel planes, forming a floor and ceiling; "web" members in between connect them in such a way that external loads are distributed in all directions.

This book is "...an exchange of information about what has been done recently in the development of flat space grid structures." There are photos, drawings, models of structures and joints. The three sections of the book deal with flat double-layer space grid structures; stressed-skin space grids; and fine clear drawings of space grid geometries. Also an extensive bibliography. Very little text; it's not needed as the drawings and photos are excellent.

Space Grid Structures by John Borrogo

Standard Formwork and Shoring Systems

18

Fuller Patents

Fuller's first patent on geodesics is so complete that it's framed in glass in the U. S. patent office.

Available from the government, 50¢ each, are intricately detailed descriptions of the designs that have yet to be fully realized.

The primary patent, filed in 1951—"Building Construction"—describes the derivation of the geodesic dome from the icosahedron, and includes a description of space grid domes for spanning over 140'.

"Laminar Geodesic Dome" gives chord factors for a 4-frequency diamond panel dome, and tells you how to use the panels to make a tunnel geodesic of any length.

Patent No.	Title
2,882,235	Building Construction
3,203,144	Laminar Geodesic Dome
2,906,113	Self-strutted Geodesic Plydome
2,914,074	Geodesic Tent
3,197,927	Geodesic Structures

50¢ each from: U.S. Patent Office, Washington, D.C. 20402

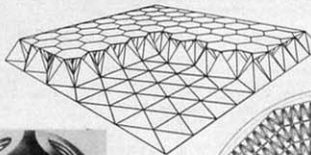
A good index to the performance of any building frame is the structural weight required to shelter a square foot of floor from the weather. In conventional wall and roof designs the figure is often 50 lbs. to the sq. ft. I have discovered how to do the job at around 0.78 lb. per sq. ft. by constructing a frame of generally spherical form in which the main structural elements are interconnected in a geodesic pattern of approximate great circle arcs intersecting to form a three-way grid, and covering or lining this frame with a skin of plastic material.

My "three-way grid" of structural members results in substantially uniform stressing of all members, and the framework itself acts almost as a membrane in absorbing and distributing loads. The resultant structure is a spidery framework of many light pieces, such as aluminum rods, tubes, sheets, or extruded sections, which so complement one another in the particular pattern of the finished assembly as to give an extremely favorable weight-stress ratio, and withstand high stresses.

In dealing with the great range of conditions that the dome must geometrically satisfy (span and height most commonly) it becomes readily apparent that the basic icosahedron cannot remain in a pure state. This brings us to the matter of a geometrical breakdown. This can be described as an attempt to expand the icosahedral form to satisfy the space requirements and allow the components from which it is made to remain within structural fabrication and erection limits.

I have found that if the structural members be aligned with the lines of the grid, the resulting framework will be characterized by more uniform stressing of the individual members than is possible with any construction heretofore known.

Also I have found that a very special relationship exists between a geodesic building structure made of interconnected struts and a complementary geodesic building structure made of flexible fabrics or plastic skins where these two structural components are made to conform in structure, pattern or behavior to a mutual three way great circle synergy. My present invention is concerned with an improved geodesic skin or tent construction which gives a new and synergistic stress distribution—synergistic in the sense that the behavior of the skin under stress is unpredicted by its several parts, and that there is imparted to the structure a strength beyond that which would be calculated using accepted values of strengths of materials and usual methods of stress analysis and computation.



Space Grid Structures by John Borrogo

Standard Formwork and Shoring Systems

18

Space Grid Structures
John Borrogo
1968; 200 pp.
\$12.50 postpaid
from: The M. I. T. Press
Room 765
50 Ames Street
Cambridge, Mass. 02142
or WHOLE EARTH CATALOG

sanctioned by Brand for developing the sort of popular interfacing devices (like the 1963 computer mouse) appropriate to cybernetic coevolution.²⁶ Brand was likewise one of the only critics to review the introduction of computing to architecture described in *The Architecture Machine* (1973), written by Nicholas Negroponte, director of MIT's Architecture Machine Group, the 1967 progeny of Wiener's cybernetic group. Negroponte reciprocally appointed Brand to the group's prestigious successor, MIT's Media Lab, founded 1985.²⁷ In 1984, the Whole Earth network established the archetypal electronically networked community, the Whole Earth 'Lectronic Link, or WELL for short: hereafter, the World Wide Web was heralded as the sort of hive or "village well" earlier sought in the communes.

However extraordinary the Whole Earth network's forecasting ability, it is a moot point whether the Web succeeded in leveling the distribution of information and political power. The empowerment of the grassroots through Alternative Technology, meanwhile, remained gestational. The effort to found a coevolutionary architecture through Alternative Technology was exhaustively promoted by *CoEvolution Quarterly* and the 1978 volume *Soft Tech*, edited by Brand and Baldwin.²⁸ Institutions with close ties to the Whole Earth network—the New Alchemy Institute (with its 1976 laboratories on Prince Edward Island and Cape Cod),²⁹ the Integrated Life Support Systems Laboratories (cofounded by Baldwin), and the Zomeworks company (cofounded by Baer)³⁰—explored the gentle extraction of nature's solar, wind, geothermal, and biofuel reserves through Alternative Technologies such as updated windmills and greenhouses (Figure 10). In 1976, Governor Jerry Brown appointed Sim Van der Ryn, founder of an Alternative Technology sister organization to the *Whole Earth Catalog*, the Farallones Institute,³¹ as California State Architect and director of the state's groundbreaking Office of Alternative Technology,³² which also employed Baldwin. Completing the

ascent of the whole design ethos to state government, Brand was retained as a consultant to Governor Brown from 1977 to 1979,³³ as Van der Ryn completed the Bateson Building (1977–1981), a large, deep-plan, low-energy office block for the State of California filling a block of the Sacramento capitol (Figures 11 and 12).

A "biological paradigm" according to design team member Peter Calthorpe—a former dome builder alongside Lloyd Kahn (Figure 13) and participant at the Farallones Institute—the Bateson Building was poignantly named for Gregory Bateson, the systems theorist of an ecology of mind.³⁴ Using an exposed precast concrete structural



7. Drop City, Trinidad, Colorado, c. 1965–1973. (Source: Environmental Communications.)

system with timber infill shaded from the endless Sacramento summer sun, the Bateson Building incorporated a passive climate control system with a cooling rockbed, its lofty atrium flooded with light, its air tempered by canvas tube ducts, and planted with foliage in a bid to combine climate, flora, and social space into a sort of coevolutionary community. Here at its most elementary and compassionate, the long reach of systems theory located in the Bateson Building imposed little more than a heightened relation of the personal, to the social, to the urban, to the economic, and to the natural.³⁵ Unlike the reclusive closed systems of New Alchemy, for example, the Bateson Building rhetorically connected its climatically and socially sheltered atrium to the outside world via the terraced voids of its open frame. The building recalled something of the urban holism requested by the *Whole Earth Catalog's* most revered architectural critic, Lewis Mumford, and before him, Frank Lloyd Wright and Bernard Maybeck. It was not a caricature of a cybernetic or biological technostructure; with its pronounced stylistic debts to Louis Kahn and traditional Japanese architecture, its outlook was as humanly unsystematic as any of the other coevolutionary experiments visited by Brand.

Puzzled by its failure to become a coherent political force, the philosopher Bruno Latour argues that ecology is mistakenly assumed to be not human.³⁶ It is a line of argument of unusual relevance to the way in which the *Whole Earth network's* "coevolutionary" projects for happenings,

domes, books, electronic networks, laboratories, and offices fell short of their holistic, cybernetic, and hive-like ideal. Indeed their saving grace, it could be argued, was the way in which they could not help being unsystematically human. Whole design was hardly potently political, nor was it always exciting or spectacular, but as a precursor to politics—assembling people, technologies, and values—it compared favorably to anything hailing from more mainstream design.

Longevity and Learning

Brand wrote in *CoEvolution Quarterly* that "Ecology is a whole system, alright, but coevolution is a whole system in *time*. The health of it is forward—systemic self-education which feeds on certain imperfection. Ecology maintains. Coevolution learns."³⁷ Here is Brand reformulating design as an learning process in a private notebook entry from January 1972:

Perfectionism and Group Process. Perfectionism is taking an idea personally. Perfectionist energy flows because it thinks it knows. But it doesn't know. And if the flow is other than desired, or other than useful, it doesn't want to know. The perfectionist is sending, not receiving. What does know is history, consequences. What sometimes knows in advance is Other People with some experience of their own and without pledged allegiance to the perfectionist's great surmise. Enter group process. Exit perfection.³⁸

Two decades later in *How Buildings Learn*, Brand cast the architect as the perfectionist with no more than a stylistic concern for historical process.³⁹ Brand's dynamic of adaptation required that the designer pay sustained attention to time, the unseen vector of all systems, including that of building. That concern for time—the medium for learning, change, and communication—prompted the founding in 1995 of The Long Now Foundation by Brand and others, principally dedicated to the installation of a solar-driven clock in the high desert plateau adjoining Great Basin National Park in New Mexico⁴⁰ (Figure 14). Conceived by computer scientist Danny Hills, it is an intriguing commission to measure time, record culture, and preserve dying languages for a "long now" of ten thousand years; but the clock is obviously a poetic device foremost, a memento of finitude (our lives) and seeming infinitude (the duration of the world), and thereby of our collective and individual responsibility in managing the world. No more determinist than an heirloom clock on the (Earth's) mantelpiece, the Clock of the Long Now (and its role as a mental figure) competes with architecture's ability to gather our attention around the things about which we care. Buildings, too, are clocks of the long now, and so it was that Brand's interest in Hills's invention first appeared on the last page of *How Buildings Learn*, as though an afterimage of everything that the book claimed for architecture. "My approach is to examine buildings as a whole—not just whole in space, but whole in time," Brand explained.⁴¹

An urge to relate design to longevity is traceable back to the *Whole Earth network's* internal disagreements over Fuller's geodesic dome concept in the 1960s and 1970s. Such was the initial loyalty to the domical vision that one edition of the *Whole Earth Catalog* was edited inside a 1969 pillow dome made by the vanguard Ant Farm group, with a geodesic dome within, another without.⁴² But Lloyd Kahn's interest in Fuller waned markedly shortly after the outstanding success of his own *Domebooks* (Figure 15). "There will be no

Whole Systems

Buckminster Fuller


The insights of Buckminster Fuller initiated this Catalog.

Among his books listed here, his most recent is probably the best introduction—it's a succinct summary of what's been on his mind for a year and what's on his mind now: how mankind may hatch and survive the hatching. An Operating Manual for Spaceship Earth.

Of the other, larger, books, *Nine Chains to the Moon* is his earliest and most openly metaphysical. The *Unfinished Epic of Industrialization* the most beautiful. *Ideas and Integrities* his most personal. *No More Secondhand God* the most generalized. *World Design Science Decade* (co-authored with John McHale) the most programmatic.

People who beef about Fuller mainly complain about his repetition—the same ideas again and again, it's embarrassing. It is embarrassing, also illuminating, because the same notions take on different uses when re-approached from different angles or with different contexts. Fuller's lectures have a raga quality of rich nonlinear endless improvisation full of convergent surprises.

Some are put off by his languages, which makes demands on your head like suddenly discovering an extra engine in your car—if you don't let it drive you faster, it'll drag you. Fuller won't wait. He spent two years silent after illiterary language got him in trouble, and he returned to human communication with a redesigned instrument.



Ideas and Integrities
Buckminster Fuller
1963; 318 pp.
\$1.95 postpaid

No More Secondhand God
Buckminster Fuller
1963; 163 pp.
\$2.25 postpaid

Order from:
Cullier Books
The MacMillan Company
Order Dept
Front and Brown Streets
Riverside, N. J. 08075

Order from:
Southern Illinois University Press
600 West Grand
Carbondale, Illinois 62903

or WHOLE EARTH CATALOG

You belong to the universe. The significance of you will forever remain obscure to you, but you may assume that you are fulfilling your significance if you apply yourself to converting all your experiences to highest advantage of others. You and all men are here for the sake of other men.

I define "synergy," as follows: Synergy is the unique behavior of whole systems, unpredicted by behavior of their respective sub-systems' events.
[Ideas and Integrities]

Thinking is a putting-aside, rather than a putting-in discipline, e.g., putting aside the tall grasses in order to locate the trail into informative visibility. Thinking is FM-frequency modulation—for it results in tuning-out of irrelevantities as a result of definitive resolution of the exclusively tuned-in or accepted feedback messages' pattern differentiability.
["Omnidirectional Halo" / No More Secondhand God]

The World Design Science Decade documents contain some that is in the other books and much that isn't. The 6 volumes set costs \$10.50 postpaid to students (formal and informal); \$30.00 postpaid to others. This is a very good deal.

Order from:
World Resources Inventory Office
P.O. Box 909
Carbondale, Illinois 62901


Man is so deeply conditioned in his reflexes by his millennium of false functioning that he has too many inferiority complexes to yield to political reformation. The obsolete games will be abandoned only when realistic, happier and more interesting games come along to displace the obsolete games.
[WDSO Document 3]

We find that original question asking is a consequence of interrogations, whether in the computer or the human brain. We find then that original questions are second derivative events in the computer life.
[WDSO Document 3]

My Recommendations for a Curriculum of Design Science:

1. Synergetics
2. General Systems Theory
3. Theory of Games (Von Neumann)
4. Chemistry and Physics
5. Topology, Projective Geometry
6. Cybernetics
7. Communications
8. Meteorology
9. Geology
10. Biology
11. Sciences of Energy
12. Political Geography
13. Ergonomics
14. Production Engineering

[WDSO Document 5]



Operating Manual for Spaceship Earth
Buckminster Fuller
1969; 143 pp.
\$4.25 postpaid

Order from:
Southern Illinois University Press
600 West Grand
Carbondale, Illinois 62903

or WHOLE EARTH CATALOG

For \$4.95 you can get a paperback called *Environment and Change* which has an identical "Operating Manual" along with 24 other futuristic articles, including fine pieces by R. G. H. Siu, John R. Platt, Herman Kahn, Robert Theobald, Gunnar Myrdal, David Buzelon, and John Turner.

Order from:
University of Indiana Press
P. O. Box 369
Bloomington, Indiana 47401

or WHOLE EARTH CATALOG

Nine Chains to the Moon
Buckminster Fuller
1958, 1963; 375 pp.
\$2.45 postpaid

Order from:
Southern Illinois University Press
600 West Grand
Carbondale, Illinois 62903

or WHOLE EARTH CATALOG

Common to all such "thrust" mechanisms—and without which they are imbecile contraptions—is their guidance by a phantom captain.

This phantom captain has neither weight nor sensorial tangibility, as has often been scientifically proven by careful weighing operations at the moment of abandonment of the ship by the phantom captain, i.e., at the instant of "death." He may be likened to the variant of polarity dominance in our bipolar electric world which, when balanced and unit, vanishes as abstract unity 1 or 0. With the phantom captain's departure, the mechanism becomes inoperative and very quickly disintegrates into basic chemical elements.

An illuminating rationalization indicated that captaining—being phantom, abstract, infinite, and bound to other captains by a bond of understanding as proven by their recognition of each other's signals and the meaning thereof by reference to a common direction (toward "perfect")—are not only all related, but are one and the same captain. Mathematically, since characteristic of unity exist, they cannot be non-identical.

Since Yogi is a personalized art, the art dies with the person. The abstract power involved remains as real and true, always, but it cannot be made utilizable in increasing continuity for the world in general. Christ and his counterparts realized this and were unwise in their refusal to apply this power to self ends. It was this personal limitation of the Yogi art which led the gnostic philosophers to search further. They sought a means of limitless articulation.
[Nine Chains to the Moon]

The will of history reads "for everybody or for nobody," and since we balk at "for nobody" it has to be "for every body." And that's the way it is going, lickety-split and the world around.
[WDSO Document 3]

Personal Self-Disciplining. In 1927 I gave forever the general economic dictum of society, i.e., that every individual who wants to survive must earn a living. I substituted, therefore, the finding made in concept one, i.e., the individual's autonomic responsibility in universe. I sought for the tasks that needed to be done that no one else was doing by attempting to do, which if done would physically and economically advantage society and eliminate pain.
[WDSO Document 5]

Reshape environment; don't try to reshape man. [WDSO Document 1]

To begin our position-fixing aboard our Spaceship Earth we must first acknowledge that the abundance of immediately consumable, obviously desirable or utterly essential resources have been sufficient until now to allow us to carry on despite our ignorance. Being eventually exhaustible and spoilsable, they have been adequate only up to this critical moment. This cushion-for-error of humanity's survival and growth as it now was apparently provided just as a bird inside of the egg is provided with liquid nutriment to develop it to a certain point. But then by design the nutriment is exhausted at just the time when the chick is large enough to be able to locomote on its own legs. And so as the chick pecks at the shell seeking more nutriment it inadvertently breaks open the shell. Stepping forth from its initial sanctuary, the young bird must now forage on its own legs and wings to discover the next phase of its regenerative sustenance.

Brain deals exclusively with the physical, and mind exclusively with the metaphysical. Wealth is the progressive mastery of matter by mind.

A new, physically uncompromised, metaphysical initiative of unbiased integrity could unify the world. It could and probably will be provided by the utterly impersonal problem solutions of the computers.

Possession is becoming progressively burdensome and wasteful and therefore obsolete.

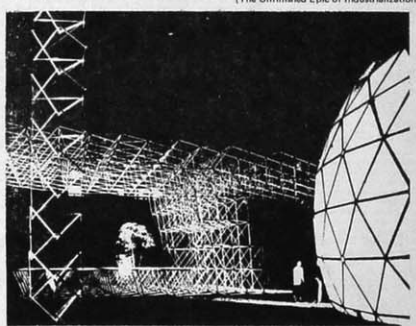
You and I are inherently different and complementary. Together we average as zero—that is, as sternity.
[Operating Manual for Spaceship Earth]

The Unfinished Epic of Industrialization
Buckminster Fuller
1963; 227 pp.
\$4.50 postpaid

Order from:
Small Publishers Company
276 Park Avenue South
New York, N. Y. 10015

or WHOLE EARTH CATALOG

However, man unconsciously sorting mail on an express train with unuttered faith that the switchmen are not asleep, that the track workers are doing their job, that the technologists who designed the train and the rails know their stuff, that the thousands of others whom he may never know by face or name are collecting tariffs, paying for repairs, and so handling assets that he will be paid a week from today and again the week after that, and that all the time his family is safe and in well being without his personal protection constitutes a whole new era of evolution—the first really "new" since the beginning of the spoken word. In fact, out of the understanding in the spoken word was industrialization wrought after millenniums of seemingly whitherless sweat work.
[The Unfinished Epic of Industrialization]



Tension and Compression are complementary functions of structures. Therefore as functions they only co-exist. When pulling a tenuous rope its girth contracts in compression. When we load a column in compression its girth tends to expand in tension. When we investigate tension and compression, we find that compression members, as you all know as architects, have very limited lengths in relation to their cross sections. They get too long and too slender and will readily break. Tension members, when you pull them, tend to pull, approximately (almost but never entirely), straight instead of trying to curve more and more as do too thin compression loaded columns. The contraction of the tension members in their girth, when seasonally loaded, brings its atoms closer together which makes it even stronger. There is no limit ratio of cross section to length in tensional members of structural systems. There is a fundamental limit ratio in compression. Therefore when nature has very large tasks to do, such as covering the solar system or the universe she arranges her structural systems both in the microcosm and macrocosm in the following manner. Nature has compression operating in little remotely positioned islands, as high energy concentrations, such as the earth and other planets, in the macrocosm; or as isolated electrons, or protons or other atomic nuclear components in the microcosm while cohering the whole universal system, both macro and micro, of mutually remote, compressional, and oft non-simultaneous, islands by comprehensive tension—compression islands in a non-simultaneous universe of tension. The Universe is a tansynergy.
[WDSO Document 2]

wondrous new solution to housing," Kahn suddenly warned, "... we have learned that there is far more to be learned from wisdom of the past: from structures shaped by imagination, not mathematics, and built of materials appearing naturally on the earth, than from any further extension of whiteman technoplastic prowess."⁴³ Kahn's classic 1973 compendium *Shelter* was typeset on sophisticated *Whole Earth Catalog* machines and was cinematic in its sequence of double-page spreads,⁴⁴ but it switched allegiance to traditional, vernacular, and folk dwelling, relinquishing Kahn's reputation as the best known dome builder in America (Figure 3). Peter Calthorpe—Kahn's erstwhile dome builder colleague and a Bateson Building codesigner—arrived at comparable conclusions when, in the 1980s, he became a chief advocate for the New Urbanism and its avowed promotion of "local history, climate, ecology, and building practice."⁴⁵

Kahn delivered his seeming halt to modernization during an address at the birthplace of cybernetics, MIT, after he was shown Negroponte's SEEK Architecture Machine manipulating bricks by robotic arm (Figure 16). Industrial modernization had prompted the foundation of MIT in 1861 and, sixteen years before that, the retreat of protoecologist Henry David Thoreau to nearby Walden Pond.⁴⁶ Analogously to Thoreau's deliverance, Kahn's discovery that the world contains "no wondrous new solution" became a dictum of whole design, positing instead a dialectic between modernity and tradition. This relation of dwelling to totality has roots in Transcendentalism, the literary and philosophical movement of nineteenth-century New England, which figured a universe composed of "corresponding forms."⁴⁷ "What of architectural beauty I now see," Thoreau wrote as a Transcendentalist, "I know has gradually grown from within outward, out of the necessities and character of the indweller, who is the only builder—out of some unconscious truthfulness, and nobleness"—this was the frontispiece chosen both for a mainstay of the *Catalog*'s recommended building literature, Ken Kern's

otherwise prosaic *The Owner-Built Home* (1972), and for the proceedings of the MIT conference at which Kahn and Kern were confronted by the Architecture Machine.⁴⁸

Ostensibly, Brand's reception of Negroponte's Architecture Machine was diametrically opposed to Kahn's reaction against it. Yet Brand's meditations upon building, too, drew a line under the ultimate worth of technology as the medium of whole

design. After decades studying MIT's cybernetic projects, for example, Brand found his ultimate architectural ideal not in the cybernetic experiments taking place at MIT, but in the timber-framed bulk of the building where the experiments took place. At MIT's Building 20, hurriedly built in 1943 in response to the war effort, Brand discovered a structural tolerance for "rhizomatic" organization as Wiener and his cybernetic scientist colleagues



9. Lama Foundation, San Cristobel, New Mexico, 1967–present. (Source: Environmental Communications.)

tunneled electronic rigs through walls and floors (Figure 17). Such mutability was in vivid contrast to the rigid, 1985 I.M. Pei building which would house the Media Lab across the way, an institution reified, Brand argued, by Pei's conclusive, artistic form⁴⁹ (Figure 18). Brand's detection of *How Buildings Learn* was in the end convivially everyday, placing architecture at the disposal of anyone with a copy of the *Reader's Digest Complete Do-It-Yourself Manual*. The sale between 1973 and 1990 of some eight million copies of this utilitarian handbook for amateurs, Brand noted without embarrassment, was evidence of a sustained mass desire to engage with habitat.⁵⁰ Brand's journalism aimed to make the techniques of construction, communication, and agriculture accessible again; and others in the Whole Earth network, like Baldwin and Baer, pursued rigorously independent, garage-assembly research, as though in defiance of technology's sequestering by governmental, academic, and private labs.⁵¹

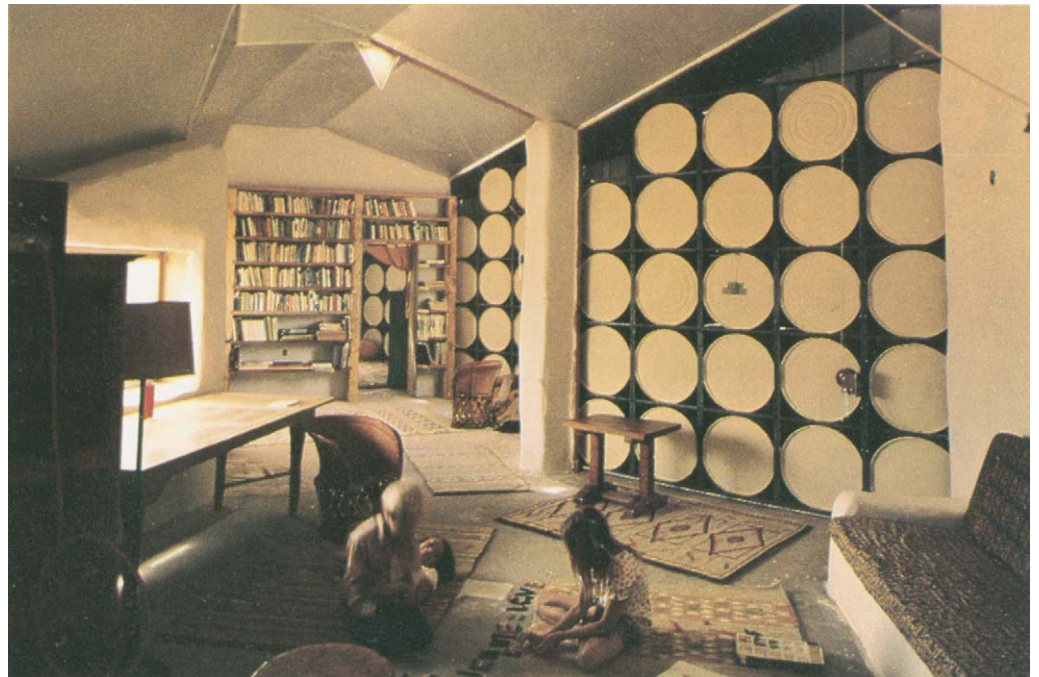
In accordance with this adjusted sense of design, the agrarian shed simplicity of Kahn's self-built home at Bolinas, California, was in marked contrast not only to the renowned and technically complex 1971 geodesic dome he had previously constructed on the site but also to the fine octagonal tower which replaced the dome in 1975 and from which the house grew (Figure 19). That tower had taken its cue from agricultural and vernacular buildings, which Kahn encountered when staying in

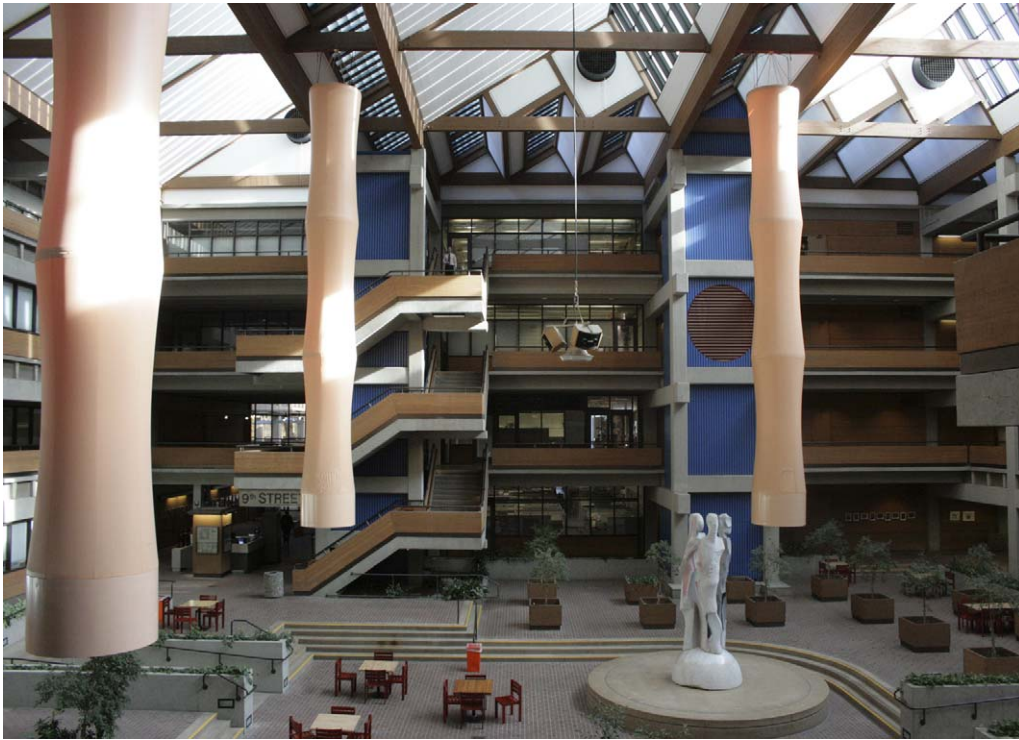
the English village of Mapledurham in the early 1970s.⁵² Brand was similarly influenced by traditional English architecture when preparing *How Buildings Learn*. The Whole Earth network, then, maintained through design a curious dialectic between essentializing, premodern models, and a modern relativism. For example, Kahn's first

construction after abandoning dome building was little short of reactionary in its design, a gable-ended shed; but materially, there was a contemporary spirit in the little building, with fiberglass for the lights in the gable ends, its timber mostly recovered as waste from the streets of San Francisco (Figure 20). Much of Kahn's book *Shelter* similarly suggested not straightforward tradition, but *bricolage* and hybridity. Here was a nonteleological modernism, an excursion into architecture's imminent losses and gains simultaneously.

The conclusion drawn by Kahn and Brand, that a built object must work with its local material ecology, was markedly different from their founding enthusiasm for the geodesic dome arriving in a locality as an envoy from a higher, more abstract, and atemporal synergy. Contrary to modern architecture's furious attempts at efficiency, Kahn

10. Steve Baer, Baer Residence, Corrales, New Mexico, 1972. (Source: data unknown.)





11. Office of the State Architect, Bateson Building, Sacramento, California, 1977. (Author image.)

summarized his newfound sense of what made housing aesthetically, functionally, and ecologically satisfactory: the employment of the human hand, the integrity of materials, and a respect for time and place. The best materials originated not in industry, Kahn now argued, but “are those that come from close by, with the least processing possible”—in temperate climates, trees; in deserts, adobe.⁵³ Kahn was critical of attempts to copy nature straight, though like many other *Whole Earth Catalog* reviewers, he was guardedly impressed by the exposition of natural design processes found in D’Arcy Wentworth Thompson’s classic of 1917, *On Growth and Form* (Figure 21). Here was a handbook, the *Catalog* contended, of importance to “artists, inventors, engineers, computer systems designers, [and] biologists” alike⁵⁴—it supplied a natural language, of infinite longevity, for the disparate disciplines trying to assemble the whole as a time-based open work.

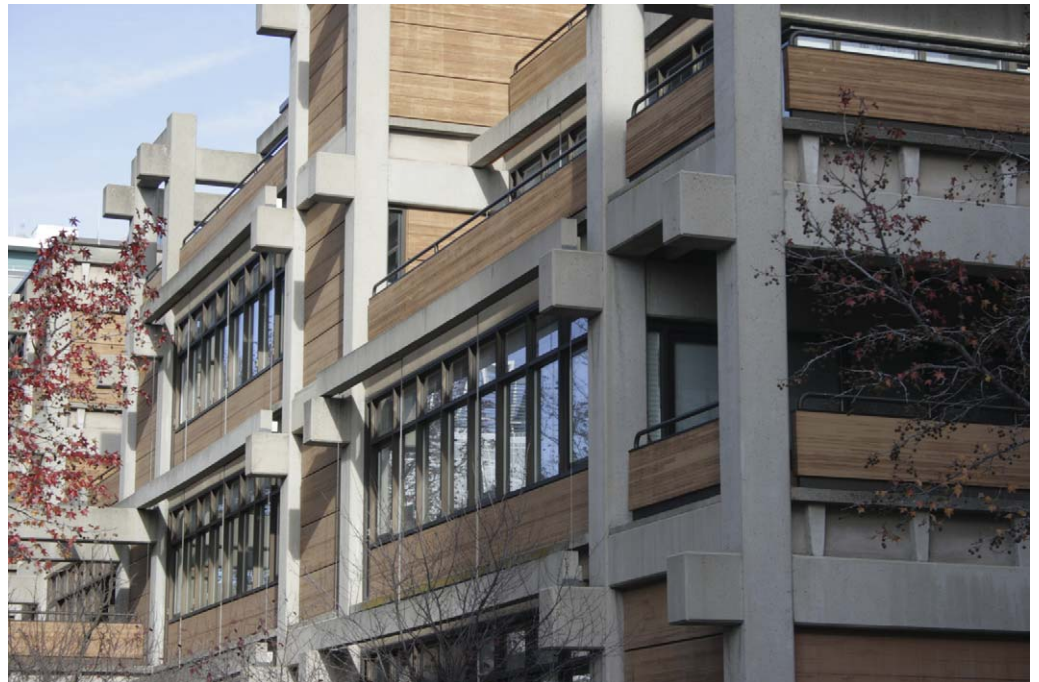
The Ontology of the Whole

Whole design might amount to little more than an expanded modernism—like modernism, but still more universal, with a corresponding devaluation of particularity.⁵⁵ True, Kahn and Brand refocused attention on the genius of place and the experience of making; but where particularity matters the most—in the political realm—the Whole Earth network constantly moved attention away from *particular* sufferings, inequities, and identities

toward a more general, more abstract, and more universal systematization.⁵⁶ Whatever its power to direct our attention to the interaction of the components of a system (be it a building, a society, a world, or indeed all these, all at once), holism implies the overbearing presence of an absolute, which can have political consequences ranging from

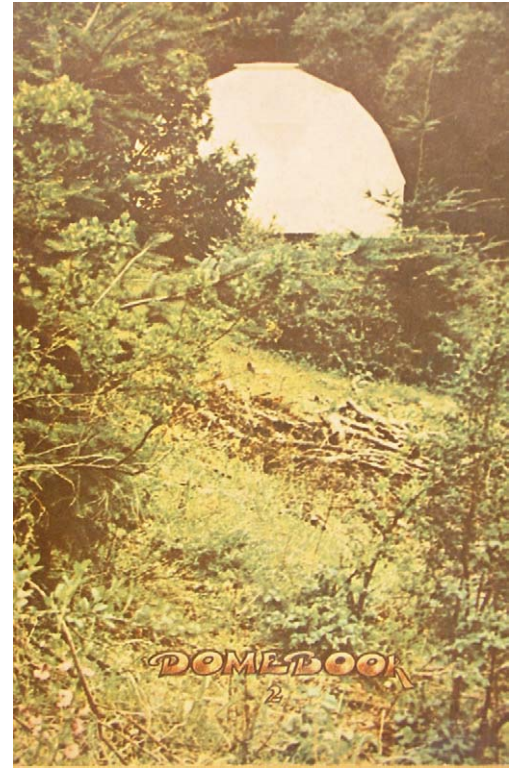
naïveté to totalitarianism.⁵⁷ There is little point disputing that the Whole Earth network enjoyed a relative social privilege, producing a largely white, Bay Area, middle-class, male, and educated constituency’s idealization of culture and nature, dreamt up while innercity America smoldered. Suspicion of a Whole Earth–style ecological nation, which Governor Jerry Brown’s administration in California was deemed to prototype, was memorably articulated in *California Über Alles*, the 1979 punk song by the Dead Kennedys recorded while Brand and Van der Ryn served in Sacramento: “Zen fascists will control you/100% natural/You will jog for the master race/And always wear the happy face.” Publication of the *Catalog*, Brand candidly confessed of a purpose with wider implications for politics, “meant that I could work on the communes without actually having to live on one.”⁵⁸

12. Office of the State Architect, Bateson Building, Sacramento, California, 1977, atrium. (Author image.)



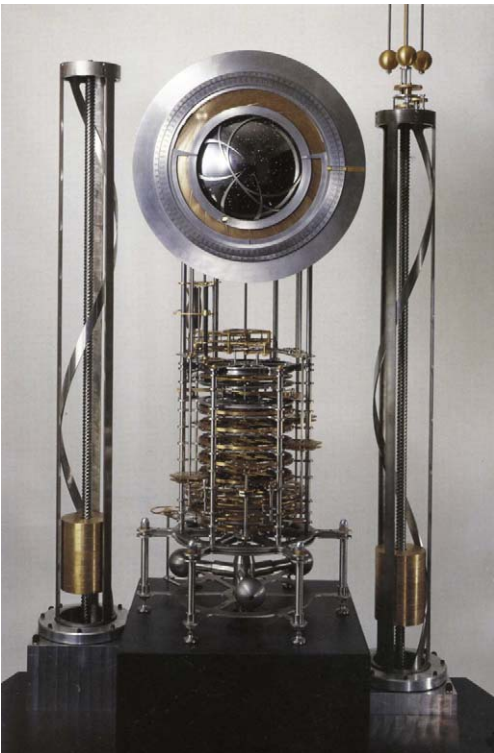


13. Lloyd Kahn and others, Dome construction at Pacific High School, Santa Cruz, c. 1969. (Source: *Domebook 2*.) (Photo courtesy of Lloyd Kahn.)



15. Lloyd Kahn, *Domebook 2*, 1971. (Source: *Domebook 2*.) (Photo courtesy of Lloyd Kahn.)

14. Danny Hills, Clock of the Long Now prototype, 1999. (Photo courtesy of Stewart Brand.)

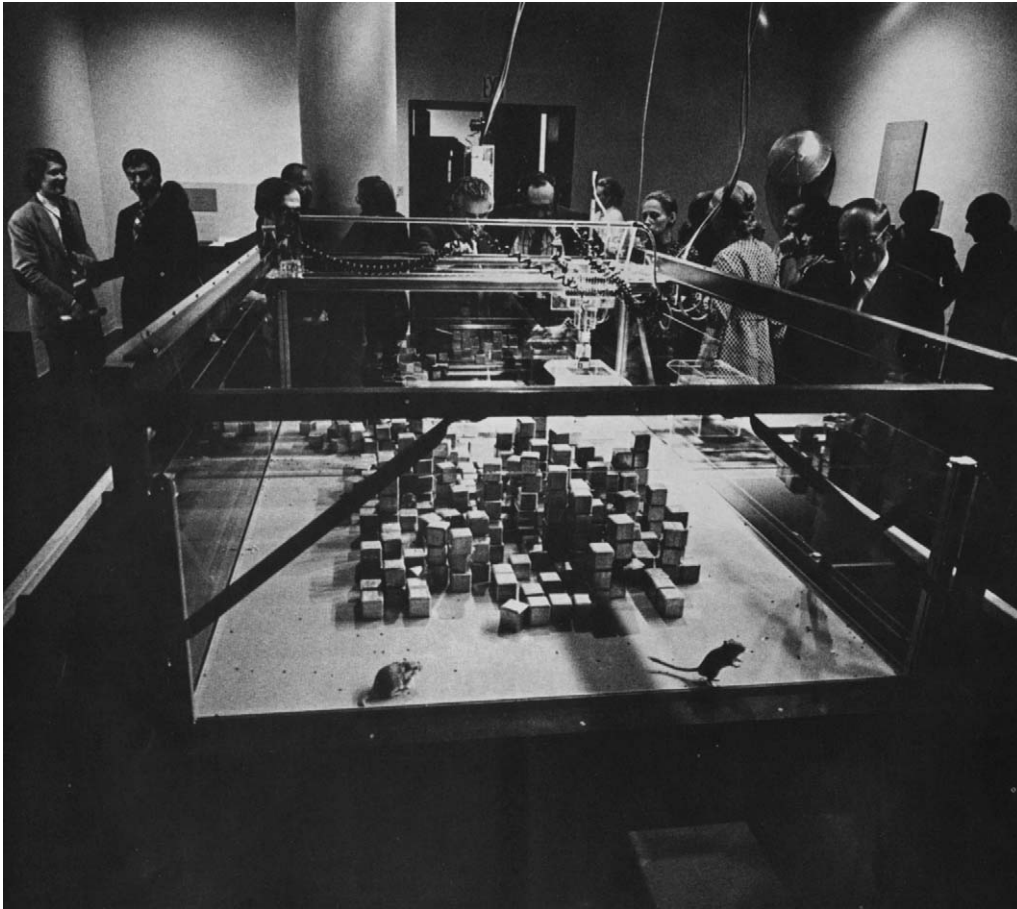


It is at the risk, then, of a wishful reading that this article draws attention to the way that the *Whole Earth Catalog* combines the most appealing features of universalism *and* particularism: it approached the world at the most abstract and equitable levels on the one hand and at the most material and identity-centered on the other. It prototyped this miraculous universalist-particularist world—I shall refrain from claiming that it *achieved* it—by providing a space of assembly to a suburban, mall-oriented, late-capitalist, Cold War America. Its ambition was comparable to the print-based “public sphere” of the seventeenth and eighteenth centuries.⁵⁹

In order to habilitate ecology into politics, Bruno Latour has extended a Kantian ethics to all things, human and nonhuman—which is simply to treat all things as ends in themselves. “No entity is merely a means. There are always also ends. In other words, there are only mediators,” Latour writes of an ethos that he thinks should underwrite a politics dealing with *real things* in a postmodern world.⁶⁰ The *Whole Earth Catalog*, its pages filled with things, was such a grand mediator, I suggest. “Objects—taken as so many issues—bind all of us in ways that map out a public space profoundly different from what is usually recognized under the label of ‘the political,’” argues Latour in *Making*

Things Public.⁶¹ Extending a Kantian reading, we can claim that the *Catalog* presented particular objects not for their formal beauty, but so as to share beautiful *experiences* as accessed through the objects (Figure 22). This aesthetic experience was a capacity to reason and act, at which point readers recognized their own universal humanity within a coherent whole.

To this I will add the proposal that the *Catalog* was *itself* modeling whole design. As an object, as a structure, the *Whole Earth Catalog* was deeply appealing and curiously modern. Its cover images of the whole earth could evoke emotional responses comparable to the photographs of machine ball bearings used to argue the case for modernism in the 1920s. The *Whole Earth Catalog* delivered a modernistic shock of the new, in the things it showed, the connections it made, and the making strange of familiar things, all characteristic of the bourgeois encounter with the agrarian and industrial.⁶² It remains a fascinating read because it was by this kaleidoscopic method that it, like Diderot’s *Encyclopédie* before it, alerted its reader to the opportunities effected by modern society’s increasing remove from mere subsistence. Political slogans at the time, since devalued as clichés, are redolent with the fascination of unexpected



16. MIT Architecture Machine Group, SEEK Architecture Machine, 1970. (Source: *Software*, catalog of an exhibition at the Jewish Museum, 1970.) (Photo by Harry Shunk.)

has drawn between the *Catalog* and the *Encyclopédie*,⁶⁵ and in any case, the lines written by Diderot's collaborator Baron d'Holbach, in the *Système de la nature* of 1770, could serve as a rationale for the *Catalog* with no modification:

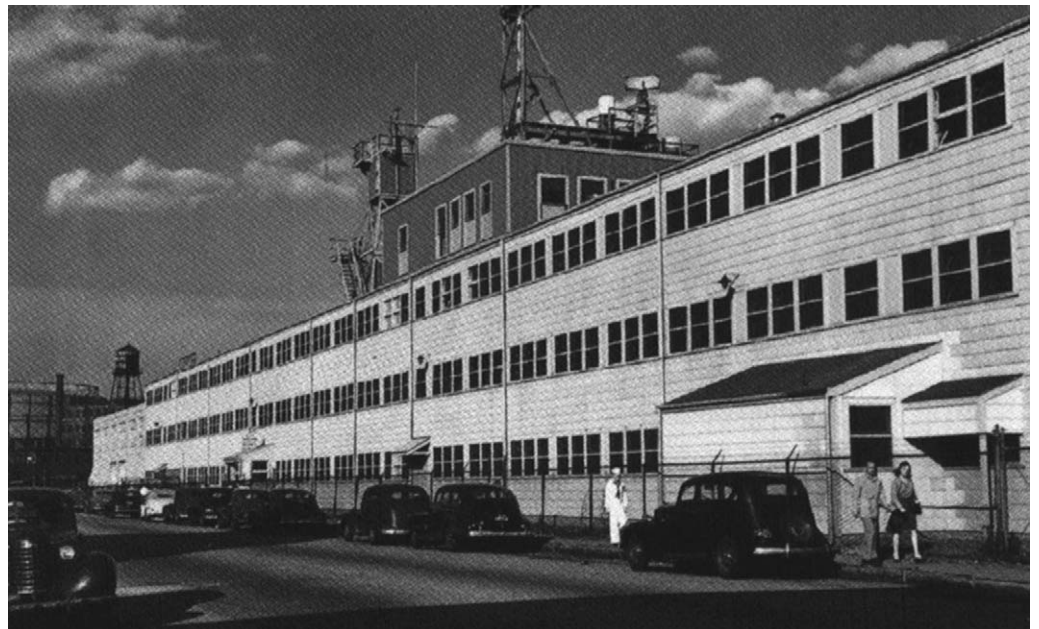
... man is a production formed in the course of time; who is peculiar to the globe he inhabits, who is the result of the peculiar laws by which it is directed; who, consequently, can only date his formation as coeval with that of his planet.⁶⁶

We can also correlate the *Catalog* to the struggle for humanism following the Second World War by comparing it to Edward Steichen's legendary 1955 photographic exhibition and catalog *The Family of Man* (Figure 23). In each, an inspired editor, dependent upon the participation of others, assembled a sense of totality from the massed fragments of things. Both were compelled by the Cold War's mental and literal image of the atomic

relationships availed between human community, technology, and nature: "Think Globally, Act Locally," urged René Dubos as an advisor to the United Nations Conference on the Human Environment in 1972, suggesting seven years later the creation of an ecological World Order in which "natural and social units maintain or recapture their identity, yet interplay with each other through a rich system of communications,"⁶³ a vision redolent of the *Whole Earth Catalog's*.

The *Catalog* can be compared, as well, to the devices of Gilles Deleuze and Félix Guattari, synchronous intensities spinning into diverse fields, pages by turn connecting technologies to bodies to plants, and humans to nonhumans. I hesitate to say posthumans: while the comparison of the *Catalog* and the Deleuzian "plateau" is productive (Deleuze and Guattari read Gregory Bateson),⁶⁴ the *Catalog's* ecology of mind was resolutely grounded in reason. It was a rhizomatic rationalism, if we can imagine such a thing, a hippie Enlightenment revival. We know this from the comparison Brand

17. Building 20, MIT, Cambridge, Massachusetts, 1943 (demolished). (Source: data unknown.)





18. I.M. Pei, Wiesner Building (Media Lab), Massachusetts Institute of Technology, Cambridge, Massachusetts, 1985. (Source: Wikipedia Creative Commons [Attribution-ShareAlike License].) (Photo by Harris Wang.)

bomb⁶⁷ and both were derided, in retrospect, for their universalizing, apolitical overtone, their unabashed empathy with the world.

Philosopher Maurice Merleau-Ponty's description of the human individual as a vital "pivot" for making sense of the world has been revisited by art historian Blake Stimson as a way to better understand the import of post-War serial photographic projects such as *The Family of Man*.⁶⁸ Separated by a decade during which consumerism had accelerated, the "pivotal" role of the viewer of *Family of Man* can apply, through adaptation, to the reader-contributor of the *Whole Earth Catalog*. The *Catalog's* reader-contributors were, if anything, still more intriguing subjects—consumers and citizens at one and the same time, pivots for great series of testimonials about how things work in the world. This combination of postmodern and modern sensibilities was momentary but not perverse inasmuch as the *Whole Earth Catalog* was trying to reconcile modernization's twin phenomena of reason and commerce. The *Catalog* employed copywriting finesse (Brand came from a family in the advertising business) to "sell" mighty and apparently *unprofitable* ideas about the world. A conventional assumption is that avant-garde projects are doomed because the designer cannot change the conditions of production, so the *Whole Earth Catalog* tackled the problem in reverse, changing the conditions of consumption. Faced with

the worrying alternative paths of unchecked consumerism, militarism, and ecologies of anarchistic, deep, or millenarian cast,⁶⁹ the *Catalog* staked out the ground for an almost "middle-American" ecology available through mail order.

The *Whole Earth Catalog's* aesthetic system—a collage of content, set between iconic images of the Earth—implied that each reader "constructed" the world by knowledge, experience, and choice held within a natural boundary set by the biosphere at large. Collage, admittedly, can be as illusionistic of "the whole" as it was illustrative.⁷⁰ In 1974, architectural theorist Manfredo Tafuri trenchantly cautioned that "language can speak of the indeterminate, the casual, the transient, since in them it greets the advent of the Whole. Yet this is but an endeavor to give a form of expression to the phenomenon of mass consumption," with "roots in the technological myth. Technology can thus be read mystically, as a 'second nature'."⁷¹ But *Catalog* editors doubtless saw its technological collage less as a system in itself than as a *portal* to a material system awaiting the reader in the world. In a description

19. Lloyd Kahn, Kahn Residence, Bolinas, California, c. 1973. (Source: *Shelter*, 1973.) (Photo courtesy of Lloyd Kahn.)



of the book format befitting the *Whole Earth Catalog*, Deleuze and Guattari wrote that:

There is no longer a tripartite division between a field of reality (the world) and a field of representation (the book) and a field of subjectivity (the author). Rather, an assemblage establishes connections between certain multiplicities drawn from each of these orders, so that a book has no sequel nor the world as its object nor one or several authors as its subject. . . . The book as assemblage with the outside, against the book as image of the world.⁷²

The high-quality color images of Earth on its cover were the overriding aesthetic legacy of the *Whole Earth Catalog*, picturing design's raw material at a new and completely meta level (Figure 1). Whereas *The Family of Man* reserved color for its climactic image of the atomic bomb, the *Whole Earth Catalog* affectingly did the same for the image of the planet threatened by the bomb.⁷³ It was a publishing first, and Brand's moral purpose in distributing the image of Earth as widely as possible⁷⁴ is distinct from classical, Romantic, and scientific traditions of observing nature by oneself, usually from a privileged viewpoint, and as a man.⁷⁵

That we have in the covers of the *Whole Earth Catalog* an aid to collective reason, not just a poster, is suggested by the fact that Brand did not long entertain the idea that in these beautiful pictures of the whole earth we have *really* seen the whole earth. At a 1971 sauna party, Brand was invited by another guest to consider, apparently of an aspect of the view from the sauna, that "The mountain has two sides." "And either before or after," Brand recalled, "he said, 'Imago'. Which put together in me to realize The mountain has two sides. The image has one."⁷⁶ Similarly, the picture of the whole earth on the cover of Brand's *Catalog* was more an idealized mental picture, an imago.⁷⁷ Unlike the "unfurled" cartographic projections (including Fuller's Dymaxion Maps) that purport to

show the world in its whole circumference and in continuous duration, the images Brand obtained from NASA were necessarily restricted to depicting one side of the globe at one moment (as Fuller pointedly reminded Brand in 1966).⁷⁸ "The perpetual limitation of knowledge, of consciousness,"⁷⁹ brooded Brand. The whole earth depicted on the cover of the *Catalog* was sublime in its capacity to inspire awe and pleasure (all the moreso for a viewer on drugs) but acted, then, as a call to reason, morality, and action, pointers to which would be found within the *Catalog's* directory.

Conclusions: Toward Whole Architecture

The *Catalog's* methodology was all too close to modern architecture's, one might say: Brand was an

"architect" in the way he provided an institutional and material framework through which to stage the desires of others and assuage antagonism⁸⁰ ("who could dream of a better example of hybrid forums," asks Latour, "than the scale models used by architects all over the world to assemble those able to build them at scale 1?").⁸¹ The way in which *constraint* exercises a space for coevolution became of marked interest to Brand, in politics as in building, in building as in the environment. By the time Brand wrote *How Buildings Learn*, he accepted the role of building code, for instance:

A building is the interface between two human organizations—the intense group within and the larger, slower, more powerful community outside. . . . As a youth I regarded building

20. Lloyd Kahn, Shed, San Francisco area, c. 1972. (Source: *Shelter*, 1973.) (Photo courtesy of Lloyd Kahn.)



On Growth and Form

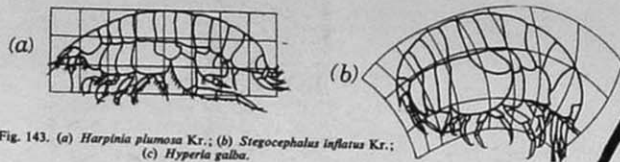


Fig. 143. (a) *Harpinia plumosa* Kr.; (b) *Stegocephalus inflatus* Kr.; (c) *Hyperia galba*.

A paradigm classic. Everyone dealing with growth or form in any manner can use the book. We've seen worn copies on the shelves of artists, inventors, engineers, computer systems designers, biologists. Would one of you do a thorough review of D'Arcy Thompson's venerable book for the CATALOG?

When Plateau made the wire framework of a regular tetrahedron and dipped it in soap-solution, he obtained in an instant a beautifully symmetrical system of six films, meeting three by three in four edges and these four edges running from the corners of the figure to its centre of symmetry. Here they meet, two by two, at the Maraldi angle; and the films meet three by three, to form the re-entrant solid angle which we have called a 'Maraldi pyramid' in our account of the architecture of the honeycomb. The very same configuration is easily recognized in the minute siliceous skeleton of *Callimitra*. There are two discrepancies, neither of which need raise any difficulty. The figure is not rectilinear but a spherical tetrahedron, such as might be formed by the boundary edges of a tetrahedral cluster of four co-equal bubbles; and just as Plateau extended his experiment by blowing a small bubble in the centre of his tetrahedral system, so we have a central bubble also here.

This bubble may be of any size; but its situation (if it be present at all) is always the same, and its shape is always such as to give the Maraldi angles at its own four corners. The tension of its own walls, and those of the films by which it is supported or slung, all balance one another. Hence the bubble appears in plane projection as a curvilinear equilateral triangle; and we have only got to convert this plane diagram into the corresponding solid to obtain the spherical tetrahedron we have been seeking to explain (Fig. 63).

The geometry of the little inner tetrahedron is not less simple and elegant. Its six edges and four faces are all equal. The films attaching it to the outer skeleton are all planes. Its faces are spherical,

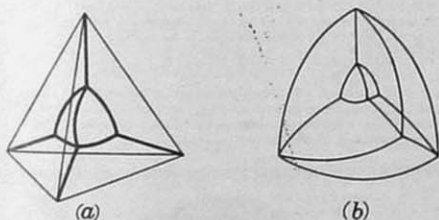


Fig. 63. Diagrammatic construction of *Callimitra*. (a) A bubble suspended within a tetrahedral cage; (b) another bubble within a skeleton of the former bubble.

and each has its centre in the opposite corner. The edges are circular arcs, with cosine $\frac{1}{2}$; each is in a plane perpendicular to the chord of the arc opposite, and each has its centre in the middle of that chord. Along each edge the two intersecting spheres meet each other at an angle of 120° .¹

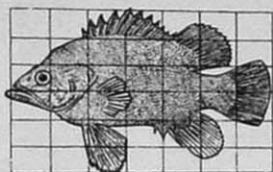


Fig. 150. *Polyprion*.

Fig. 151. *Pseudopriacanthus altus*.

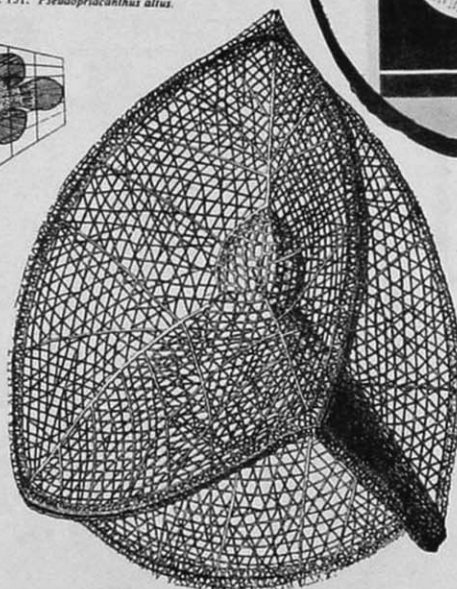
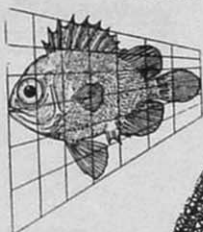


Fig. 62. A Nassellarian skeleton, *Callimitra senesae* Hkl. (0.15 mm. diameter)



Fig. 153. *Antigonia capros*.



On Growth and Form
D'Arcy Wentworth Thompson
Two volume edition
1917, 1952

\$27.50 postpaid (Currently out of print)

Abridge paper edition
1917, 1961; 346 pp.

\$2.75 postpaid

from:
Cambridge University Press
510 North Avenue
New Rochelle, N. Y. 10801

or WHOLE EARTH CATALOG

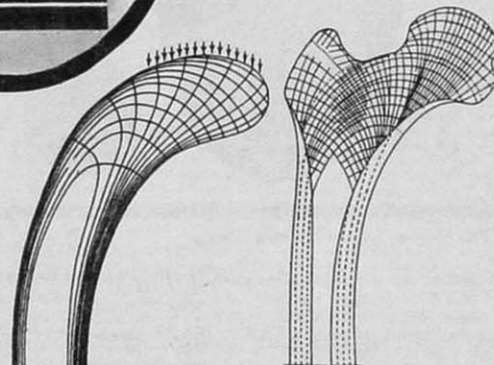
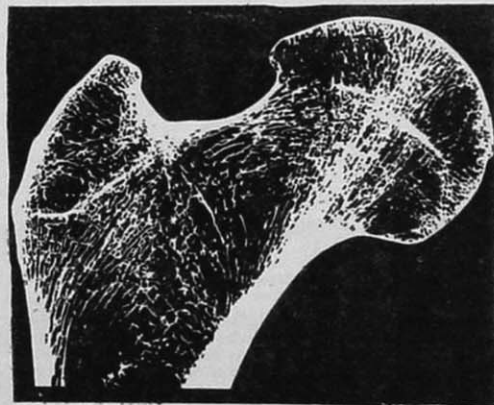


Fig. 101. Crane-head and femur. After Culmann and J. Wolff.

The engineer, who had been busy designing a new and powerful crane, saw in a moment that the arrangement of the bony trabeculae was nothing more nor less than a diagram of the lines of stress, or directions of tension and compression, in the loaded structure: in short, that Nature was strengthening the bone in precisely the manner and direction in which strength was required; and he is said to have cried out, 'That's my crane!'



codes as the embodiment of all that was unoriginal and constricting in society. Later I learned their value.⁸²

As a consequence, whole design increasingly sounded notes of conservatism, not directionless ebb and flow. Its disdain for modernist architecture, its respect for tradition as a prerequisite of learning, and its call for established building techniques accessible to the lay builder were summarized in the romantic reverence shown by *How Buildings Learn* for the English country house. Brand's book was almost bereft of truly "public" buildings—monuments, he implied, to architects, and to inert institutions, which are impressed upon fragile local social ecologies. The apparently mundane technical defects of modernist architecture that Brand painstakingly recounted were indicative, he suggested, of buildings devised by "artists" who will not inhabit them and are not invested in the collective development of culture.⁸³

Nevertheless, the prevailing tenor of Brand's theories (if not of all those hailing from the Whole Earth network) has been gently *anarchic*. His preferred building methods were ad hoc, additive, rehabilitating, un-mortgaged, environmentally sensitive, multiple authored.⁸⁴ Brand—who organized the first conference for computer hacking (1984)⁸⁵—brought something of the sensibility of open-source software to bear on architecture. Relatively unpolluted by the claims of capital and intellectual property, it is an idealistic vision in which community leans ever toward inclusion rather than exclusion and consensus never slides into hegemony. Supporting the vision is a drive toward common, nonproprietary building methods that revere craft and nature as links to an emerging future as much as to a receding past. Similarly, it would seem, Lloyd Kahn has advocated simple, speedy stud wall construction and the observation of local building custom so that buildings do not become fetish objects, but instruments and containers for life. Like evolutionary biology and

Earth Homes

Dirt—the cheapest and most abundant building material—has for ages been used to construct shelters. These three pamphlets offer current information on soil as a construction material.

Adobe Construction Methods gives details on laying bricks, fireplaces and pictorial and cross section views of foundations, floors, and walls.

Earth for Homes is a non-technical account of field experiences, with formulas and procedures for different types of earth buildings.

Soil-Cement—Its Use in Building is a well-detailed booklet on the stabilization of earth with cement, and describes all aspects of using the Cive-Ram earth moulder.

Adobe Construction Methods

L. W. Neubaer
1964, 35 pp.
\$.25

from:
Agricultural Publications
207 University Hall
University of California
Berkeley, CA 94720

Oily, waterproofing agents, especially emulsified asphalt, are being widely and successfully used as stabilizers. A fractional volume of a water emulsion of asphalt, added to the earth-and-water mix, provides an internal waterproofing that permanently protects adobe bricks.

When you build with adobe, you get covered with it.

A bar graph illustrating the soil texture classification as used by the USDA Bureau of Soil. Soil classes based on the relative amounts of clay, silt, and sand. C, Results of certain soil tests. The numbers indicate suitability for earth construction. Note that the best mixes contain large percentages of sand.

Making Bricks

Manual labor is, of course, the historical method of brick making. Make rectangular forms of wood or metal. Lay them on the ground, on a smooth area, and place mud in the forms by shovel or bucket. Soak the adobe carefully, and tamp it into all corners of the forms, to insure well-shaped bricks. Strike the top off level, then lift the forms, leaving the bricks in place. Not too wet, or the mud will run after you remove the forms, or may shrink and crack extensively upon drying. Cover bricks with paper to slow down the initial drying. After lifting the form, wash excess mud off its inner faces with water, and repeat the molding process. Allow the bricks to lie flat for one to three days, until they are sufficiently strong to hold their shapes when turned. At that time, set bricks on edge, so air may circulate freely on both sides. This will promote uniform drying and help prevent warping and cracking. After a few more days of drying in this position, stack the bricks in loose piles for a few weeks, to complete their drying and curing.

Stabilization

You can often improve soils that are unsatisfactory for brick making by mixing them with other soils or minerals.

Course sand or even some types of gravel, may often be added to good advantage. Generally, clay in the soil adds strength, while sand and gravel aid in reducing shrinkage.

Portland cement increases the strength of soil, and makes it water resistant.

Earth for Homes

free from: Department of Housing and Urban Development
Division of International Affairs
Washington, D. C. 20410

Rammed earth walls are made by tamping moist earth into forms. The walls are rammed directly upon the foundations and in sections. The forms are similar to those used for concrete except they must be stronger.

One distinct advantage of rammed earth construction claimed by its proponents is that the earth used to make the walls requires less handling than is required by any other form of earth construction. Many believe that this advantage more than offsets the disadvantage of the heavy and relatively complex form which must be periodically moved and carefully leveled as the work progresses.

Fig. 34. CIVE-RAM moulder for the production of rammed earth blocks. (Illustration by the author.)

Soil-Cement—Its Use in Building

1964, 85 pp., 93 illustrations
\$1.50 postpaid from:
United Nations
Sales Section
New York, N. Y. 10017

FORMS IN WHICH SOIL IS USED

Soil is used in construction in the following forms:
(a) In the form of rubble, cut from the surface of the earth, in pieces or blocks of soil.
(b) As bricks, made in wooden forms or molds with soil moistened to the required degree.
(c) Moistened soil compacted in situ, in suitable rigid frames to form monolithic walling (rammed earth).
(d) As stabilized soil, by combining it with an agent in order to improve its constructive properties.

Soil-cement roofing

If it is desired to use soil-cement as roofing for a house, the following methods may be used:
(a) Laths or reeds are laid on the roof truss or joists and nailed down; a plastic mortar of cement and (sandy) soil in the proportions of 1:7 by volume, with vegetable fibres 3 cm in length added as a reinforcement in the proportion of one part to four parts of mortar, is spread over the laths or reeds. The layer of mortar should be 3 cm deep, duly compacted, and its surface should be smoothed with a trowel. After the material has had time to dry and harden, two or three coats of bituminous material are brushed over the surface in order to make the roofing waterproof.

FIGURE 35. SECTIONAL VIEW showing construction details, including wooden base.

Yurt

A friend of ours got interested in the yurts used by nomadic people of Central Asia. Yurts are round buildings (tents) made out of a lattice work of sticks covered with sheets of felt. The roof is a truncated cone. The opening serves as skylight and smoke hole.

After building a number of yurts similar to the Mongolian ones out of different materials, Bill decided that he would like to build one out of milled lumber. I helped him construct one similar to the one in the plan. It is not difficult and certainly cheap. I do not know how easy it will be for someone who knows nothing about yurts and carpentry to build one, but Bill usually answers letters and I am sure he will be able to answer specific questions about the construction. Plans may be ordered from Bill Copertwhite, Bucks Harbor, Maine. Inquire as to price.

(Suggested and reviewed by Jur Bekker)

This YURT design has its origins in the folk wisdom of ancient Mongolia where the prototype has, for thousands of years, been found to withstand the severe cold and violent winds of the steppes.

26

The Wilderness Cabin

Not many log cabins are still being built. For one thing, it uses a lot of wood. However, it's a way for a man to go into the woods and with very few tools, erect a shelter. Maybe you've got to clear trees for a building site, or thin out an overgrown forest, or there is no road to your land. If so, here are diagrammed instructions on selecting a site, use of tools, and building a log cabin. Details are not extensive, but common sense will fill the gaps.

The Wilderness Cabin
Cabin Planter
1961, 100 pp.
\$5.95 postpaid from:
The MacMillan Company
Front Street
Riverside, N.J.
07075

OR WHOLE EARTH CATALOG

But an even better and more direct method than personal search is to go to the county seat in the county where you want to build. Ask the county auditor for a list of tax-delinquent properties, and the descriptions and plots of each location. During your first free weekend, examine the sites. If you find something you like, pay the back taxes.

When the original owner has failed to pay the taxes for a certain number of years—in many states the period is five years—and you pay the back taxes, you can get what is called a "tax assignment" from the county. Your final ownership paper is about equivalent to a quitclaim deed. This is good enough while you personally own the site. Should you attorney obtain a Torrens title for you, or procure a warranty deed through legal formalities.

Window and door frames

Window and door frames should be installed in a manner regarded as "floating." That is, they must not be spiked to the logs in such fashion as to allow the logs, when drying out and shrinking, to settle their weight on the spikes.

To accomplish this, I slot the door and window frames about 2 inches vertically at a position where every spike is driven through the door or window frames into the log ends. As the logs settle, the head end of the spike slides along these slots in the frames. As far as appearance is concerned there is no objection to this slotting because the door and window jams strips cover these slotted areas. (See illustration.)

Method of Slotting and Spiking Window and Door Frames for Log Cabins

Cabin on the Yukon River at 50 Degrees Below Zero



23. Edward Steichen (installation designed by Paul Rudolph), "The Family of Man," The Museum of Modern Art, New York, 1955. (Source: Digital Image ©The Museum of Modern Art/Licensed by SCALA/Art Resource, New York.)

learning, Kahn's preferred architecture operates away from known problems—he asks the builders he interviews for his books what they would do differently in retrospect.⁸⁶ And Kahn's own building career, again in retrospect, is better understood as a dialectical process than as a return to the past: Around Mill Valley and Big Sur in the mid-1960s, Kahn had worked in massive concrete and post and beam, before turning to the supreme lightness and complexity of geodesics, finally synthesizing the contradiction of mass and lightness to his own satisfaction, in the 1970s, with the material and creative manipulability of stud wall construction.

Can such buildings convey any larger public meaning? We can try to extrapolate how a design could possibly be judged according to its pertinence to "the whole" by turning back to Gregory Bateson. He wrote that "Any aggregate of events or objects" (and here we can imagine a building, or even the *Whole Earth Catalog*, as such an aggregate):

shall be said to contain "redundancy" or "pattern" if the aggregate can be divided in any way by a "slash mark," such that an observer perceiving only what is on one side of the slash mark can guess . . . what is on the other side of

the slash mark. We may say that what is on one side of the slash contains *information* or has meaning about what is on the other side.⁸⁷

For Bateson, "redundancy" and "pattern" were the mechanisms of meaning. "The whole" might *have* to be accessed in this way—aesthetically, as something perpetually beyond summary, even by science. The inevitability of aesthetic judgment helps diagnose a problem discovered by students at Rhode Island School of Design in 1968. "This," their structures instructor announced as the newly published *Catalog* was held aloft, "changes everything," but students who attempted the straightforward unification through design of all things found that their disagreements about what mattered were still more prominent than their agreements.⁸⁸ Of importance to Bateson was that an "aggregate" announce the presence of contexts ultimately beyond its control, but in which it is embedded.

It was the collective human need to imagine the shape of these contexts that explained the success of religion, Bateson thought—"My father, the geneticist William Bateson, used to read us passages of the Bible at breakfast—lest we grow up to be *empty-headed* atheists,"⁸⁹ he recollected in a passage quoted by the *Whole Earth Catalog*. And the present article will conclude within a perplexing nexus of design, ecology, polity, and religion partly because it is as startlingly present today as it was at the inception of the *Whole Earth Catalog*. In 1969, Bateson urgently framed a reasoned rejoinder to the California State Board of Education's assertion of equal scientific standing for Biblically based "creation theory" and scientifically based evolutionary theory. For all his anthropological sympathy with religion's attempts to picture the whole, Bateson wanted students to work back from imagination to reason.⁹⁰ So did Brand—as evangelicals, hippie pantheists, and deep ecologists were variously claiming that humanity is subject to a *divine* whole, the predominant tone of *Whole Earth* publications was proscientific,



24. James Hubbell, Sea Ranch Chapel, Sea Ranch, California, 1984. (Author image.)

antifundamentalist, and discursive. The famous opening line of the first *Whole Earth Catalog* put it this way: “We are as gods and might as well get good at it.” Only the rational “we,” cognizant of a larger natural system and inspired by its picturing, could attain the power once imagined as God.

This theological turn is relevant to design because the casting of rational humans as godlike has a long ancestry in western architectural theory which, from the Renaissance on, tends to instate the designer as a proxy god.⁹¹ “The world (universe) is a machine for making gods,” Richard Buckminster Fuller reminded himself in 1967 as he contemplated Brand’s demand to see an image of the whole earth.⁹² The invocation of divinity left the

Whole Earth network fatally vulnerable to mystical readings: a 1955 “noosphere” model of global consciousness, published by Jesuit scientist Pierre Teilhard de Chardin,⁹³ eventually impressed some prominent commentators of the Whole Earth network who saw the interconnection of biological, physical, social, and informational patterns as a kind of cybernetic divinity.⁹⁴ At its core, however, the *Whole Earth Catalog* accepted the “mysterious” interconnection of things not as the end of human enquiry but as its instigation. In 1989, for example, the *Whole Earth Catalog* published *The Fringes of Reason*, an appendix on alternative “New Age” belief systems. “Oh God,” wrote Brand in his foreword, “how did I get into this room with all these *weird people*?” He answered his own

question with Batesonian composure—“The believers of strange, strong beliefs are living a particularly ripe form of myth, tapping directly into hidden cultural structures that probably shape the rest of us as well, though indirectly”—and closed by suggesting that the scientific process itself “really is two-minded; it has to be to get anywhere. One mind gleefully speculates, the other ruthlessly slaughters speculation.”⁹⁵

Sustainable architecture might proceed accordingly “two minded” to avoid, at one extreme, an adoration of “organic” forms purporting to represent the underlying order of the world (Figure 24), or at another extreme, a cybercultural euphoria in the purportedly weightless economy, or at another, the materialist banality of designs driven by energy consumption calculations. Only an architecture that speculates, then slaughters speculation, that offers a “slash mark” which leaves loose ends, can honestly respond to the ecological whole if ecology itself is impossible to picture. Ecological politics, Latour tells us:

does not know what an eco-political system is and does not rest on the insights of a complex science whose model and methods would, anyway, if it existed, totally escape the reach of poor thinking and (re)searching humanity. This is its great virtue. It does not know what makes and does not make up a system. It does not know what is and is not connected. . . . Neither cybernetics nor hierarchy make it possible to understand the agents that are out of equilibrium, chaotic, Darwinian, as often as they are global, sometimes rapid, sometimes slow, that it brings into play via a multitude of original experimental devices whose mixed unity precisely does not—and this is the point—form an exact and definitive science.⁹⁶

After Vitruvius, Mark Wigley claims, “The figure of the architect became established as the

organizer of domains about which he or she doesn't necessarily have expertise."⁹⁷ This potentially cheerful incompetence is compromised if the architect clings to the mantle of divinity, manifested as authorship of an holistic-seeming built object in which "shallow guesses are frozen as deep decisions."⁹⁸ The real lesson of Moses' prohibition of graven images, Latour drolly concludes, was "Thou shall not freeze frame. If you stick to them, images are dangerous, blasphemous, idolatrous, but they are safe, innocent, indispensable if you learn how to jump from one image to the next."⁹⁹ The designer jumping from one image to the next in the *Whole Earth Catalog* enjoyed a vastly expanded realm of nonexpertise, and experienced something of an ecology of mind, ensuring that the problem of ecology could not be reduced to one building and its architect.

Acknowledgments

For their aid in preparing this article, I particularly wish to acknowledge Lloyd Kahn; the Humanities Institute, UC Davis, and their 2006–2007 Fellows; the distinguished participants of the Whole Earth Symposium held at UC Davis in 2006, and my coconvener for that event, Douglas Kahn; Blake Stimson; the editor and reviewers of the *Journal of Architectural Education*; and my patient household.

Notes

1. An early version of this article was given at "The Whole Earth: Parts Thereof" symposium, University of California, Davis, May 8, 2006.
2. For a thorough period overview, see William Chaitkin, "Alternatives," in Charles Jencks, ed., *Architecture Today* (London: Academy, 1982), chapters 11–16. For a recent critique of countercultural architecture, see Margaret Crawford, "Alternative Shelter: Counterculture Architecture in Northern California," in Stephanie Barron, Sheri Bernstein, and Ilene Susan Fort, eds., *Reading California: Art, Image, and Identity* (Berkeley: University of California Press, 2000), pp. 248–70. The ideas of countercultural design are collected in Chris Zelov et al., eds., *Design Outlaws on the Ecological Frontier* (Cape May, NJ: Knossos, 1997), which accompanied a 1994 documentary film *Ecological Design: Inventing the Future*. On geodesics and ecology, see "Closing the Circle: The Geodesic Domes and a New Ecological Consciousness, 1967," in Christine Macy and Sarah Bonnemaïson, eds., *Architecture and Nature: Creating the American Landscape* (New York: Routledge, 2003), pp. 292–346. On alternative

- technology and environmentalism, see Andrew Kirk, "Appropriating Technology: The *Whole Earth Catalog* and Counterculture Environmental Politics," *Environmental History*, 6 (July, 2001), pp. 374–94; Andrew Kirk, "Machines of Loving Grace: Appropriate Technology, Environment, and the Counterculture," in Peter Braunstein and Michael William Doyle, eds., *Imagine Nation: The American Counterculture of the 1960s and '70s* (New York: Routledge, 2002); "On Point: Crafting an Alternative to Environmentalism at the *Whole Earth*," unpublished paper delivered at the "Whole Earth" symposium; "Shelter and Land Use: Whole Earth Visions of Alternative Architecture and Technology," unpublished paper delivered at the American Studies Association Annual Meeting, Oakland, October 2006. Kirk's research is now comprehensively available in an essential survey, *Counterculture Green: The Whole Earth Catalog and American Environmentalism* (Lawrence: University Press of Kansas, 2007). On the scandal that alternative technology provoked in France in the 1970s, see Caroline Maniaque, "The secret is in the pattern that connects," unpublished paper delivered at "The Whole Earth" symposium. On the politics of information technology (with clear relevance for architecture), see Fred Turner's *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago: University of Chicago Press, 2006). The broader semantic and political relationship between architecture, environment, and postmodernism in the 1960s and 1970s has been insightfully explored by two editors of the journal *Grey Room*: see Reinhold Martin, "Organicism's Other," *Grey Room*, no. 4 (Summer 2001): 43–51, and "Environment, c. 1973," *Grey Room*, no. 14 (Winter 2004): 78–101; and Felicity D. Scott, "Acid Visions," *Grey Room*, 23 (Spring 2006): 22–39, revised as chapter 7 of *Architecture or Techno-Utopia* (Cambridge, MA: MIT Press, 2007). For a refreshed overview of ecological architecture and modernism, see James Steele, *Ecological Architecture: A Critical History* (New York: Thames & Hudson, 2005).
3. W. Chaitkin, "Alternatives," p. 222.
 4. On deterritorialization, see Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia [Mille Plateaux]*, 1980, Brian Massumi, trans. (London: Continuum, 2002).
 5. Figures from Lloyd Kahn, ed., *Shelter, 1973* (reprinted, Bolinas: Shelter Publications, 1990), n.p., and Roger Conover, "Building Books," *Architect* (December 2006, 2004), http://archinect.com/features/article.php?id=11175_0_23_0_C (accessed March 15, 2007).
 6. For circulation details of the *Catalog*, see for instance Sam Binkley, "The Seers of Menlo Park: The Discourse of Heroic Consumption in the *Whole Earth Catalog*," *Journal of Consumer Culture* 3, no. 3 (2003): 283–313, 294. Binkley notes that massive sales of hippie literature was typical. Similarly, Ian McHarg's *Design with Nature* sold 350,000 copies over thirty years (see Peder Anker, "The Closed World of Ecological Architecture," *JAE* 10, no 5 (2005): 527–52, 535).
 7. According to Paul Oliver, the *Whole Earth Catalog* enjoyed "virtually a cult object value" at the Architectural Association in the early 1970s. Paul Oliver, *The Houses in Between*, pp. 79–88, 81, in James Gowan, ed., *A Continuing Experiment: Learning and Teaching at the Architectural Association* (London: The Architectural Press, 1975). The AA student magazine *Street Farmer* was one manifestation of this culture (see W. Chaitkin, "Alternatives," p. 275). For France, see Maniaque, "The secret

is in the pattern that connects"; for Global Tools, see *Casabella*, May 1973.

8. See W. Chaitkin, "Alternatives," and Charles Jencks, *Architecture Today* (London: Academy, 1988). Jencks explained that he had been unable to update the excised sections following Chaitkin's death, but conceded that "alternative architecture" had led to movements like community architecture, computer-aided design, and the Graz School (p. 330).
9. See, for instance, S. Binkley, "The Seers of Menlo Park," Steve Best and Douglas Kellner, "Kevin Kelly's Complexity Theory: The Politics and Ideology of Self-Organising Systems," *Democracy & Nature* 6, no. 3 (2000): 375–99; and Richard Barbrook and Andy Cameron, "The California Ideology," *Mute* no. 3 (1995), <http://www.hrc.wmin.ac.uk/theory-californiaindeology-main.html>.
10. The *Catalog* originated when Brand and his then-wife, Lois Jennings, were touring New Mexico and Colorado selling provisions to intentional settlements. See F. Turner, *From Counterculture to Cyberculture*, pp. 70–71, and A. Kirk, *Counterculture Green*, pp. 47–48.
11. See Simon Sadler, "Drop City Revisited," *JAE* 58, no. 1 (2006): 5–14. See too C. Macy and S. Bonnemaïson, "Closing the Circle," pp. 323–28, and F.D. Scott, "Acid Visions."
12. See Steve Joshua Heims, *Constructing a Social Science for Postwar America: The Cybernetics Group, 1946-1953* (Cambridge, MA: MIT Press, 1991).
13. See Norbert Wiener, *Cybernetics, or Control and Communication in the Animal and Machine* (Cambridge, MA: MIT Press, 1948).
14. Walter Gropius, *The New Architecture and the Bauhaus* (London: Faber and Faber Ltd, 1935), quoted in Mark Wigley, "Whatever Happened to Total Design?," *Harvard Design Magazine*, no. 5 (summer 1998): 4. Peder Anker even contends that by the late 1930s, the emigrant Bauhaus was gravitating toward an ecological model of totality. Peder Anker, "The Bauhaus of Nature," *Modernism/Modernity* 12, no. 2 (2005): 229–51, 229 passim.
15. See Stewart Brand, rev. ed., *How Buildings Learn: What Happens After They're Built*, 1994 (London: Phoenix, 1997), p. 63.
16. M. Wigley, "Whatever Happened to Total Design?," p. 2.
17. S. Brand, *How Buildings Learn*, p. 188.
18. *Ibid.*
19. See also Bruce Clarke, "The Flow of Energy through a System: Getting Started with Systems in the *Whole Earth Catalog*," unpublished paper delivered at "The Whole Earth" symposium.
20. Quoted in Kevin Kelly, *Out of Control: The New Biology of Machines, Social Systems and the Economic World* (New York: Basic Books, 1994), p. 74, no citation given. On the history of the hive analogy and architecture, see Juan Ramirez, *Beehive Metaphor: From Gaudí to Le Corbusier* (London: Reaktion, 2000).
21. This fear was epitomized in popular culture by the classic 1967 dystopian television thriller *The Prisoner*. Confronted by a vision of "The whole earth, as The Village," "a perfect blueprint for world order" in which "the sides facing each another suddenly realize that they are looking into a mirror," *The Prisoner's* individualist hero, Prisoner No. 6, scornfully declares his ambition "to be the first man on the moon" (*The Prisoner—The Chimes of Big Ben*, Alternate Version, 1967, directed by Don Chaffey and written by Vincent Tilsley).

22. See F. Turner, *From Counterculture to Cyberculture*, pp. 46–48, 52, 67. On the relationship between USCO and Drop City and for a critique of immersive environments, see also F.D. Scott, “Acid Visions,” pp. 22–39. For a recollection of the disused Garnerville church in which USCO was headquartered, see S. Brand, *How Buildings Learn*, p. 33.
23. Here quoted from *Whole Earth Catalog* (Menlo Park, CA: Portola Institute, Fall 1969), inside cover.
24. See Stewart Brand, *Il Cybernetic Frontiers* (New York: Random House, 1974); see also the interview with Stewart Brand, Kevin Kelly, and Howard Rheingold, with Fred Turner, Stanford University, November 2006, <http://vodreal.stanford.edu/sul/sgp/061109.ram>.
25. William Hedgepeth, *The Alternative* (New York: Macmillan, 1970), p. 165.
26. See *Whole Earth Supplement* (January 1970), and F. Turner, *From Counterculture to Cyberculture*, pp. 107–110. SRI personnel at the rendezvous included Doug Englebart and Bill English.
27. Brand went on to write his best selling account *The Media Lab: Inventing the Future at MIT* (Harmondsworth, UK: Penguin, 1987); see too Stewart Brand, “Sitting at the Counterculture,” in Chris Zelov, ed., *Design Outlaws*, p. 68.
28. The “soft” path received impetus from the Whole Earth-inspired Alloy Conference of March 1969. See “Alloy Report,” 1969, *The Last Whole Earth Catalog* (Harmondsworth, UK: Penguin, 1971), pp. 112–117. The key article on Alternative Technology remains Kirk, “Appropriating Technology.” See too Witold Rybczynski, *Paper Heroes: A Review of Appropriate Technology* (Garden City, NY: Anchor, 1980). Alternative Technology drew increasing attention in the early seventies with the coincidence of the Energy Crisis and a burgeoning library of mass-selling books predicting ecological doom, notably Rachel Carson’s *Silent Spring* (1964), Paul Ehrlich’s *The Population Bomb* (1968), and the Club of Rome’s *The Limits to Growth* (1972).
29. See New Alchemy Institute, *The Journal of the New Alchemists* (Woods Hole, MA: New Alchemy Institute, 1973); Nancy Todd, *The Book of the New Alchemists* (New York: Dutton, 1977); P. Anker, “The Closed World of Ecological Architecture.” On the closed-system principle, see too William Bryant, “Outlaws in Space,” unpublished paper delivered at the American Studies Association Annual Meeting, Oakland, October 2006.
30. See Steve Baer, *Sunspots: Collected Facts and Solar Fiction*, 2nd ed. (Albuquerque, NM: Zomeworks, 1977).
31. They were both housed at the nonprofit Portola Institute. See the Web site of the Ecological Design Institute, <http://www.ecodesign.org/edi/projects/education/farallones.html> (accessed March 16, 2007); see also F. Turner, *From Counterculture to Cyberculture*, p. 70. On the Portola Institute, see A. Kirk, *Counterculture Green*, p. 43ff.
32. Van der Ryn was a professor of architecture, at University of California, Berkeley, who Brown appointed after a chance meeting at a Zen retreat.
33. On Brand’s enigmatic role as an employee of the Brown administration (1975–1983), see S. Binkley, “The Seers of Menlo Park,” p. 303, and A. Kirk, *Counterculture Green*, p. 176ff.
34. See Sam Davis, *Designing for Energy Efficiency: A Study of Eight California State Office Buildings* (Berkeley: Department of Architecture, University of California, Berkeley, 1981), p. 24; the Web site of Van der Ryn Architects, <http://www.vanderryn.com/va/pub-3.2.c.3.html> (accessed March 16, 2007); Leonard R. Bachman, *Integrated Buildings: The Systems Basis of Architecture* (Hoboken, NJ: John Wiley, 2003), pp. 405–18; and Sim Van der Ryn, *Design For Life* (Layton, UT: Gibbs Smith, 2005). Calthorpe taught dome building with Kahn at the experimental Pacific High School near Santa Cruz.
35. For a critique of the vagaries of the Bateson Building’s ecological program and others like it, see Dell Upton, *Architecture in the United States* (New York: Oxford University Press, 1998), pp. 142–47.
36. See Bruno Latour, “To Modernise or Ecologise? That is the Question,” in Bruce Braun and Noel Castree, eds., *Remaking Reality: Nature at the Millennium* (London: Routledge, 1998), pp. 221–42.
37. Quoted in Kelly, *Out of Control*, p. 85, no citation given.
38. Folio 1, correspondence 1974, January 15, 1972, Stewart Brand Editorial Files, Series 1, Box 1, *Whole Earth Access/Co-Evolution Quarterly* Records, Stanford University Special Collections.
39. See S. Brand, *How Buildings Learn*, p. vi. Research for this book started as a class at University of California, Berkeley, on the invitation of Sim van der Ryn in 1988 and was supported by Brand’s Global Business Network.
40. See Stewart Brand, *The Clock of the Long Now: Time and Responsibility* (New York: Basic Books, 1999).
41. S. Brand, *How Buildings Learn*, p. 2.
42. See F. Turner, *From Counterculture to Cyberculture*, p. 272, n. 36; Constance Lewallen and Steve Seid, eds., *Ant Farm 1968–1978* (Berkeley: University of California Press, 2004), p. 49.
43. Lloyd Kahn, “Smart But Not Wise,” in Kahn, ed., *Shelter*, p. 112. Kahn was attending the May 1972 MIT conference *Responsive House-building Technology*, with Steve Baer, Ken Kern, and Sim Van der Ryn. The proceedings were published by convener Edward Allen as *The Responsive House* (Cambridge, MA: MIT Press, 1974). “Smart But Not Wise has had a wide reading here,” Allen responded. “The usual reaction is that you are either not wrong, or mostly right, but that you made a rather biased selection of MIT projects to discuss.” Kahn’s very journey from his home in California to the MIT conference repelled him: the bathroom of the Boeing 747 gave him, he complained, “an insight into Buckminster Fuller’s ideas of housing.”
44. “We wanted it to be like a movie”—Lloyd Kahn, interview in Bolinas, California, December 2004.
45. Congress for the New Urbanism, *Charter of the New Urbanism* (1996), <http://www.cnu.org/charter> (accessed December 31, 2007).
46. On the influence of Thoreau in ecological architecture, see too Peder Anker, “The Philosopher’s Cabin and the Household of Nature,” *Ethics, Place and Environment* 6, no. 2 (2003): 133.
47. Transcendentalism entered via the conduit of Fuller’s Design Science. Fuller’s great-aunt, Margaret Fuller, cofounded with Ralph Waldo Emerson the preeminent literary journal of Transcendentalism, *Dial*, the first magazine to publish Thoreau. See Hugh Kenner, *Bucky: A Guided Tour of Buckminster Fuller* (New York: Morrow, 1973), pp. 149–50; John Beck, “Buckminster Fuller and the Politics of Shelter,” in Jonathan Hughes and Simon Sadler, eds., *Non-Plan: Essays on Freedom, Participation and Change in Modern Architecture and Urbanism* (Oxford: Architectural Press, 2000), pp. 116–25; F. Turner, *From Counterculture to Cyberculture*, p. 55.
48. Ken Kern, *The Owner-Built Home* (New York: Scribner, 1975), p. 10, and Edward Allen, *The Responsive House*, frontispiece.
49. See S. Brand, *How Buildings Learn*, pp. 24–27, 52, *passim*. Building 20 has since been demolished and replaced by Frank Gehry’s Stata Center (2004), which reverently contains a fragment of Building 20 and which, in uncanny keeping with Brand’s critique of modernist buildings in *How Buildings Learn*, was subject to a prominent 2007 lawsuit for alleged design and construction defects.
50. See S. Brand, *How Buildings Learn*, p. 159; and Reader’s Digest, *Back to Basics: How to Learn and Enjoy Traditional American Skills* (Pleasantville, NY: Reader’s Digest, 1981).
51. On this “sequestering,” see Thomas Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm, 1870–1970* (New York: Viking, 1989).
52. Interview with Lloyd Kahn, Bolinas, California, December 2004. On Kahn’s projects, see also Patricia Leigh Brown, “If I Had a Hammer? What Do You Mean If?,” *New York Times* (October 14, 2004), House & Home sec.
53. L. Kahn, “Smart But Not Wise,” p. 114.
54. Stewart Brand, “On Growth and Form,” *The Last Whole Earth Catalog* (Harmondsworth, UK: Penguin, 1971), p. 14.
55. “Political ecology,” cautions philosopher Bruno Latour, “does not seek and has never sought to protect nature. On the contrary, it wants to take control in a manner yet more complete, even more extensive, of an ever greater diversity of entities and destinies. To the modernism of world domination, it adds modernism squared.” “From Realpolitik to Dingpolitik, or How to Make Things Public,” in Bruno Latour, *Making Things Public: Atmospheres of Democracy* (Karlsruhe, Germany: ZKM/Center for Art and Media in Karlsruhe, 2005), p. 37.
56. Notoriously, for example, the hippie settlements tended to collapse in the absence of clear political procedures, typically reproducing or even exaggerating unequal gender relations and roles, tacitly excluding variance in race, and dismissive of the local communities to which they became neighbors (see, for instance, F. Turner, *From Counterculture to Cyberculture*, pp. 76–77, 119). Ecology meanwhile slid from radicalism through the more centrist Earth Day toward the conservative orientation of President Nixon’s National Environmental Policy Act in 1970. See Martin, “Environment, c. 1973.”
57. For some sense of these problems, see, for instance, “The Philosopher’s Cabin and the Household of Nature,” in P. Anker, *Imperial Ecology: Environmental Order in the British Empire, 1895–1945* (Cambridge, MA: Harvard University Press, 2002), pp. 131–41.
58. Brand, “Sitting at the Counterculture,” p. 68.
59. See Jürgen Habermas, *The Structural Transformation of the Public Sphere: An Inquiry into a Category of Bourgeois Society* (Cambridge, MA: MIT Press, 1989).
60. B. Latour, “From Realpolitik to Dingpolitik,” p. 16.
61. *Ibid.*, p. 15.
62. “Wholly aside from the value of a tool as an implement of tillage and as a weapon for the pursuit of weeds is its merit merely as a shapely and interesting implement,” notes one 1914 gardening manual. L.H. Bailey, *Manual of Gardening*, 1914, quoted in Mike Madison, *A Sense of Order: The Rural Landscape of Lower Putah Creek* (Winters, CA: Yolo Press, 2002), p. 83.
63. R.A. Eblen and W. Eblen, *The Encyclopedia of the Environment* (Boston: Houghton Mifflin, 1994), p. 702, reprinted in http://capita.wustl.edu/ME567_Informatics/concepts/global.html (accessed March 16, 2007).

64. See Deleuze and Guattari, *A Thousand Plateaus*, p. xiv, 21–22, 158, 532, cf. Bateson, *Steps to an Ecology of Mind*. “Everything important that has happened . . . takes the route of the American rhizome: the beatniks, the underground, bands and gangs, successive lateral offshoots in immediate connection with an outside” (*A Thousand Plateaus*, p. 19).
65. Brand’s foreword to Howard Rheingold, ed., *The Millennium Whole Earth Catalog* (New York: HarperCollins, 1994), insisted that the original *Catalog* was, at heart, an Enlightenment project.
66. Paul Henri Thiry and Baron d’Holbach, *The System Of Nature*, Vol. 1, 1770, Project Gutenberg e-book edn., <http://www.gutenberg.org/dirs/etext05/7son110.txt> (accessed March 15, 2007).
67. Stewart Brand’s thinking was profoundly affected by the Cold War and in some ways made him a quintessential anticommunist Cold Warrior. See, for instance, F. Turner, *From Counterculture to Cyberculture*, and A. Kirk, *Counterculture Green*.
68. See Blake Stimson, *The Pivot of the World: Photography and Its Nation* (Cambridge, MA: MIT Press, 2006).
69. See, for instance, the anarchistic ecology of Murray Bookchin and the millenarian ecology of Hal Lindsey (whose *The Late, Great Planet Earth* was first published in 1970 and went on to sell a reported thirty-five million copies).
70. “The serendipitous allure of the *Catalog*’s holistic abundance,” Binkley has found, “captivated both countercultural and mainstream consumers with the interpretive puzzle it appeared to pose” (S. Binkley, “The Seers of Menlo Park,” p. 298).
71. Manfredo Tafuri, “L’Architecture dans le Boudoir: The Language of Criticism and the Criticism of Language,” *Oppositions* no. 3 (1974), reprinted in K. Michael Hays, ed., *Oppositions Reader* (New York: Princeton Architectural Press, 1998), pp. 146–73, 163–64.
72. Deleuze and Guattari, *A Thousand Plateaus*, p. 23.
73. The whole earth, the emblem presiding over Earth Day, April 22, 1970, supplanted “the image of the mushroom cloud” in whose shadow people had “cowered . . . for 20, 25 years” (interview with Stewart Brand, <http://www.massivechange.com/StewartBrand.html> [accessed August 28, 2006]).
74. “Why haven’t we seen an image of the Whole Earth yet?” Brand asked in 1966 on buttons sold at Berkeley, Stanford, Columbia, Harvard, and MIT, and in questionnaires mailed to U.S. senators, personnel of the U.S. and Soviet space programs, and public intellectuals like Marshall McLuhan and Buckminster Fuller. Only Fuller responded defending the technicians of the space program against the accusatory tone of Brand’s question by framing it in terms of technical priority.
75. On distant views of nature and the world, see also P. Anker, “The Philosopher’s Cabin and the Household of Nature,” p. 532; and Denis Cosgrove, *Apollo’s Eye: A Cartographic Genealogy of the Earth in the Western Imagination* (Baltimore, MD: Johns Hopkins Press, 2001).
76. Stewart Brand, “69-70-71-72 by Stewart Brand,” p. 3, September 20, 1971, Stewart Brand Editorial Files, Series 1, Box 1, *Whole Earth Access/Co-Evolution Quarterly* Records, Stanford University Special Collections.
77. Cf. the interpretation of the Fuller sphere put forward by C. Macy and S. Bonnemaïson, “Closing the Circle,” p. 315, which draws on Gianni Vattimo.
78. Questionnaire return from Richard Buckminster Fuller to Stewart Brand, “Mixed 1960s” folio, Dymaxion Chronofile, Vol. 315, Box 166, Folder 6, 1967, Richard Buckminster Fuller Archives, Stanford University Special Collections.
79. Stewart Brand, “69-70-71-72 by Stewart Brand,” p. 3, September 20, 1971, Stewart Brand Editorial Files, Series 1, Box 1, *Whole Earth Access/Co-Evolution Quarterly* Records, Stanford University Special Collections.
80. In reaction to conventional management, Brand went so far as to give his method at the *Catalog* a name, “Transcendental planning,” which avowedly entailed a sublimation of self-interest within collective action. See F. Turner, *From Counterculture to Cyberculture*, p. 91, and on other problems of power and leadership, pp. 64–65. At the back of the *Last Whole Earth Catalog*, Brand even published the “source code” of his enterprise, down to its financial records. In practice though the *Whole Earth Catalog* was not an entirely open work, but managed by individuals, Brand above all. “What is crucial to notice about modernity,” writes the technology pioneer Jaron Lanier of projects like Diderot’s *Encyclopédie* and Brand’s *Whole Earth Catalog*—which he approvingly distinguishes from truly “hive mind” models—“is that structure and constraints were part of what sped up the process of technological development, not just pure openness and concessions to the collective.” Jaron Lanier, “Digital Maoism: The Hazards of Online Collectivism,” *Edge* (2006), http://www.edge.org/3rd_culture/lanier06/lanier06_index.html (accessed March 16, 2007). Brand now concedes that politics are a necessity that cannot be overcome by organization (see, for instance, the interview with F. Turner, Stanford University, November 2006, <http://vodreal.stanford.edu/sul/sgp/061109.ram>).
81. B. Latour, “From Realpolitik to Dingpolitik,” p. 24.
82. S. Brand, *How Buildings Learn*, p. 18. Brand praises “property lines . . . geometrical, two-dimensional, out of this world. But nothing else so rigorously sculpts everything we build.” (*Ibid.*, p. 73). This reiterates, from a diametrically opposed viewpoint, a thesis that can also be found in Rem Koolhaas’s *Delirious New York* (1978).
83. “Don’t get involved in a trip when you’re building,” Lloyd Kahn concurs. “Stick to rectangles or you’ll ruin your life, your marriage.” Interview with Lloyd Kahn, Bolinas, California, December 2004. One could draw an interesting parallel between these arguments for an “artless” architecture and the demand for cultural “running-room” restated by Hal Foster, *Design and Crime* (London: Verso, 2002).
84. Compare, for instance, with the chopped and squatted houses featured in N. Wates and C. Wolmar, eds., *Squatting: The Real Story* (London: Blackrose Press, 1980), and discussed in Ben Franks, “New Left/New Right,” in J. Hughes and S. Sadler, eds., *Non-Plan*, pp. 32–43.
85. See <http://www.think.org/conference/about.html> (accessed March 18, 2007).
86. Interview with Lloyd Kahn, Bolinas, California, December 2004.
87. Gregory Bateson, *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology* (Northvale, NJ: Jason Aronson, 1972), p. 131, also quoted in Jay Mechling, “Mind, Messages, and Madness: Gregory Bateson Makes a Paradigm for American Culture Studies,” in Jack Salzman, ed., *Prospects, An Annual of American Cultural Studies* (New York: Cambridge University Press), p. 178.
88. The anecdote was recalled by Alan Bradbury during the discussion “1968: Whole Earth Catalog,” in *Action Speaks!* (Providence, RI: WNRI Public Radio, 2006), <http://www.as220.org/actionspeaks/> (accessed March 16, 2007).
89. G. Bateson, *Steps to an Ecology of Mind*, p. 343, also quoted in Stewart Brand, “Understanding Whole Systems,” in *Whole Earth Epilog* (San Francisco, CA: Point, 1974). William Bateson is reputed to have coined the word “genetics.”
90. See Elwood B. Ehrle, “California’s Anti-Evolution Ruling,” *BioScience* (March 1, 1970): 291.
91. See M. Wigley, “Whatever Happened to Total Design?,” p. 6.
92. “Mixed 1960s” folio, Dymaxion Chronofile, Vol. 315, Box 166, Folder 6, 1967, Richard Buckminster Fuller Archives, Stanford University Special Collections. Fuller’s note is next to Brand’s questionnaire; I suppose the connection between the two. Fuller ascribed the thought to Nietzsche, which oddly changes its Nietzschean intent: Jay Baldwin attributes the interest in geodesic domes in the sixties to a belief among design students that “there were patterns that had significance other than the mere whim of the architect-as-artist” (Zelov, *Design Outlaws*, p. 73.)
93. See Pierre Teilhard de Chardin, *The Phenomenon of Man* (London: Collins, 1959, first published in French in 1955); see too C. Macy & S. Bonnemaïson, “Closing the Circle,” pp. 319–23.
94. I particularly refer here to John Perry Barlow and Kevin Kelly. Teilhard de Chardin was meanwhile an inspiration to U.S. theologian Francis Schaeffer, who urged the church to revisit the role of Christian stewardship over nature, and is credited with providing the groundwork for the American conservative project to establish political policies based on religious beliefs.
95. Stewart Brand, “Foreword,” in Ted Schultz, ed., *The Fringes of Reason: A Whole Earth Catalog* (New York: Harmony, 1989), n.p.
96. B. Latour, “To Modernise of Ecologise?,” p. 229.
97. M. Wigley, “Whatever Happened to Total Design?,” p. 4.
98. S. Brand, *How Buildings Learn*, p. 63.
99. B. Latour, “From Realpolitik to Dingpolitik,” p. 26.

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