Environmental History 6 (2001): 374-394

# Appropriating Technology

## The *Whole Earth Catalog* and Counterculture Environmental Politics

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"We are as gods, and might as well get good at it."
—Stewart Brand, *The Whole Earth Catalog*, 1968.

When Stewart Brand issued his clarion call for technological acceptance in the opening lines of the first *Whole Earth Catalog*, the American environmental movement was in the middle of significant ideological and political reorientation. Until the mid-1960s, most environmental advocacy aimed at preserving American wilderness from industrial development and urban encroachment. Environmental activists from John Muir to Howard Zahniser focused the environmental debate on the problems of industrial technology and constructed a sharp dichotomy between nature and human civilization. In this ideological tradition, wilderness became the ultimate symbol of environmental purity and abundance with the polluted modern technological city its antithesis. This bipolar, often antimodernist, framework served conservation and preservation activists well in early fights to convince the American public of the reality of scarcity and the necessity for preservation of some forestlands and remote natural treasures.[1] This simple dichotomy was less effective when applied to increasingly complex environmental and social politics after the mid-1960s.

Following the 1964 passage of the Wilderness Act, environmental activism was enmeshed in the social struggles, political upheaval, and cultural tensions of the 1960s. A new generation of counterculture environmentalists struggled to resolve long-standing tensions between the modernist faith in Progressive reform and the antimodernist distrust of technology and desire to return to a simpler time. The success of the wilderness movement created an ideological crisis for environmentalists who found it increasingly difficult to define their movement in terms of progress vs. preservation. The spirit of cooperation that united a diverse coalition of environmental advocates behind the banner of wilderness disintegrated in the years after the passage of the Wilderness Act, and environmental politics became increasingly complicated and the boundaries of the debate harder to define.[2] Almost immediately after the successful passage of the Wilderness Act, wilderness ceased to be a defining

environmental issue. As the 1960s progressed, Americans increasingly focused less on preserving a pristine nature and more on preserving the whole environment.

The tensions between modernist desires for a technological fix and antimodernist dreams of a wilderness utopia, always simmering below the surface of wilderness politics, came bubbling to the surface again in the mid-1960s. A new generation of counterculture environmentalists, invigorated by New Left politics, attempted to move beyond the progress vs. preservation debate and redefine the parameters of the environmental movement. Counterculture environmental politics embraced the seemingly contradictory notion that the antimodernist desire to return to a simpler time when humans were more closely tied to nature could be achieved through technological progress. Counterculture environmentalism simultaneously encompassed both antimodernsim *and* modernism. Nowhere is this apparent contradiction more visible than in the pages of the *Whole Earth Catalog* (*WEC*) where primitive wood stoves and survivalist supplies for counterculture neo-Luddites share the page with personal computers, geodesic domes, and oscilloscopes.[3] Inside the covers of *WEC*, the seemingly neat bipolar world of twentieth-century environmental politics becomes a messy melange of apparently incongruous philosophies and goals.

Prior to the rise of the counterculture environmentalists, twentieth-century environmental politics only *appeared* to be neatly bipolar. In fact, the jarring juxtapositions on the pages of *WEC* only highlighted old and deep tensions in American environmental politics. Henry Thoreau was a pencil designer and entrepreneur. John Muir began his adult life as an inventor locally renown for his mechanical genius, and Aldo Leopold was a scientific forester. All of them struggled to reconcile their modernist epistemology and technological enthusiasm with their antimodern desire to restore purity to nature. Environmental historians are well aware of these struggles but tend to downplay the complex relationship between technological enthusiasm and environmental advocacy, stressing instead the ways these and other environmentalists transcended materialism and technocracy and offered alternative visions for American society.

Historical actors in the drama of twentieth-century environmental advocacy are often rated on a sliding scale according to the purity of their wilderness vision. Using this system, most environmental historians have ranked Thoreau, Muir, and Leopold high on the scale for their early, and seemingly complete, conversions to the wilderness ethic. Like fundamentalists, environmentalists and environmental historians love their prodigal sons—if you never saw that "fierce green fire," you might as well go home. Those who fail to make the full conversion are generally left out of the canon. Ambivalent conservationists who questioned the wilderness trope are ignored or ranked low on the scale of significant environmental figures.[4] The wilderness purity test tends to aim analysis of environmentalism toward the areas where environmental politics appear black and white, and the actors in the drama are easier to pigeonhole. This overenthusiasm for wilderness prodigals is counterproductive and helps foster a misleading sense of ideological purity in environmental politics that is not supported by the historical record. Historian William Cronon's "trouble with wilderness" stems from his belief that by venerating a mythically pure wilderness we cede ground in the rest of the environment where most of us live.[5] Giving precedence to purity in wilderness philosophy similarly causes problems for environmental history. It makes it too

easy to paint American perceptions of technology and the environment in black and white when shades of gray often prevail—as if you have to choose between wilderness or civilization. The bipolar division of the environment into pure wilderness and impure everything else has deeply compromised environmentalism and sometimes skews environmental history. A look at *WEC* and the counterculture political milieu from which it grew can provide a welcome corrective to the wilderness trope in environmental history.

To understand post-1960 environmentalism, environmental historians must turn away from John Muir and Aldo Leopold and look more closely at E. F. Schumacher, Amory Lovins, Murray Bookchin, Stewart Brand, and the generation of environmentalists who struggled to craft an environmental philosophy that recognized that humans "were as gods, and might as well get good at it."

## *Whole Earth*'s Counterculture Roots

Popular representations of counterculture environmentalists often include stereotypical back-to-nature communes complete with bearded wilderness advocates and naked children draped in flowers living off edible plants. It was not uncommon for younger environmentalists inspired by a renewed interest in the life and writings of Thoreau, Muir, and an emerging group of countercultural environmental prophets such as Gary Snyder to drop out and take to the woods. During the 1960s and 1970s, many counterculture environmentalists did in fact reject the modern world of large-scale technological systems in favor of a simpler, more primitive, and environmentally conscious lifestyle.[6]

At the same time, other counterculture environmentalists moved in an entirely different direction. Influenced by New Left politics, this faction critically reevaluated longstanding assumptions about the relationship between nature, technology, and society. In particular, these environmentalists replaced the wilderness focus that dominated 1960s environmentalism with a more encompassing ecological sensibility that embraced new technologies. In the late 1960s and 1970s, technologically minded counterculture environmentalists helped reshape the American environmental movement, infusing it with a youthful energy and providing it with a new sense of purpose and direction. These new counterculture environmentalists embraced *alternative technologies* as a solution to contemporary concerns about pollution, overpopulation, and the realization that America was entering a new phase in its development.

This new phase was envisioned as a "post-scarcity" economy, where advanced industrial societies theoretically possessed the means to provide abundance and freedom and reconcile nature and technology if only they choose to do so.[7] Led by New Left social theorists such as Herbert Marcuse and Murray Bookchin, post-scarcity adherents shared the belief that "the poison is . . . its own antidote."[8] In other words, technology used amorally and unecologically created the social and environmental problems of industrial capitalism. Technology used morally and ecologically could create a revolution that inspired a utopian future. The New Left critics emphasized that social and environmental problems in America stemmed not from a lack of

resources but from a misguided waste of the "technology of abundance."[9] If, these critics argued, the American people could be convinced to abandon their bourgeois quest for consumer goods, then valuable resources could be redirected toward establishing social equity and ecological harmony instead of consumerism and waste. In the late 1960s, post-scarcity assumptions fueled a brief period of technology-based utopian optimism that profoundly influenced a generation of environmentalists.

This thoughtful reevaluation of the role of technology in American society and politics is perhaps the most significant and lasting contribution of the counterculture to American culture and a critical step in the evolution in environmentalism. The move away from antimodernism manifested itself in many ways, from Buckminster Fuller designing affordable and environmentally sympathetic geodesic domes to Steve Jobs and Steve Wozniak developing "personal" computers to put the power of information in the hands of individuals.[10] Working toward similar goals, other counterculture environmentalists and sympathetic scientists and engineers focused on alternative energy, earth-friendly design, recycling, and creative waste management as the best ways to subvert the large industrial structures they viewed as most damaging to the environment and to attempt to equalize the world power structure. Whether they were building personal computers in their garage or designing composting toilets, the idea that technology could be directed toward shaping a brighter future became a driving force in environmental advocacy after 1970.

The utopian optimism and revolutionary political program of the New Left failed to become a part of the mainstream environmental movement. Consumed with the reactive fight against the Vietnam War and university bureaucracies, the predominantly campus-based New Left movement fragmented and disintegrated in the early 1970s. But renewed scarcity in the 1970s helped confirm the urgency of environmental concerns while tempering utopian ambitions that were based on post-scarcity. The politicized counterculture environmental movement survived the New Left and remained active in a multifaceted attempt to construct an alternative society.

The relationship between the counterculture, technology, and the environment is complex. It would be a mistake to assume that all of those who considered themselves counterculturalists and environmentalists thought or acted alike. Even among those who advocated the use of technology to solve environmental problems, a clear program of action or thought was rare. Often, countercultural environmentalists seemed to occupy separate but parallel universes defined by whether they considered technology to be the problem or the solution. The relationship between the counterculture and technology was always one of fundamental ambivalence. Counterculture environmentalists never constructed a unified philosophy that united like-minded individuals and organizations under one banner. They were a diverse group with a wide variety of perspectives, often pursuing opposed or mutually exclusive projects. What differentiated counterculture environmentalists from other environmental activists in the 1960s and 1970s was a shared desire to use environmental research, new technologies, ecological thinking, and environmental advocacy to shape a social revolution based on alternative lifestyles and communities, alternatives that would enable future generations to live in harmony with each other and the environment.

Counterculture environmentalists were not the first Americans to debate technology and the environment. The technology debate began in the Industrial Revolution

of the nineteenth century. While some Americans looked at advances in science and technology with a wary eye, many Americans viewed technology as beneficial and benign. This was particularly true for a generation of middle-class Progressive conservation advocates who believed that rational planning, expert management, and science were the keys to a sound environmental future. From amateur conservation advocacy groups to the utilitarian U.S. Forest Service of Gifford Pinchot, American conservation advocates looked to science for solutions to waste and wanton destruction of scarce natural resources. For most of the twentieth century, most resource conservation advocacy stemmed from the notion that through science and the march of progress humans could tame and control all elements of the natural world, stopping waste and maximizing productivity. This thinking inspired massive reclamation and irrigation projects and experiments with chemicals to rid the world of unwanted pests and predators. The steadfast faith in technology and the scientific worldview prevailed into the 1960s.[11]

In the decades following World War II, attitudes toward technology began to change. While never quite a mainstream trend, more Americans questioned the dominant view of technology and progress. A catalyst for this reevaluation was horrifying devastation caused by use of the atomic bomb in Japan. Once the patriotic fervor of the war subsided, conservationists and intellectuals started discussing what it now meant that humans had the power to destroy the world. Books like John Hersey's *Hiroshima*, published in 1946, graphically depicted the awesome destructive power of atomic weapons and inspired a growing segment to recognize the far-reaching environmental implications of modern technology. After years of turning out pro-war propaganda films, Hollywood, along with a legion of science fiction writers in the 1950s, produced a steady stream of books and films presenting horrifying visions of technology run amok. A generation of Americans born after World War II grew up watching giant nuclear ants or other such mutants of technology destroying humanity in movies such as Gordon Douglas's *Them!* (1954). By the mid-1960s, a growing segment of American society, particularly young Americans, evinced ambivalence about technology. During the 1950s, a sense of genuine terror over the evil potential of science without a social conscience grew.[12] At the same time, older members of the conservation movement also found themselves increasingly alienated from the world of modern atomic science, massive reclamation projects, and postwar consumer technology. They were distressed particularly by the consequences of technocratic thinking for American society and culture.

Within the conservation movement, a growing ambivalence toward technology turned into full-fledged technophobia for many. Fear shaped much of the conservationist alienation from the postwar world; fear that the prominence of the hard sciences, the expansion of the space race, and the explosion of consumer technology de-emphasized contact with the nonhuman world. The consequences of nuclear technology for American society led conservationists such as John Eastlick to wonder if Americans had been "blinded by the fearful brightness of the atomic bomb," and were now stumbling through life with little awareness of the environmental and social degradation that surrounded them.[13]

Despite discomfort with the modern world, most conservationists used modernist means to express and act upon their antimodernist revulsion. Even as their alienation

from postwar technocracy grew, their Progressive-style faith in government agencies, and protective federal laws continued to be staples.[14] For most of its history, the conservation movement embraced organizational principles and actions based on the idea of linear progress through Progressive enlightenment. At the same time, it viewed the history of the twentieth century as a steady decline toward chaos and environmental collapse, brought on by rampant population growth and unregulated technological expansion.[15] Although these two ideals seemed to be diametrically opposed and irreconcilable, both shared the same roots as direct responses to concerns about the relationship between nature and technology in post-industrial America. By drawing on both traditions, sometimes consciously and sometimes not, postwar conservationists and critics of technology attempted to reconcile dreams for reform with competing fears that the system was beyond repair. They were simultaneously hopeful and afraid.

Other critics of postwar society, including a contingent of more radical environmental preservationists and prominent European and American intellectuals, were less inclined to search for compromise and more willing to propose far-reaching structural changes. The most stunning of these critiques came from biologist Rachel Carson, whose explosive *Silent Spring,* published in 1962, explained in frightening detail the ecological consequences of humanity's attempt to control and regulate the environment.[16] Carson became the first of many to warn of an impending environmental "crisis." During the 1960s, a series of influential books appeared warning of an apocalyptic future if the present course was not altered. Carson's fellow biologist, Barry Commoner, produced several bestsellers, including *The Closing Circle,* warning of the dangers of sacrificing the health of the planet for temporary material gain.[17]

Three other writers also provided inspiration for a new generation of Americans who questioned the role of technology in causing social, economic, and environmental injustice. Jacques Ellul, author of *The Technological Society,* asserted that "all embracing technological systems had swallowed up the capitalistic and socialistic economies" and were the greatest threat to freedom in the modern world.[18] Ellul argued that there was "something abominable in the modern artifice itself." The system was so corrupt that only a truly revolutionary reorientation could stop social and environmental decay.[19] Herbert Marcuse, in his popular *One Dimensional Man,* described a vast and repressive world technological structure that overshadowed national borders and traditional political ideologies.[20] Marcuse popularized the insights of the Frankfurt school of Marxian philosophers and sociologists.[21] Together Marcuse and Ellul provided a critical intellectual framework for Americans looking to construct alternatives to the scientific worldview.

The most influential of the structural critics of the technological society was Lewis Mumford. Mumford began his career as a public intellectual as a strong proponent of science and technology. His 1934 classic, *Technics and Civilization,* influenced a generation and strengthened the popular belief that technology was moving human civilization toward a new golden age.[22] Like most Progressive thinkers of the industrial period, Mumford envisioned a modern world where technology helped correct the chaos of nature and brought balance to ecology. In *Technics,* Mumford extolled the virtues of the machine and painted a positive picture of how technology could reshape the world to eliminate drudgery and usher in an unprecedented period in

history where machines and nature worked together for human benefit. But this prophet of the machine age rethought his views in the 1960s. Like Marcuse and Ellul, Mumford became increasingly alarmed about the power of large technological systems. As Mumford looked around at the world of the 1960s and 1970s he worried that the ascendance of the "megamachine" boded ill for human society.[23] The "machine," once the symbol of progress toward a more balanced world, emerged as a metaphor for describing a seemingly out-of-control capitalist system.[24]

The preoccupation with technology and its consequences became one of the central features of 1960s social and environmental movements, and of the counterculture in particular. In 1968, Theodore Roszak released his influential study of the youth movement, *The Making of a Counter Culture*.[25] The counterculture was a direct reaction to "technocracy," which Roszak defined as a "society in which those who govern justify themselves by appeal to technical experts, who in turn justify themselves by appeals to scientific forms of knowledge."[26] The counterculture radicals of the 1960s, he argued, were the only group in America capable of divorcing themselves from the stranglehold of 1950s technology and its insidious centralizing tendencies. Roszak's position on technocracy mirrored Ellul and Marcuse. For Roszak the most appealing characteristic of the counterculture was its rejection of technology and the systems it spawned. Charles Reich, in his bestseller *The Greening of America* (1970), also highlighted the youth movement's rejection of technology as a fundamental component of the counterculture ideology.[27] For both Reich and Roszak, bureaucratic organization and complexity made the technocracy evil. From the perspective of Roszak, Reich, and much of the younger generation, the problem with America stemmed from that realization that there was nothing small, nothing simple, nothing remaining on a human scale.

This bigness and bureaucratization concerned British economist E. F. Schumacher, whose popular book *Small Is Beautiful* (1973) became a model for decentralized humanistic economics "as if people mattered."[28] Of all the structural critiques of technological systems, Schumacher's provided the best model for constructive action and was particularly influential in shaping counterculture environmentalism. Unlike more pessimistic critics of the modern technocracy, Schumacher assured that by striving to regain individual control of economics and environments, "our landscapes [could] become healthy and beautiful again and our people . . . regain the dignity of man, who knows himself as higher than the animal but never forgets that *noblesse oblige*."[29] The key to Schumacher's vision was an enlightened adaptation of technology. In *Small Is Beautiful,* Schumacher highlighted what he called "intermediate technologies," those technical advances that stand "halfway between traditional and modern technology," as the solution to the dissonance between nature and technology in the modern world.[30] These could be as simple as using modern materials to construct better windmills or more efficient portable water turbines for developing nations. The key to "intermediate technologies" was to apply advances in science to specific local communities and ecosystems. Schumacher's ideas were quickly embraced and expanded upon by a wide range of individuals and organizations, often with wildly different agendas, who came together under the banner of a loosely defined ideology that became known as "appropriate technology" (AT).

Appropriate technology emerged as a popular cause at a conference on technological needs for lesser-developed nations in England in 1968.[31] For individuals and organizations concerned with the plight of developing nations, Schumacher's ideas about intermediate technologies provided a possible solution for promoting a more equitable distribution of wealth while avoiding the inherent environmental and social problems of industrialization.[32] Appropriate technology quickly became a catch-all for a wide spectrum of activities involving research into older technologies that had been lost after the Industrial Revolution and the development of new high- and low-tech small-scale innovations. The most striking thing about appropriate technology, according to historian Samuel P. Hays, was "not the mechanical devices themselves as the kinds of knowledge and management they implied." Alternative technology represented a move away from the Progressive faith in expertise and professionalization and toward an environmental philosophy predicated on self-education and individual experience.[33] Alternative technology also represented a viable alternative to wilderness-based environmental advocacy.

The AT movement was also bolstered by the New Left. Particularly influential were the writings of eco-anarchist Murray Bookchin. Bookchin provided a critical political framework by situating the quest for alternative technologies within the framework of revolutionary New Left politics. In books such as *Our Synthetic Environment* (1962) and *Post-Scarcity Anarchism* (1971), he argued that highly industrialized nations possessed the potential to create a utopian "ecological society, with new ecotechnologies, and ecocommunities."[34] From this perspective, the notion of scarcity, a defining fear of the conservation movement, was a ruse perpetuated by "hierarchical society" to keep the majority from understanding the revolutionary potentialities of advanced technology. More than most New Left critics, Bookchin also clearly linked revolutionary politics with environmentalism and technology. "Whether now or in the future," he wrote, "human relationships with nature are always mediated by science, technology and knowledge."[35] By explicitly fusing radical politics and ecology, the New Left provided a model for a distinctly counterculture environmentalism. From the perspective of the New Left, pollution and environmental destruction were not only a matter of avoidable waste but a symptom of a corrupt economic system that consistently stripped both the environment and the average citizen of rights and resources.[36]

Although the utopian program of Bookchin and the New Left ultimately failed to capture the hearts of most environmentalists, it did help establish a permanent relationship for many between environmental and social politics. This linking of the social, political, and environmental in the 1970s paved the way for new trends of the 1980s such as the environmental justice movement. For inner-city African Americans and others who felt alienated from the predominantly white middle-class environmental groups such as the Sierra Club or the Wilderness Society, the New Left vision of environmental politics provided inspiration. By connecting ecological thinking with urban social issues and radical politics, the New Left introduced environmentalism to a new and more diverse group of urban Americans who had felt little connection to the wilderness and recreation-based advocacy of the conservation/preservation movement.[37]

At the same time, the New Left helped bolster the growing technological fascination of many counterculture environmentalists. The AT movement represented a different direction for radical politics in the late 1960s. By then the campus-based New Left movement was primarily a movement against the Vietnam War. New Left politics on the campus focused on striking back at the Pentagon, IBM, AT&T, and other representatives of the technocratic power structure. Escalating violence, renewed scarcity fears, and a host of pressures inside and outside the campus-based movement caused the New Left to fracture and ultimately collapse. Disillusioned by the failure of the revolution, many counterculturalists moved away from radical politics. At the same time, proponents of appropriate technology in Europe and America were taking New Left–inspired politics in some different and unconventional directions. Stewart Brand, a former member of Ken Kesey's Merry Pranksters, and organizations such as the New Alchemy Institute worked to create an alternative society from the ground up by adapting science and technology for the people.

By the early 1970s, the neo-Luddites in the American environmental movement had ceded ground to a growing number of appropriate technologists. This new group of counterculture radicals, environmentalists, scientists, and social activists recognized the liberating power of decentralized individualistic technology. The AT movement was varied and diffuse with much disagreement even among its adherents about how to define their ideology. The term meant different things to different groups, but they generally agreed that an "appropriate" technology had the following features: "low investment cost per work-place, low capital investment per unit of output, organizational simplicity, high adaptability to a particular social or cultural environment, sparing use of natural resources, low cost of final product or high potential for employment."[38] An appropriate technology was cheap, simple, and ecologically safe. The proponents of appropriate technology also agreed on the basic idea that alternative technologies could create more self-sufficient lifestyles and new social structures based on democratic control of innovation and communitarian anarchism. For supporters of appropriate technology, the most radical action against the *status quo* was not throwing bombs or staging sit-ins but fabricating wind generators to "unplug from the grid."

The move toward appropriate technology represented a significant break for the counterculture and the environmental movement. A new breed of young environmentalists built on the ideas of Schumacher, Bookchin, Marcuse, and others to craft a very different political agenda from their technophobic predecessors in the environmental movement. This new agenda found its best expression in the pages of a new publication. *The Whole Earth Catalog* was run by young radicals who wanted to fight fire with fire; they wanted to resist technocracy and frightening nuclear and military technology by placing the power of small-scale, easily understood, appropriate technology in the hands of anyone willing to listen.

## A Counterculture Sears Catalog

No single institution or organization better represents the technological universe through which counterculture environmentalists defined themselves than the *Whole Earth Catalog* and its successor, *CoEvolution Quarterly*. This eclectic and iconoclastic

publication became a nexus of radical environmentalism, appropriate technology research, alternative lifestyle information, and communitarian anarchism. First published in 1968, as the AT movement burst onto the world scene, *WEC* brought a wide range of divergent counterculture trends under one roof. Commune members, computer designers and hackers, psychedelic drug engineers, and environmentalists were but a few of those who could find something of interest in the pages of *WEC*. The publication's founder, Stewart Brand, set out to create a survival manual for "citizens of planet Earth" and "hippie environmentalist spacemen."[39] According to Brand, *WEC* was a "movable education" for his counterculture friends "who were reconsidering the structure of modern life and building their own communes in the backwoods." Under his direction, *Whole Earth* and its successors extolled the virtues of steam-powered bicycles, windmills, solar collectors, and wood stoves, alongside new "personal computers," satellite telephones, and the latest telecommunications hardware. Brand and his followers were convinced that access to innovative and potentially subversive information and energy technologies was a vital part of changing the cultural perceptions that contributed to environmental decay.[40]

Brand's creation perfectly captured the post-Vietnam counterculture movement of the mid-1970s with its emphasis on lifestyle and pragmatic activism over utopian idealism and politics. *WEC* marketed real products, not just ideas, and the focus was always on theoretically feasible, if not always reasonable, solutions to real world problems. For Brand and his colleagues, *Stop the 5-Gallon Flush*, a guide to stopping water waste with simple household technological fixes, was just as revolutionary a book as *Das Kapital*.[41] Brand's practical revolution appealed to the growing numbers of disenchanted New Left radicals who tired of sitting in coffee houses endlessly debating politics but who still wanted to somehow subvert the system. The publishers of *WEC* inadvertently advanced the radical notion that by staying home from the protest demonstration and modifying your toilet, building a geodesic dome, or a solar collector you could make a more immediate and significant contribution to the effort to create an alternative future than through more conventional expressive politics.

In contrast to the downbeat rhetoric of the late 1960s campus-based New Left, Brand and his enthusiastic collaborators remained optimistic about a coming revolution brought about by appropriate technology. Drawing on the optimism of utopian post-scarcity visions of the future, Brand and other alternative technology proponents were representative of a new direction within the counterculture characterized by intellectual curiosity and a love for creative technical innovation. Inspired by the work of Buckminster Fuller, Brand expanded the "outlaw area" of counterculture innovation away from music production and psychedelic drug research toward areas such as alternative energy and information technology.[42] Brand was hardly a pragmatist; he was a dreamer. *WEC* began with the working assumption that large numbers of Americans were willing to abandon their current lives and move into self-sustaining, ecologically friendly communities. The first issues of the catalog were aimed at those who were working to use the best of small-scale technology to literally disconnect themselves from the infrastructures of mainstream society and relocate to rural or wilderness areas. At first, *WEC* promoted radically detached self-sufficiency as the key to a viable revolutionary politics.

No one better captured the optimistic spirit of appropriate technology as presented in the pages of *WEC* than the iconoclastic self-taught designer and Harvard dropout Buckminster Fuller. Born in 1895, Fuller was venerated by the 1970s, but still full of radical ideas and an inspiration to a younger generation.[43] For more than four decades he had been on a personal quest to create a completely new way of viewing design, construction, and the environment. Fuller wanted to reform the "human environment by developing tools that deal more effectively and economically with evolutionary change."[44] Although a prolific designer, Fuller is best known for the concept of "dymaxion" design. Fuller defined dymaxion as "doing the most with the least."[45] His geodesic dome epitomized the ideal of appropriate technology, using the most sophisticated design principles and the latest technologies to make more with less. He was an acute observer of the natural world. Unlike most of his contemporaries, especially in the 1930s, Fuller saw the universe in terms of interconnected triangles and spheres instead of straight lines and boxes. The ultimate example of his design ideal was the brilliant and elegantly simple geodesic dome. The domes consisted of a series of linked triangles forming a sphere that proved to be so strong that it could be built with very lightweight materials and remain structurally sound in virtually any size.

The geodesic dome was based on complex mathematics and design principles, and at the same time a structure so uncomplicated that almost anyone could build one from materials at hand. The geodesic dome became the preferred domicile for counterculture communes like Colorado's Drop City because the domes were cheap, easy to build, often portable, and environmentally friendly.[46] Fuller's artful designs epitomized the post-scarcity ideal of appropriate technologies as the basis for alternative communities and alternative societies. At *WEC*, Brand published information on Fuller, Paolo Soleri, Moshe Safdie, and other designers and architects who utilized design and technical innovation to create alternative realities.[47]

In the early years, *WEC* articulated an appealing vision for those looking for a permanent retreat from the status quo. Individuals who planned their escape through the pages of *WEC* discovered a program of action where "choices about the right technology, both useful old gadgets and ingenious new tools, are crucial," but "choices about political matters are not."[48] For appropriate technology enthusiasts, lifestyle became the primary form of political expression. In *WEC*, Brand assembled an almost mind-boggling array of information on tools, science, products, services, and publications ranging from the mundane to the downright weird, but all somehow concerned with crafting alternative lifestyles that subverted traditional networks of political, spiritual, and physical energy. For those who encountered *WEC*, the experience was often a revelation. According to Gereth Branwyn, subsequently a staff writer for *Wired Magazine*, "I got my first *Whole Earth Catalog* in 1971. It was the same day I scored my first bag of pot. I went over to a friend's house to smoke a joint . . . he pulled out this unwieldy catalog his brother had brought home from college. I was instantly enthralled. I'd never seen anything like it. We lived in a small redneck town in Virginia—people didn't think about such things as 'whole systems' and 'nomadics' and 'Zen Buddhism.' I traded my friend the pot for the catalog."[49] At a time when the New Left movement was dissipating, *WEC* and the AT movement provided hope that an alternative environmental and political future was still possible.

Not all counterculturalists, environmentalists, or appropriate technology advocates agreed with the radical self-sufficiency message of *WEC* in the early years. The first *WEC* appealed to the dropout school of hippies and back-to-the-landers who took their political cues from the likes of Ken Kesey, who encouraged them to "Just . . . turn your back and say . . . 'Fuck It' and walk away."[50] Years later, Brand realized that *WEC*'s uncritical enthusiasm for self-sufficiency and dropout politics in those early years may have caused harm. In *Soft Tech,* he wrote with some regret, "Anyone who has actually tried to live in total self-sufficiency . . . knows the mind-numbing labor and loneliness and frustration and real marginless hazard that goes with the attempt. It is a kind of hysteria."[51] Despite Brand's concerns about an overemphasis on self-sufficiency and escapism, most readers of the *WEC* never took the message literally. The vast majority of the almost two million people who purchased copies of *WEC* in its first three years never left the city, never abandoned society for a lonely exile. The message that most readers got from *WEC* was unbridled technological optimism, the idea that innovation and invention with a conscience could overcome even the worst social and environmental problems. It was this message, so profoundly different from the technophobia expressed by environmentalists and critics like Theodore Roszak that made *WEC* such a significant phenomenon. Brand and other proponents of the AT movement understood something about "technocracy's children" that Roszak did not: the youth culture of the 1960s and 1970s was, in the words of appropriate tech enthusiast and chronicler, Witold Rybczynski, "immensely attracted to technology."[52]

From the beginning, *WEC* and the AT movement as a whole directed that attraction in two distinct directions: the "outlaw edges" of alternative energy technology and information and communications technology. Over the years, readers of the catalog could find careful descriptions of the Vermont Castings "Defiant" wood stove closely followed by the latest information on Apple computers. This incongruous juxtaposition made perfect sense to Brand. "The Vermont Castings tool manipulated heat, the Apple tool manipulated information." "Both cost a few hundred dollars, both were made by and for revolutionaries who wanted to de-institutionalize society and empower the individual, both embodied clever design ideas," all characteristics of appropriate technology. According to Brand, the ability to manipulate energy and information were necessary to change the system.[53] The only way one could hope to cast off the chains of the industrial world was to steal the keys to the kingdom. Acquiring the knowledge to manipulate energy in particular was viewed by supporters of appropriate technology and a growing faction of the environmental movement as a crucial step in freeing oneself from existing structures of oppression and environmental degradation and enabling self-sufficiency.

With this broadened agenda in mind, the energy focus at *Whole Earth* and then *CoEvolution Quarterly* shifted from low-tech basic tools, the wood stove or individually crafted hand saws, to much more sophisticated alternative energy solutions such as solar, geothermal, biogas and biofuels, and high-tech wind harnessing devices such as the ever popular "Gemini Synchronous Inverter." Brand and crew drew inspiration from groups like The New Alchemists who were pushing the edges of appropriate technology and putting the latest alternative energy technologies into active use in their laboratories on Prince Edward Island and Cape Cod.[54] Other organizations explored appropriate technology from a variety of perspectives. They researched new

household technologies such as composting toilets, affordable greenhouses, and organic gardening techniques along with alternative energy technologies. While the research of individuals and organizations working in the area of AT varied greatly, all involved shared the common goal of using technical research to enable simpler more ecologically sensitive lives and economies of a human scale.

The concentration on alternative renewable energy at *WEC*, the New Alchemy Institute, and other organizations reflected a larger shift in direction in the American environmental movement as a whole. The energy crisis of the early 1970s brought a realization on the part of environmentalists that many of the ecological problems of the postwar era were either directly or indirectly linked to the acquisition and distribution of energy. Long lines at gas stations and soaring fuel prices brought home the reality of finite energy resources. This renewed realization that scarcity was once again a real and long-term problem forced counterculture environmentalists to re-evaluate the aspects of their technological enthusiasm derived from 1960s New Left notions of a post-scarcity world.

By the mid-1970s, it was clear that post-scarcity was a long way off. The move away from post-scarcity politics toward an appropriate technology philosophy that recognized scarcity and reformulated utopian radicalism paved the way for AT to move into the mainstream. The energy crisis of the 1970s forced millions of Americans to reevaluate their environmental positions and helped the environmental movement dramatically expand its base. Environmental organizations working in the area of AT were poised to provide a new vision of environmental activism to this broadened audience of concerned Americans. The community of individuals and organizations working on alternative energy solutions became particularly influential during the 1970s.

All of the new and renewed energy technologies featured in the pages of *WEC* became components of what British physicist Amory Lovins referred to as the "soft path." Lovins popularized the soft path to energy solutions in a widely read and highly controversial 1976 article in the prestigious journal *Foreign Affairs*.[55] For Lovins and his supporters the soft path was the moral alternative to an American "federal policy . . . [that] relies on rapid expansion of centralized high technologies to increase supplies of energy."[56] Instead of increasing centralization, soft path proponents supported decentralized appropriate technologies and urged western nations, specifically the United States, to direct their research toward renewable alternatives and explore the possibility of shrinking the system to provide a more equitable relationship with developing nations. Appropriate soft technologies such as passive solar, the use of new technologies combined with traditional building materials to heat buildings with energy from the sun, were available immediately to all who were interested. Lovins emphasized that the benefits of soft tech were accessible for regular citizens of the western world and easily transferable to developing nations as well. Simple passive solar techniques like painting a south-facing wall black and covering it with glass, could radically decrease the dependence on large energy systems.[57] Soft path proponents pointed to several significant energy technologies with long and productive histories that fit perfectly with the ideal of easily accessible renewable energy for a modern world. Most of the soft path solutions to modern energy problems were retooled versions of preexisting technologies. None of these older technologies better captures the spirit of the soft path energy movement than the venerable windmill.

The use of wind as a source of power began when humans first harnessed the wind to power ships and soon after as an efficient means for the mechanization of food production and irrigation. For thousands of years, cultures all over the globe relied on wind power to mill their grains, drain their lowlands, draw water from aquifers, and saw their lumber.[58] In America the windmill became an emblem of self-sufficiency as farmers and ranchers moved onto the arid plains and mastered the technology of the windmill in order to survive far from established services and energy sources. Americans quickly discovered that windmills could be fabricated out of a wide variety of locally available materials and constructed cheaply from mail order plans. As early as 1885 windmills generated electrical power. Early researchers learned that windmills were an excellent source of electrical power on a small scale, and even small windmills could easily provide enough electricity for a home or small business. Preexisting windmills could be retrofitted with electrical generators and provide power to a remote farm or mill while retaining the capacity to pump water or grind wheat.[59] While many adopted the windmill as a permanent source of power, wind energy never became the standard that many thought possible. Wind power faded from view for most of the twentieth century.

The energy crisis of the 1970s renewed the interest in wind energy. One of the reasons that wind never went mainstream was because of an inability to regulate the wind. The power from wind generators ebbed and flowed, and the fickle winds never maintained a schedule. This made wind a poor substitute for hydroelectric or coal turbines, which could sustain a constant and manageable flow of energy for large systems and power grids. Soft path supporters were unconcerned about the problems of wind power for large systems. On the contrary, they sought sources of power that were better suited to small systems.

Like E. F. Schumacher, Lovins and other soft tech proponents believed that the ability to construct small-scale self-sufficient systems provided individuals and communities with a closer connection to the earth and a greater degree of control over their lives. The windmill was the type of technology that could enable one to use the latest research in electric power generators and new materials such as fiberglass to build machines that produced no pollutants and provided essentially free and limitless energy. For soft path proponents the potential of the windmill was both practical and political. Disconnecting yourself from the power grid was the first step toward a cleaner environment and a move toward reevaluating all of the large systems that dominated the economy and daily life of developed nations. The key to the politics behind soft path and AT science was the notion that real change came not from protest but from constructing viable alternatives to the status quo starting with the basic elements of human life: food, energy, and shelter. Lovins's credentials as a professionally trained scientist lent credibility to the AT movement and caused both opponents and supporters to articulate carefully their energy positions. Brand approved not only of Lovin's ideas but his terminology as well: "'Soft' signifies that something is alive, resilient, adaptive," Brand mused, "maybe even lovable."[60] By the mid-1970s, soft path energy research into solar power, wind, geothermal heat, biogas conversion, and recycled fuels moved to the forefront of the environmental and AT movements.

At the same time that a growing number of environmentalists explored different paths toward decentralization through renewable energy development, others worked

in the second area of the "outlaw edge": information technology (IT). For Brand, alternative energy was important, but IT was where the real action was. As he later expressed it, "Information technology is a self-accelerating fine-grained global industry that sprints ahead of laws and diffuses beyond them."[61] Brand was intrigued by what he called the "subversive possibilities" of technologies as diverse as recording devices, desktop publishing, individual telecommunications, and especially personal computers. He joined a growing group of counterculturalists who had a deep respect for innovators like Steve Jobs and Steve Wozniak, who were designing and then using their computers to push what Brand referred to as "the edges of the possible and permissible."[62] Like Lovins and the soft path proponents, alternative information technology was viewed, perhaps somewhat naively, by people like Steve Jobs and Stewart Brand as a means of personal empowerment. The mandate at Apple was to "build the coolest machine you could imagine," something so different that people would rethink the role of the machine in modern life.[63] The naming of the products suggested that these machines were somehow more natural than earlier computers. Old computers were identified by acronyms and numbers, new computers were named Apple and were accessed through the "mouse." This was friendly technology, designed to be unthreatening and easy to use. The specifics of how information and communications technology could become weapons in the war against the status quo were never clearly articulated by AT proponents. Optimistic counterculturalists held a general sense that the personal computer and other new technologies were intrinsically radical and could change the world simply by existing. The details could be worked out later. In the meantime their contagious enthusiasm and inventive genius inspired a technological revolution that ultimately transformed the American economy in unanticipated ways and created ideological paradoxes for the AT pioneers who helped spawn that revolution.

For many in the counterculture of the early 1960s, computers had represented the epitome of all that was wrong with technology in the service of technocracy. During that era computers were giant humming machines that were immensely expensive and required a high level of technical expertise to operate. They were the heartless mechanized brains of oppression, used by IBM and the Pentagon to design weapons of destruction and quantify the body counts in Vietnam. Neo-Luddites dismissed the computer as a malevolent machine of centralization and dehumanization. Critics argued that computers were nothing more than "low-grade mechanical counterfeits" of the human mind, devices propagated by the "most morally questionable" elements of society.[64] Many of the first purchasers of *WEC* would have agreed with these critiques. They had a hard time conceiving a role for computers in their utopian back-to-nature communes. But other counterculturalists, including Brand, quickly recognized the potential of the new wave of microcomputers and personal information technology to link individuals and organizations to transform American society. The widespread dissemination of information was essential to the project of constructing alternatives and transforming society. Long before most, Brand and others involved in the AT movement realized that computers had the potential to help build a new cyber-community. What, these pioneers wondered, could be more alternative than an electronic utopia, an alternative universe where individuals separated by huge distances could share ideas, images, and thoughts with thousands of other like-minded

people all over the world? AT enthusiasts were some of the first Americans to go online, and the *Whole Earth 'Lectronic Link* (WELL) became one of the early attempts to create a "virtual community."[65] By the mid-1970s, *WEC*'s successor, *CoEvolution Quarterly*, was dedicating more space to information technology than any other subject. They were no longer alone.

## Conclusion

Before the end of the 1970s, organizations like the *Whole Earth Catalog* and The New Alchemy Institute brought together some of the most innovative members of the counterculture to attempt to reconcile nature and the machine. For Stewart Brand and other appropriate technology enthusiasts, the research they promoted, in both alternative energy and alternative information systems, succeeded in substantially altering the way Americans thought about the power of technology as a benevolent force for environmental protection, ecological living, and personal liberation. In many ways the reconciliation of ecology and technology popularized by *WEC* provided a more integrated and realistic model for environmentalism. By demonstrating that there were possibilities for a middle ground between modern technology and environmental consciousness, the AT movement contributed to the acceptance of environmentalism in mainstream American culture.

Despite this success, the AT movement was not without its ironic consequences. The liberal idealism that drove AT often failed to account for the degree to which even small-scale and individualistic ideas, such as the personal computer, could very rapidly be incorporated into and even strengthen the very systems they were designed to subvert. In 1980, Alvin Toffler published his hugely popular book *The Third Wave*, which argued that the world was on the brink of a third industrial revolution.[66] According to Toffler, this third revolution would grow out of the transformation of information technologies and would have profound consequences for industry and society. In many ways Toffler's vision was remarkably accurate. Information technologies have reshaped the American economy and society at an incredible pace. One of the most disturbing consequences of the counterculture environmental technology movement is that it helped launch this revolution and the new industrial giants it spawned. The young counterculture or counterculture inspired entrepreneurs who started their careers pushing the "outlaw edges" of the "possible and permissible" are now billionaires who run major corporations such as Apple, Intel, and Microsoft that dominate the American economy. Many of the radicals of yesterday have become the capitalist elite of today.

We live now in an age of technological systems of a level of complexity that makes the once threatening technological structures of the 1960s look antiquated and benign. One of the central notions of the AT movement was the belief that access to innovative information and energy technologies was a vital part of changing cultural perceptions and social conditions that contributed to environmental decay. Today the "outlaw edge" of technology that inspired the counterculture is more often occupied by new industrial giants such as Intel. Corporations whose factories drain millions of gallons of water a day out of ancient desert aquifers to wash the silicon chips

that power personal computers, with little concern for the effect on the environment and high-powered staff lawyers to fight off grassroots environmentalists who protest.[67] Examples like this lend credence to declensionist readings of the counterculture and environmentalism after the landmark victories of the 1960s. But the relationship between counterculture environmentalists and technology was always ambivalent. It should come as no surprise that the legacy of their technological revolution is also ambivalent.

While the AT revolution may not have played out the way New Left theorists expected, the majority of the AT initiatives have had an overwhelmingly positive impact on American culture and American environmentalism and offer a suggestion for how to move environmentalism out of the wilderness. The promotion of renewable energy resources and energy conservation through technological invention provides one example of success. Energy-efficient houses, thermal windows, solar power, and high-efficiency electrical devices have become widely accepted standard features of American culture. Curbside recycling and the proliferation of post-consumer waste recycling have also gained approval and become a part of daily life. Many of these technologies and services that seem so obvious and sensible that they go unnoticed today resulted from the radical innovation of counterculture environmentalists. Whether they went back to the land, or into the laboratory, they infused environmentalism with an optimistic hope that one day the nagging question of how to reconcile the tension between the modernist desire to exploit the progressive potential of technological innovation with the antimodernist desire to preserve the natural world might be resolved through politically enlightened technical innovation.

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## Notes

1. In this essay I use the term antimodernism to group individuals and organizations who defined themselves in opposition to the prevailing twentieth-century belief in progress through technological innovation. Antimodernists in the conservation and preservation movements rarely rejected the modernist/Progressive ideal that societies are improvable, they simply rejected the notion that improvement required looking forward to new technologies to solve old problems.
2. Michael McCloskey, "Wilderness Movement at the Crossroads, 1945–1970," *Pacific Historical Review* 41 (August 1972): 346–61. Samuel P. Hays, "From Conservation to Environment: Environmental Politics Since World War Two," *Environmental Review* 6 (fall 1982): 14–41. Mark W. T. Harvey, "Echo Park, Glen Canyon, and the Postwar Wilderness Movement," *Pacific Historical Review* 60 (February 1991): 43–67.
3. The *Whole Earth Catalog* has had many incarnations. Because of the editor's iconoclastic style and alternative publishing methodology, *Whole Earth* is maddeningly difficult to properly cite. The first addition was published in 1968 as, *The Whole Earth Catalog: Access To Tools,* edited by Stewart Brand and published by the Portola Institute with

distribution provided by Random House. Several revised versions followed between 1969 and 1971, all with Brand as the lead editor, when *The Last Whole Earth Catalog* (Portola & Random House, 1971) appeared. *The Last Whole Earth* won the prestigious National Book Award in 1972. All of the *Whole Earths* were reprinted many times and often there were seasonal editions. Between 1972 and 1999 there were several notable editions. See, especially, Stewart Brand, ed., *The Next Whole Earth Catalog: Access to Tools* (The Pont Foundation with distribution by Rand McNally in the U.S. and Random House in Canada, 1980). This particular edition is notable for shear size, 608 oversized pages, and breadth of coverage. There were also several *Whole Earth*–type companion volumes, such as J. Baldwin and Stewart Brand, eds., *Soft-Tech* (New York: Penguin Books, 1978), that focused on particular issues. Brand relinquished the editorship in the 1980s and several editors have since shepherded the perennially popular publication through several more editions. Most notable among these are: Howard Rheingold, ed., *The Millennnium Whole Earth Catalog* (San Francisco, Calif.: Harper San Francisco, 1994), and Peter Warshall, ed., *30th Anniversary Celebration: Whole Earth Catalog* (San Rafael, Calif.: Point Foundation, 1999). The thirtieth-anniversary edition includes a wonderful collection of Alternative Technology and Counterculture essays by leaders from the 1960s–1990s. Kevin Kelly, ed., *Signal: Communication Tools for the Information Age, A Whole Earth Catalog* (New York: Harmony Books, 1988).

4. Arthur Carhart is the example I know best. Universally considered a leading activist in the 1940s and 1950s, he has been dismissed by environmental historians primarily because his wilderness philosophy was not pure enough. For a recent corrective to these tendencies, see Charles T. Rubin, *Conservation Reconsidered: Nature, Virtue, and American Liberal Democracy* (Lanham, Md.: Rowman & Littlefield Publishers, 2000). This excellent collection of essays takes on the tendencies of historians to depict conservation, preservation, and environmentalism as oppositional movements. Particularly useful is Bob Pepperman Taylor's Afterword.
5. William Cronon, ed., *Uncommon Ground: Toward Reinventing Nature* (New York: W. W. Norton & Company, 1995), 69. For a remarkably similar argument against elevating a mythically pristine wilderness at the expense of the rest of the environment, see Arthur Carhart, *Planning for America's Wildlands* (Harrisburg, Pa.: The Telegraph Press, 1961). Carhart has often been criticized for his failure to support the Wilderness Bill at a time when his influence and access to a national audience was at a high point. Carhart argues convincingly that wilderness as defined by the Wilderness Society did not really exist in any pure state, but it was an "experience" a construct that lived "within your mind," rather than in a particular place. Carhart refused to support the Wilderness Bill in 1964 because he felt that arguing for wilderness purity would be a *de facto* concession to those who sought to develop lands not considered pristine.
6. This section on counterculture environmentalism and the WEC owes a great deal to an essay I wrote for an edited collection on the counterculture. "Machines of Loving Grace: Appropriate Technology, Environment, and the Counterculture," in *Imagine Nation: The American Counterculture of the 1960s and 1970s,* ed. Michael Doyle and Peter Braunstein (New York: Routledge, forthcoming).
7. Murray Bookchin, *Post-Scarcity Anarchism* (Berkeley, Calif.: The Ramparts Press, 1971).
8. Ibid., 12.
9. Ibid., 11.
10. Steven Levy, *Hackers: Heroes of the Computer Revolution* (New York: Penguin Books, 1994).
11. The classic study of the conservation movement is Samuel P. Hays, *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890–1920* (Cambridge,

Mass.: Harvard University Press, 1959). Also useful is Stephen Fox, *The American Conservation Movement: John Muir and His Legacy* (Madison: University of Wisconsin Press, 1981).

12. For an excellent overview of the effect of atomic technology on American culture, see Paul Boyer, *By the Bombs Early Light: American Thought and Culture at the Dawn of the Atomic Age* (New York: Pantheon Books, 1985).
13. John Eastlick, "Proposed Collection of Conservation of Natural Resources," FF-51, box 4, Conservation Library Collection archive.
14. Fox, *The American Conservation Movement.* Fox highlights Muir's antimodernist rhetoric as evidence that the conservation movement had, from the beginning, two distinct strains of thought: one, progressive and modern, focused on efficiency and reform; and the other, antimodernist, focused on the aesthetic and spiritual values of wilderness. A further discussion of these ideas can be found in Max Oelschlaeger, *The Idea of Wilderness: From Prehistory to the Age of Ecology* (New Haven, Conn.: Yale University Press, 1991).
15. Oelschlaeger, *The Idea of Wilderness,* 2.
16. Rachel Carson, *Silent Spring* (Greenwich, Conn.: Fawcett Publications, 1962).
17. Barry Commoner, *The Closing Circle: Nature, Man, and Technology* (New York: Alfred A. Knopf, 1971).
18. Jacques Ellul, *The Technological Society,* trans. Joachim Neugroschel (New York: Continuum, 1980); first published in French in 1954 and in English in 1964. Quote is from Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm* (New York: Penguin Books, 1989), 450.
19. Quote is from Langdon Winner, "Building a Better Mousetrap: Appropriate Technology as a Social Movement," in *Appropriate Technology and Social Values: A Critical Appraisal,* ed. Franklin A. Long and Alexandra Oleson (Cambridge, Mass.: Ballinger Publishing Company, 1980), 33.
20. Herbert Marcuse, *One Dimensional Man: Studies in the Ideology of Advanced Industrial Society* (Boston: Beacon Press, 1964).
21. Hughes, *American Genesis,* 445.
22. Lewis Mumford, *Technics and Civilization* (New York: Harcourt Brace & World, 1963).
23. Hughes, *American Genesis,* 446–50. Lewis Mumford, *The Myth of the Machine: The Pentagon of Power* (New York: Harcourt Brace Jovanovich, 1970).
24. For an in-depth look at the "machine" in American culture, see Leo Marx, *The Machine and the Garden: Technology and the Pastoral Ideal in America* (New York: Oxford University Press, 1964). This classic study remains the best source on the strange relationship between technology and nature in American culture. See also Richard White, *The Organic Machine* (New York: Hill & Wang, 1995).
25. Theodore Roszak, *The Making of the Counter Culture: Reflections on the Technocratic Society and Its Youthful Opposition* (New York: Doubleday & Company, 1968).
26. Ibid., 8.
27. Charles A. Reich, *The Greening of America: How the Youth Revolution is Trying to Make America Livable* (New York: Random House, 1970).
28. E. F. Schumacher, *Small Is Beautiful: Economics as if People Mattered* (New York: Harper & Row, 1973).
29. Ibid., 124.
30. A useful taxonomy of technologies can be found in Marilyn Carr, ed., *The AT Reader: Theory and Practice in Appropriate Technology* (New York: Intermediate Technology Development Group of North America, 1985), 6–11.
31. Witold Rybczynski, *Paper Heroes: A Review of Appropriate Technology* (Garden City, N.Y.: Anchor Books, 1980), 1–4.

32. David Dickson, *Alternative Technology and the Politics of Technical Change* (Glasgow: Fontana/Collins, 1974), 148–73.
33. Samuel P. Hays, *Beauty, Health, and Permanence: Environmental Politics in the United States, 1955–1985* (Cambridge: Cambridge University Press, 1987), 262.
34. Lewis Herber (Murray Bookchin), *Our Synthetic Environment* (New York: Alfred A. Knopf, 1962). Murray Bookchin, *Post-Scarcity Anarchism* (Berkeley, Calif.: The Ramparts Press, 1971). Quote is from *Post-Scarcity*, 22. See also Ulrike Heider, *Anarchism: Left, Right, and Green* (San Francisco, Calif.: City Lights Books, 1994); and, Arthur Lothstein, ed., *"All We Are Saying . . .": The Philosophy of the New Left* (New York: Capricorn Books, 1970).
35. Bookchin, *Post-Scarcity Anarchism*, 21.
36. The best overview of the New Left, the counterculture, and environmentalism can be found in Robert Gottlieb, *Forcing the Spring: The Transformation of the American Environmental Movement* (Washington D.C.: Island Press, 1993), 81–114. See also, Martin Lewis, *Green Delusions: An Environmentalist Critique of Radical Environmentalism* (Durham, N.C.: Duke University Press, 1992. For a very different point of view from Gottlieb's and from that in this essay, see Hays, *Beauty, Health, and Permanence*, 259–65. Hays argues that there were only superficial similarities between the "negative" counterculture and the "positive" environmental alternative lifestyle movement.
37. See Robert D. Bullard, *Dumping in Dixie: Race, Class, and Environmental Quality* (Boulder, Colo.: Westview Press, 1990), and *Confronting Environmental Racism: Voices from the Grassroots* (Boston: South End Press, 1993).
38. Carr, ed., *The AT Reader*, 9. There are many fine sources on the development of appropriate technology, see David Dickson, *Alternative Technology and the Politics of Technical Change* (New York: Universe Books, 1975); Nicholas Jéquier, ed., *Appropriate Technology: Problems and Promises* (Paris: Organization for Economic Co-operation and Development, 1976); Franklin A. Long & Alexandra Oleson, eds., *Appropriate Technology and Social Values;* Witold Rybczynski, *Taming the Tiger: The Struggle to Control Technology* (New York: Penguin, 1985); Mathew J. Betz, Pat McGowan, and Rolf T. Wigand, eds., *Appropriate Technology: Choice and Development* (Durham, N.C.: Duke Press Policy Studies, 1984); Ron Westrum, *Technologies and Society: The Shaping of People and Things* (Belmont, Calif.: Wadsworth Publishing, 1991); and Theodore Roszak, *Where the Wasteland Ends: Politics and Transcendence in Postindustrial Society* (Garden City, N.Y.: Anchor Books, 1973). Two recent works shed new light on the history of alternative technology within the context of environmental politics. Martin W. Lewis, *Green Delusions: An Environmentalist Critique of Radical Environmentalism* (Durham, N.C.: Duke University Press, 1992); and Charles T. Rubin, ed., *Conservation Reconsidered: Nature, Virtue, and American Liberal Democracy* (Lanham, Md.: Rowman & Littlefield Publishers, 2000).
39. Winner, "Building a Better Mousetrap," 31.
40. Stewart Brand, *The Media Lab: Inventing the Future at MIT* (New York: Penguin Books, 1988); *How Buildings Learn: What Happens After They're Built* (New York: Penguin Books, 1994); *The Clock of the Long Now: Time and Responsibility* (New York: Basic Books, 1999).
41. Witold Rybczynski, *Stop the 5-Gallon Flush* (Montreal: Minimum Cost Housing Group, 1975).
42. Kevin Kelly, ed., *Signal: Communications Tools for the Information Age, A Whole Earth Catalog* (New York: Harmony Books, 1988), 3.
43. R. Buckminster Fuller and Robert Marks, *The Dymaxion World of Buckminster Fuller* (Garden City, N.Y.: Anchor Books, 1973); Robert Marks, ed., *Buckminster Fuller: Ideas and Integrities* (Englewood Cliffs, N.J.: Prentice-Hall, 1963); Robert Snyder, ed., *Buckminster Fuller: Autobiographical Monologue/Scenario* (New York: St. Martin's Press, 1980).

44. Snyder, *Buckminster Fuller*, 38.
45. Ibid., 54–55.
46. Clark Secrest, "'No Right to be Poor': Colorado's Drop City" *Colorado Heritage* (winter 1998): 14–21.
47. Paolo Soleri's vision of an alternative world created through revolutionary architecture was even more iconoclastic than Fuller's. Soleri's radical design ideas were popularized in *Arcology: The City in the Image of Man* (Cambridge, Mass.: MIT Press, 1969), and epitomized by his still unfinished life project, Arcosanti in the Arizona desert. Like Soleri, Moshe Safdie focused on alternative designs for communal living. See Moshe Safdie, *Beyond Habitat* (Cambridge, Mass.: MIT Press, 1970).
48. Winner, "Building a Better Mousetrap," 32.
49. Gareth Branwyn, "Whole Earth Review." Streettech website: http://www.streettech.com/bcp/BCPgraf/CyberCulture/WholeEarthReview.html (6/26/01).
50. Tom Wolfe, *The Electric Kool-Aid Acid Test* (New York: Bantam Books, 1997), 191–200.
51. Baldwin and Brand, *Soft Tech*, 5.
52. Rybczynski, *Paper Heroes*, 94.
53. Kelly, *Signal*, 3.
54. Todd, "The New Alchemists." *Soft Tech*, 149–65.
55. Amory Lovins, "Energy Strategy: The Road Not Taken." *Foreign Affairs* 55 (October 1976): 65–96; Hugh Nash, ed., *The Energy Controversy: Soft Path Questions and Answers* (San Francisco, Calif.: Friends of the Earth, 1979); Jim Harding, ed., *Tools for the Soft Path* (San Francisco, Calif.: Friends of the Earth, 1979).
56. Lovins, "Energy Strategy," 65.
57. Ibid., 82–83.
58. T. Lindsay Baker, *A Field Guide to American Windmills* (Norman: University of Oklahoma Press, 1985); Paul Gipe, *Wind Energy Comes of Age* (New York: Wiley, 1995); Robert W. Righter, *Wind Energy in America: A History* (Norman: University of Oklahoma Press, 1996); David Rittenhouse Inglis, *Wind Power and Other Energy Options* (Ann Arbor: University of Michigan Press, 1978; Michael Hackleman, *The Homebuilt, Wind-Generated Electricity Handbook* (Culver City, Calif.: Peace Press, 1975); Richard L. Hills, *Power From Wind: A History of Windmill Technology* (Cambridge: Cambridge University Press, 1994). See also, Nicholas P. Chermisnoff, *Fundamentals of Wind Energy* (Ann Arbor, Mich.: Ann Arbor Science, 1978); Douglas R. Coonley, *Wind: Making It Work For You* (Philadelphia: The Franklin Institute Press, 1979).
59. Hills, *Power From Wind*, 265–81.
60. Baldwin and Brand, *Soft Tech*, 5.
61. Kelly, *Signal*, 3.
62. Ibid. For more on Jobs, Wozniak, and Apple, see Steven Levy, *Insanely Great: The Life and Times of Macintosh, The Computer That Changed Everything* (New York: Penguin Books, 1995); Steven Levy, *Hackers: Heroes of the Computer Revolution* (New York: Penguin Books, 1994); and Jeff Goodell, "The Rise and Fall of Apple Inc." *Rolling Stone* (April 4, 1996): 51–73 and (April 18, 1996): 59–88.
63. Goodell, "The Rise and Fall of Apple Inc," 52.
64. Theodore Roszak, *The Cult of Information: A Neo-Luddite Treatise on High-Tech, Artificial Intelligence, and the True Art of Thinking* (Berkeley: University of California Press, 1994), xiii–xv.
65. See the WELL website: http://www.well.com (6/26/01).
66. Alvin Toffler, *The Third Wave* (New York: Bantam Books, 1982).
67. Bruce Selcraig, "Albuquerque Learns It Really Is A Desert Town." *High Country News* 26 (December 26, 1994): 1–6.

Grace Lees-Maffei and Rebecca Houze's
The Design History Reader (Berg, 2010)



# OPERATING MANUAL FOR SPACESHIP EARTH

## R. Buckminster Fuller (1969)

Our little Spaceship Earth is only eight thousand miles in diameter, which is almost a negligible dimension in the great vastness of space. Our nearest star – our energy-supplying mother-ship, the Sun – is ninety-two million miles away, and the nearest star is one hundred thousand times further away. It takes approximately four and one third years for light to get to us from the next nearest energy supply ship star. That is the kind of space-distanced pattern we are flying. Our little Spaceship Earth is right now traveling at sixty thousand miles an hour around the sun and is also spinning axially, which, at the latitude of Washington, D.C., adds approximately one thousand miles per hour to our motion. Each minute we both spin at one hundred miles and zip in orbit at one thousand miles. That is a whole lot of spin and zip. When we launch our rocketed space capsules at fifteen thousand miles an hour, that additional acceleration speed we give the rocket to attain its own orbit around our speeding Spaceship Earth is only one-fourth greater than the speed of our big planetary spaceship. Spaceship Earth was so extraordinarily well invented and designed that to our knowledge humans have been on board it for two million years not even knowing that they were on board a ship. And our spaceship is so superbly designed as to be able to keep life regenerating on board despite the phenomenon, entropy, by which all local physical systems lose energy. So we have to obtain our biological life-regenerating energy from another spaceship: the sun.

Our sun is flying in company with us, within the vast reaches of the Galactic system, at just the right distance to give us enough radiation to keep us alive, yet not close enough to burn us up. And the whole scheme of Spaceship Earth and its live passengers is so superbly designed that the Van Allen belts, which we didn't even know we had until yesterday, filter the sun and other star radiation which as it impinges upon our spherical ramparts is so concentrated that if we went nakedly outside the Van Allen belts it would kill us. Our Spaceship Earth's designed infusion of that radiant energy of the stars is processed in such a way that you and I can carry on safely. You and I can go out and take a sunbath, but are unable to take in enough energy through our skins to keep alive. So part of the invention of the Spaceship Earth and its biological life-sustaining is that the vegetation on the land and the algae in the sea, employing photosynthesis, are designed to impound the life-regenerating energy for us to adequate amount.

But we can't eat all the vegetation. As a matter of fact, we can eat very little of it. We can't eat the bark nor wood of the trees nor the grasses. But insects can eat these, and there are many other animals and creatures that can. We get the energy relayed to us by taking the milk and meat from the animals. The animals can eat the vegetation, and there are a few of the fruits and tender vegetation petals and seeds that we can eat. We have learned to cultivate more of those botanical edibles by genetical inbreeding.

That we are endowed with such intuitive and intellectual capabilities as that of discovering the genes and the R.N.A. and D.N.A. and other fundamental principles governing the fundamental design controls of life systems as well as of nuclear energy and chemical structuring is part of the extraordinary design of the Spaceship Earth, its equipment, passengers, and internal support systems. It is therefore paradoxical but strategically explicable, as we shall see, that up to now we have been mis-using, abusing, and polluting this extraordinary chemical energy-interchanging system for successfully regenerating all life aboard our planetary spaceship.

One of the interesting things to me about our spaceship is that it is a mechanical vehicle, just as is an automobile. If you own an automobile, you realize that you must put oil and gas into it, and you must put water in the radiator and take care of the car as a whole. You begin to develop quite a little thermodynamic sense. You know that you're either going to have to keep the machine in good order or it's going to be in trouble and fail to function. We have not been seeing our Spaceship Earth as an integrally-designed machine which to be persistently successful must be comprehended and serviced in total.

Now there is one outstandingly important fact regarding Spaceship Earth, and that is that no instruction book came with it. I think it's very significant that there is no instruction book for successfully operating our ship. In view of the infinite attention to all other details displayed by our ship, it must be taken as deliberate and purposeful that an instruction book was omitted. Lack of instruction has forced us to find that there are two kinds of berries – red berries that will kill us and red berries that will nourish us. And we had to find out ways of telling which-was-which red berry before we ate it or otherwise we would die. So we were forced, because of a lack of an instruction book, to use our intellect, which is our supreme faculty, to devise scientific experimental procedures and to interpret effectively the significance of the experimental findings. Thus, because the instruction manual was missing we are learning how we safely can anticipate the consequences of an increasing number of alternative ways of extending our satisfactory survival and growth-both physical and metaphysical.

Quite clearly, all of life as designed and born is utterly helpless at the moment of birth. The human child stays helpless longer than does the young of any other species. Apparently it is part of the invention "man" that he is meant to be utterly helpless through certain anthropological phases and that, when he begins to be able to get on a little better, he is meant to discover some of the physical leverage-multiplying principles inherent in [the] universe as well as the many nonobvious resources around him which will further compoundingly multiply his knowledge-regenerating and life-fostering advantages.

I would say that designed into this Spaceship Earth's total wealth was a big safety factor which allowed man to be very ignorant for a long time until he had amassed enough experiences from which to extract progressively the system of generalized principles governing the increases of energy[-]managing advantages over environment. The designed omission of the instruction book on how to operate and maintain Spaceship Earth and its complex life-supporting and regenerating systems has forced man to discover retrospectively just what his most important forward capabilities are. His intellect had to discover itself. Intellect in turn had to compound the facts of his experience. Comprehensive reviews of the compounded facts of experiences by intellect brought forth awareness of the generalized principles underlying all special and only superficially-sensed experiences. Objective employment of those generalized principles in rearranging the physical resources of environment seems to be leading to humanity's eventually total success and readiness to cope with far vaster problems of universe.

To comprehend this total scheme we note that long ago a man went through the woods, as you may have done, and I certainly have, trying to find the shortest way through the woods in a given direction. He found trees fallen across his path. He climbed over those crisscrossed trees and suddenly found himself poised on a tree that was slowly teetering. It happened to be lying across another great tree, and the other end of the tree on which he found himself teetering lay under a third great fallen tree. As he teetered he saw the third big tree lifting. It seemed impossible to him. He went over and tried using his own muscles to lift that great tree. He couldn't budge it. Then he climbed back atop the first smaller tree, purposefully teetering it, and surely enough it again elevated the larger tree. I'm certain that the first man who found such a tree thought that it was a magic tree, and may have dragged it home and erected it as man's first totem. It was probably a long time before he learned that any stout tree would do, and thus extracted the concept of the generalized principle of leverage out of all his earlier successive special-case experiences with such accidental discoveries. Only as he learned to generalize fundamental principles of physical universe did man learn to use his intellect effectively.



Once man comprehended that any tree would serve as a lever his intellectual advantages accelerated. Man freed of special-case superstition by intellect has had his survival potentials multiplied millions fold. By virtue of the leverage principles in gears, pulleys, transistors, and so forth, it is literally possible to do more with less in a multitude of physio-chemical ways. Possibly it was this intellectual augmentation of humanity's survival and success through the metaphysical perception of generalized principles which may be objectively employed that Christ was trying to teach in the obscurely told story of the loaves and the fishes.

## NOTE

Reproduced from Buckminster Fuller, R., *Operating Manual for Spaceship Earth*, Carbondale, IL: Southern Illinois University Press, 1969, pp. 49–56. Reprinted by permission of the Estate of R. Buckminster Fuller.

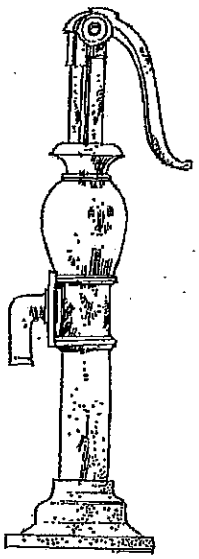
Marilyn Carr (ed.): The AT Reader (1985)

George McRobie, who analyses the process by which Appropriate Technology can and has been moving from an 'alternative' to a normal part of administrative, business and community activity.



# Schumacher on Intermediate Technology

If we define the level of technology in terms of 'equipment cost per workplace', we can call the indigenous technology of a typical developing country — symbolically speaking — a £1-technology, while that of the developed countries could be called a £1,000-technology. The gap between these two technologies is so enormous that a transition from the one to the other is simply impossible. In fact, the current attempt of the developing countries to infiltrate the £1,000-technology into their economies inevitably kills off the £1-technology at an alarming rate, destroying traditional workplaces much faster than modern workplaces can be created, and thus leaves the poor in a more desperate and helpless position than ever before. If effective help is to be brought to those who need it most, a technology is required which would range in some intermediate position between the £1-technology and the £1,000-technology. Let us call it — again symbolically speaking — a £100-technology.

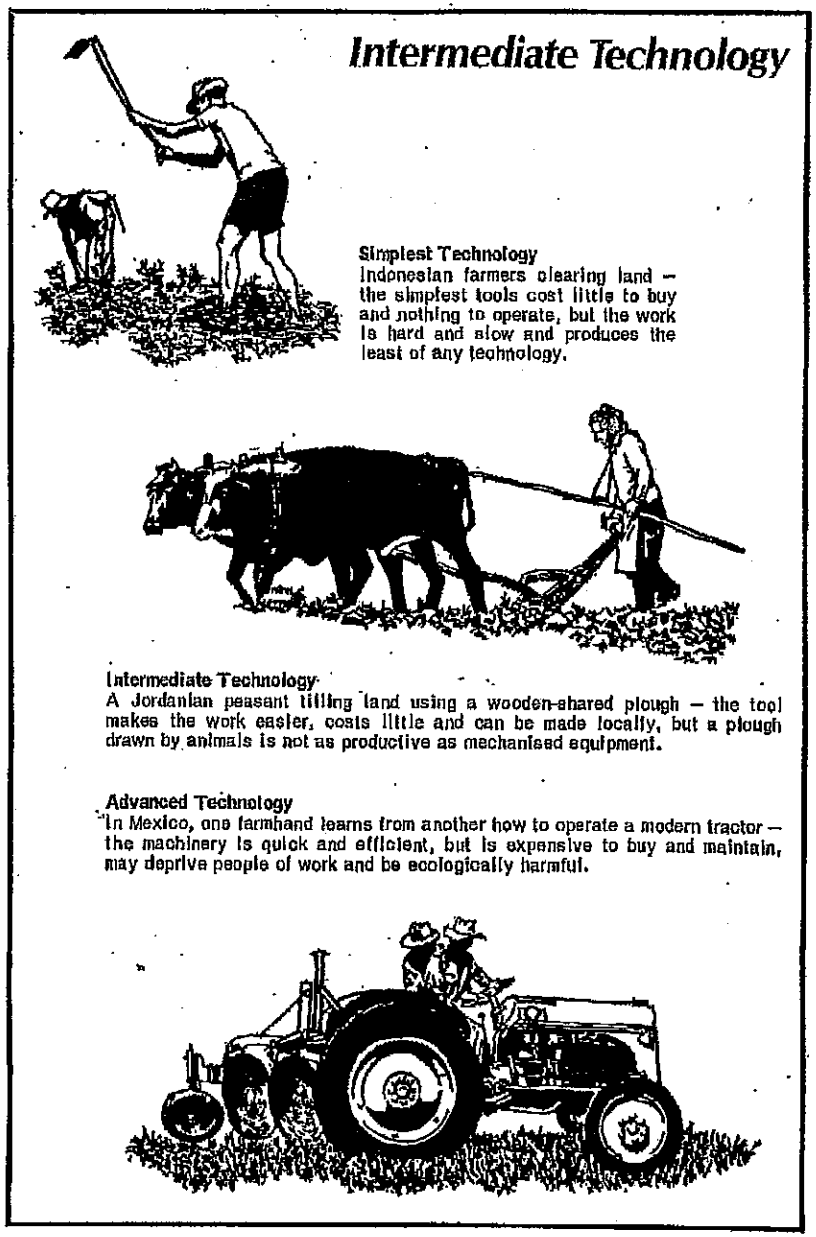


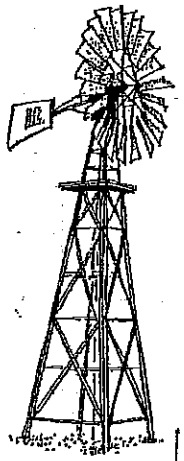
Such an intermediate technology would be immensely more productive than the indigenous technology (which is often in a condition of decay), but it would also be immensely cheaper than the sophisticated, highly capital-intensive technology of modern industry. At such a level of capitalization, very large numbers of workplaces could be created within a fairly short time; and the creation of such workplaces would be 'within reach' for the more enterprising minority within the district, not only in financial terms but also in terms of their education, aptitude, organizing skill, and so forth.

This last point may perhaps be elucidated as follows:

The average annual income per worker and the average capital per workplace in the developed countries appear at present to stand in a relationship of roughly 1:1. This implies, in general terms, that it takes one man-year to create one workplace, or that a man would have to save





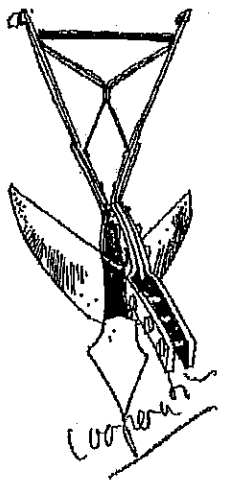


one month's earnings a year for twelve years to be able to own a workplace. If the relationship were 1:10, it would require ten man-years to create one workplace, and a man would have to save a month's earnings a year for 120 years before he could make himself owner of a workplace. This, of course, is an impossibility, and it follows that the £1,000-technology transplanted into a district which is stuck on the level of a £1-technology simply cannot spread by any process of normal growth. It cannot have a positive 'demonstration effect'; on the contrary, as can be observed all over the world, its 'demonstration effect' is wholly negative. The people, to whom the £1,000-technology is inaccessible, simply 'give up' and often cease doing even those things which they had done previously.

The intermediate technology would also fit much more smoothly into the relatively unsophisticated environment in which it is to be utilized. The equipment would be fairly simple and therefore understandable, suitable for maintenance and repair on the spot. Simple equipment is normally far less dependent on raw materials of great purity or exact specifications and much more adaptable to market fluctuations than highly sophisticated equipment. Men are more easily trained; supervision, control, and organization are simpler; and there is far less vulnerability to unforeseen difficulties.

E.F. Schumacher, *Small is Beautiful*, 1973.

## What are 'Appropriate Technologies'?



Appropriate technologies:

1 are low in capital costs;
2 use local materials whenever possible;
3 create jobs, employing local skills and labour;
4 are small enough in scale to be affordable by a small group of farmers;
5 can be understood, controlled and maintained by villagers wherever possible, without a high level of Western-style education;
6 can be produced out of a small metal-working shop, if not in a village itself;
7 suppose that people can and will work together to collectively bring improvements to their communities, recognizing that in most of the world important decisions are made by groups rather than by individuals;



8 involve decentralized renewable energy sources, such as wind power, solar energy, water power, methane gas, animal power and pedal-power (such as in that highly efficient machine, the bicycle);
9 make technology understandable to the people who are using it and thus suggest ideas that could be used in further innovations;
10 are flexible so that they can continue to be used or adapted to fit changing circumstances;
11 do not involve patents, royalties, consultant fees, import duties, shopping charges, or financial wizards; practical plans can be obtained free or at low cost and no further payment is involved.

Ken Darrow and Rick Pam, *Appropriate Technology Sourcebook*, 1978.

## A Few Definitions of Technology

Alternative technology is the term used to describe new types of equipment or new organizational forms which represent a viable alternative to the existing 'main-stream' technologies of today. Examples: 'self-help' housing schemes instead of conventional urban development programmes, or small-scale organic farming instead of large-scale energy-intensive cultivation techniques.

Appropriate technology (AT) is now recognized as the generic term for a wide range of technologies characterized by any one or several of the following features: low investment cost per work-place, low capital investment per unit of output, organizational simplicity, high adaptability to a particular social or cultural environment, sparing use of natural resources, low cost of final product or high potential for employment.

Capital-saving technology (CST) or light-capital technology (LCT), a concept pioneered by Congressman Clarence D. Long of the US House of Representatives and now widely used by the US Agency for International Development, is a technology characterized primarily by its low cost in capital and the small size of the investment needed to create a job. Building roads with efficient labour-intensive methods embodies light-capital technologies; building them with bulldozers and scrapers does not.

Community technology (CT), a term widely used in the American counterculture and by such writers as Karl Hess, is a small-scale technology which does not require a complex infrastructure, which is specifically tailored to the needs and capabilities of small urban or rural communities, and which seeks to foster community participation in the decision-making processes. Examples: small-scale co-operative industrial activities or decentralized water supply and waste disposal systems.

# The Purpose of The Whole Earth Catalog

- By Stewart Brand
- Whole Earth Catalog
- Fall 1968



Print

## PURPOSE

We are as gods and might as well get used to it. So far, remotely done power and glory as via government, big business, formal education, church has succeeded to the point where gross obscure actual gains. In response to this dilemma and to these gains a realm of intimate, personal power is developing power of the individual to conduct his own education, find his own inspiration, shape his own environment, and share his adventure with whoever is interested. Tools that aid this process are sought and promoted by the WHOLE EARTH CATALOG.

'But unfortunately,' said Radha, 'the Rani had done such a thorough job that he couldn't be interested in anyone but her – and, of course, himself.'

'No boys?'

'Maybe now. I don't know. All I know is that in my day there was nobody in his universe. No boys and, still more emphatically, no girls. Only Mother and masturbation and the Ascended Masters. Only jazz records and sports cars and Hitlerian ideas about being a Great Leader and turning Pala into what he calls a Modern State.'

'Three weeks ago,' said Ranga, 'he and the Rani were at the palace, in Shivapuram. They invited a group of us from the University to come and listen to Murugan's ideas – on oil, on industrialization, on television, on armaments, on the Crusade of the Spirit.'

'Did he make any converts?'

Ranga shook his head. 'Why would anyone want to exchange something rich and good and endlessly interesting for something bad and thin and boring? We don't feel any need for your speedboats or your television. Still less for your wars and revolutions, your revivals, your political slogans, your metaphysical nonsense from Rome and Moscow. Did you ever hear of *Maithuna*?' he asked.

'*Maithuna*? What's that?'

'Let's start with the historical background,' Ranga answered; and with the engaging pedantry of an undergraduate delivering a lecture about matters which he himself has only lately heard of, he launched forth. 'Buddhism came to Pala about twelve hundred years ago, and it came not from Ceylon, which is what one would have expected, but from Bengal, and through Bengal, later on, from Tibet. Result: we're Mahayanists, and our Buddhism is shot through and through with Tantra. Do you know what Tantra is?'

Will had to admit that he had only the haziest notion.

'And to tell the truth,' said Ranga, with a laugh that broke irrepressibly through the crust of his pedantry, 'I don't really know much more than you do. Tantra's an



enormous subject and most of it, I guess, is just silliness and superstition – not worth bothering about. But there's a hard core of sense. If you're a Tantrik, you don't renounce the world or deny its value; you don't try to escape into a Nirvana apart from life, as the monks of the Southern School do. No, you accept the world, and you make use of it; you make use of everything you do, of everything that happens to you, of all the things you see and hear and taste and touch, as so many means to your liberation from the prison of yourself.'

'Good talk,' said Will in a tone of polite scepticism.

'And something more beside,' Ranga insisted. 'That's the difference,' he added – and youthful pedantry modulated the eagerness of youthful proselytism, 'that's the difference between your philosophy and ours. Western philosophers, even the best of them – they're nothing more than good talkers. Eastern philosophers are often rather bad talkers, but that doesn't matter. Talk isn't the point. Their philosophy is pragmatic and operational. Like the philosophy of modern physics – except that the operations in question are psychological and the results transcendental. Your metaphysicians make statements about the nature of man and the universe; but they don't offer the reader any way of testing the truth of those statements. When *we* make statements, we follow them up with a list of operations that can be used for testing the validity of what we've been saying. For example, *Tat tvam asi*, "thou art That" – the heart of all our philosophy. *Tat tvam asi*,' he repeated. 'It looks like a proposition in metaphysics; but what it actually refers to is a psychological experience, and the operations by means of which the experience can be lived through are described by our philosophers, so that anyone who's willing to perform the necessary operations can test the validity of *Tat tvam asi* for himself. The operations are called yoga, or dhyana, or Zen – or, in certain special circumstances, *maithuna*.'

'Which brings us back to my original question. What *is maithuna*?'

Aldous Huxley: Island (1962)

'Maybe you'd better ask Radha.'

Will turned to the little nurse. 'What is it?'

'*Maithuna*,' she answered gravely, 'is the yoga of love.'

'Sacred or profane?'

'There's no difference.'

'That's the whole point,' Ranga put in. 'When you do *maithuna*, profane love *is* sacred love.'

'*Buddhatvan yoshidyonisansritan*,' the girl quoted.

'None of your Sanskrit! What does it mean?'

'How would you translate *Buddhatvan*, Ranga?'

'Buddhaness, Buddheity, the quality of being enlightened.'

Radha nodded and turned back to Will. 'It means that Buddhaness is in the *yoni*.'

'In the *yoni*?' Will remembered those little stone emblems of the Eternal Feminine that he had bought, as presents for the girls at the office, from a hunchbacked vendor of *bondieuseries* at Benares. Eight annas for a black *yoni*; twelve for the still more sacred image of the *yoni-lingam*. 'Literally in the *yoni*?' he asked. 'Or metaphorically.'

'What a ridiculous question!' said the little nurse, and she laughed her clear unaffected laugh of pure amusement. 'Do you think we make love metaphorically? *Buddhatvan yoshidyonisansritan*,' she repeated. 'It couldn't be more completely and absolutely literal.'

'Did you ever hear of the Oneida Community?' Ranga now asked.

Will nodded. He had known an American historian who specialized in nineteenth-century communities. 'But why do *you* know about it?' he asked.

'Because it's mentioned in all our textbooks of applied philosophy. Basically, *maithuna* is the same as what the Oneida people called Male Continence. And that was the same as what Roman Catholics mean by *coitus reservatus*.'

'*Reservatus*,' the little nurse repeated. 'It always makes me want to laugh. "Such a *reserved* young man"!' The dimples reappeared and there was a flash of white teeth.



'Don't be silly,' said Ranga severely. 'This is serious.'

She expressed her contrition. But '*reservatus*' was really too funny.

'In a word,' Will concluded, 'it's just birth control without contraceptives.'

'But that's only the beginning of the story,' said Ranga. '*Maithuna* is also something else. Something even more important.' The undergraduate pedant had reasserted himself. 'Remember,' he went on earnestly, 'remember the point that Freud was always harping on.'

'Which point? There were so many.'

'The point about the sexuality of children. What we're born with, what we experience all through infancy and childhood, is a sexuality that isn't concentrated on the genitals; it's a sexuality diffused throughout the whole organism. That's the paradise we inherit. But the paradise gets lost as the child grows up. *Maithuna* is the organized attempt to regain that paradise.' He turned to Radha. 'You've got a good memory,' he said. 'What's that phrase of Spinoza's that they quote in the applied philosophy book?'

'"Make the body capable of doing many things,"' she recited.

'"This will help you to perfect the mind and so to come to the intellectual love of God."'

'Hence all the yogas,' said Ranga. 'Including *maithuna*.'

'And it's a real yoga,' the girl insisted. 'As good as raja yoga, or karma yoga, or bhakti yoga. In fact, a great deal better, so far as most people are concerned. *Maithuna* really gets them there.'

'What's "there"?' Will asked.

'"There" is where you know.'

'Know what?'

'Know who in fact you are – and believe it or not,' she added, '*Tat tvam asi* – thou art That, and so am I; That is me.' The dimples came to life, the teeth flashed. 'And That's also *him*.' She pointed at Ranga. 'Incredible, isn't it?' She stuck out her tongue at him. 'And yet it's a fact.'

Ranga smiled, reached out and with an extended

forefinger touched the tip of her nose. 'And not merely a fact,' he said. 'A revealed truth.' He gave the nose a little tap. 'A revealed truth,' he repeated. 'So mind your P's and Q's, young woman.'

'What I'm wondering,' said Will, 'is why we aren't all enlightened – I mean, if it's just a question of making love with a rather special kind of technique. What's the answer to that?'

'I'll tell you,' Ranga began.

But the girl cut him short. 'Listen,' she said, 'listen!'

Will listened. Faint and far off, but still distinct, he heard the strange inhuman voice that had first welcomed him to Pala. 'Attention,' it was saying. 'Attention. Attention ...'

'That bloody bird again!'

'But that's the secret.'

'Attention? But a moment ago you were saying it was something else. What about that young man who's so reserved?'

'That's just to make it easier to pay attention.'

'And it *does* make it easier,' Ranga confirmed. 'And that's the whole point of *maithuna*. It's not the special technique that turns love-making into yoga; it's the kind of awareness that the technique makes possible. Awareness of one's sensations and awareness of the not-sensation in every sensation.'

'What's a not-sensation?'

'It's the raw material for sensation that my not-self provides me with.'

'And you can pay attention to your not-self?'

'Of course.'

Will turned to the little nurse. 'You too?'

'To myself,' she answered, 'and at the same time to my not-self. And to Ranga's not-self, and to Ranga's self, and to Ranga's body, and to my body and everything it's feeling. And to all the love and the friendship. And to the mystery of the other person – the perfect stranger, who's the other half of your own self, and the same as your not-self. And all the while one's paying attention to all the



things that, if one were sentimental, or worse, if one were spiritual like the poor old Rani, one would find so unromantic and gross and sordid even. But they aren't sordid, because one's also paying attention to the fact that, when one's fully aware of them, those things are just as beautiful as all the rest, just as wonderful.'

'*Maithuna* is *dhyana*,' Ranga concluded. A new word, he evidently felt, would explain everything.

'But what is *dhyana*?' Will asked.

'*Dhyana* is contemplation.'

'Contemplation.'

Will thought of that strawberry-pink alcove above the Charing Cross Road. Contemplation was hardly the word he would have chosen. And yet even there, on second thoughts, even there he had found a kind of deliverance. Those alienations in the changing light of Porter's Gin were alienations from his odious daytime self. They were also, unfortunately, alienations from all the rest of his being – alienations from love, from intelligence, from common decency, from all consciousness but that of an excruciating frenzy by corpse-light or in the rosy glow of the cheapest, vulgarest illusion. He looked again at Radha's shining face. What happiness! What a manifest conviction, not of the sin that Mr Bahu was so determined to make the world safe for, but of its serene and blissful opposite! It was profoundly touching. But he refused to be touched. *Noli me tangere* – it was a categorical imperative. Shifting the focus of his mind, he managed to see the whole thing as reassuringly ludicrous. What shall we do to be saved? The answer is in four letters.

Smiling at his own little joke, 'Were you taught *maithuna* at school?' he asked ironically.

'At school,' Radha answered with a simple matter-of-factness that took all the Rabelaisian wind out of his sails.

'Everybody's taught it,' Ranga added.

'And when does the teaching begin?'

'About the same time as trigonometry and advanced biology. That's between fifteen and fifteen and a half.'

'And after they've learned *maithuna*, after they've gone out into the world and got married – that is if you ever do get married.'

'Oh, we do, we do,' Radha assured him.

'Do they still practise it?'

'Not all of them, of course. But a good many do.'

'All the time?'

'Except when they want to have a baby.'

'And those who don't want to have babies, but who might like to have a little change from *maithuna* – what do *they* do?'

'Contraceptives,' said Ranga laconically.

'And are the contraceptives available?'

'Available! They're distributed by the government. Free, gratis, and for nothing – except, of course, that they have to be paid for out of taxes.'

'The postman,' Radha added, 'delivers a thirty-night supply at the beginning of each month.'

'And the babies don't arrive?'

'Only those we want. Nobody has more than three, and most people stop at two.'

'With the result,' said Ranga, reverting, with the statistics, to his pedantic manner, 'that our population is increasing at less than a third of one per cent per annum. Whereas Rendang's increase is as big as Ceylon's – almost three per cent. And China's is two per cent, and India's about one point seven.'

'I was in China only a month ago,' said Will. 'Terrifying! And last year I spent four weeks in India. And before India in Central America, which is outbreeding even Rendang and Ceylon. Have either of you been in Rendang-Lobo?'

Ranga nodded affirmatively.

'Three days in Rendang,' he explained. 'If you get into the Upper Sixth, it's part of the advanced sociology course. They let you see for yourself what the Outside is like.'

'And what did you think of the Outside?' Will inquired.



He answered with another question. 'When you were in Rendang-Lobo, did they show you the slums?'

'On the contrary, they did their best to prevent me from seeing the slums. But I gave them the slip.'

Gave them the slip, he was vividly remembering, on his way back to the hotel from that grisly cocktail party at the Rendang Foreign Office. Everybody who was anybody was there. All the local dignitaries and their wives – uniforms and medals, Dior and emeralds. All the important foreigners – diplomats galore, British and American oilmen, six members of the Japanese trade mission, a lady pharmacologist from Leningrad, two Polish engineers, a German tourist who just happened to be a cousin of Krupp von Bohlen, an enigmatic Armenian representing a very important financial consortium in Tangiers, and, beaming with triumph, the fourteen Czech technicians who had come with last month's shipment of tanks and cannon and machine guns from Skoda. 'And these are the people,' he had said to himself as he walked down the marble steps of the Foreign Office into Liberty Square, 'these are the people who rule the world. Twenty-nine hundred millions of us at the mercy of a few scores of politicians, a few thousands of tycoons and generals and money-lenders. We are the cyanide of the earth – and the cyanide will never, never lose its savour.'

After the glare of the cocktail party, after the laughter and the luscious smells of canapés and Chanel-sprayed women, those alleys behind the brand new Palace of Justice had seemed doubly dark and noisome, those poor wretches camping out under the palm trees of Independence Avenue more totally abandoned by God and man than even the homeless, hopeless thousands he had seen sleeping like corpses in the streets of Calcutta. And now he thought of that little boy, that tiny pot-bellied skeleton, whom he had picked up, bruised and shaken by a fall from the back of the little girl, scarcely larger than himself, who was carrying him – had picked up and, led by the other child, had carried back, carried down, to the

Frank Herbert: Dune (1965)

Leto gave Halleck their private handsignal to desist, said: 'Our ways are new here, Gurney. We must make allowances.'

'As you wish, Sire.'

'We are indebted to you, Dr Kynes,' Leto said. 'These suits and the consideration for our welfare will be remembered.'

On impulse, Paul called to mind a quotation from the O.C. Bible, said '"The gift is the blessing of the giver."'

The words rang out overloud in the still air. The Fremen escort Kynes had left in the shade of the administration building leaped up from their squatting repose, muttering in open agitation. One cried out: 'Lisan al-Gaib!'

Kynes whirled, gave a curt, chopping signal with a hand, waved the guard away. They fell back, grumbling among themselves, trailed away around the building.

'Most interesting,' Leto said.

Kynes passed a hard glare over the Duke and Paul, said: 'Most of the desert natives here are a superstitious lot. Pay no attention to them. They mean no harm.' But he thought of the words of the legend: '*They will greet you with Holy Words and your gifts will be a blessing.*'

Leto's assessment of Kynes – based partly on Hawat's brief verbal report (guarded and full of suspicions) – suddenly crystallized: the man *was* Fremen. Kynes had come with a Fremen escort, which could mean simply that the Fremen were testing their new freedom to enter urban areas – but it had seemed an honor guard. And by his manner, Kynes was a proud man, accustomed to freedom, his tongue and his manner guarded only by his own suspicions. Paul's first question had been direct and pertinent.

Kynes had gone native.

'Shouldn't we be going, Sire?' Halleck asked.

The Duke nodded. 'I'll fly my own 'thopter. Kynes can sit up front with me to direct me. You and Paul take the rear seats.'

'One moment, please,' Kynes said. 'With your permission, Sire, I must check the security of your suits.'

The Duke started to speak, but Kynes pressed on: 'I have concern for my own flesh as well as yours . . . my Lord. I'm well



aware of whose throat would be slit should harm befall you two while you're in my care.'

The Duke frowned, thinking: *How delicate this moment! If I refuse, it may offend him. And this could be a man whose value to me is beyond measure. Yet . . . to let him inside my shield, touching my person when I know so little about him?*

The thoughts flicked through his mind with decision hard on their heels. 'We're in your hands,' the Duke said. He stepped forward, opening his robe, saw Halleck come up on the balls of his feet, poised and alert, but remaining where he was. 'And, if you'd be so kind,' the Duke said, 'I'd appreciate an explanation of the suit from one who lives so intimately with it.'

'Certainly,' Kynes said. He felt up under the robe for the shoulder seals, speaking as he examined the suit. 'It's basically a micro-sandwich – a high-efficiency filter and heat-exchange system.' He adjusted the shoulder seals. 'The skin-contact layer's porous. Perspiration passes through it, having cooled the body . . . near-normal evaporation process. The next two layers . . .' Kynes tightened the chest fit. '. . . include heat exchange filaments and salt precipitators. Salt's reclaimed.'

The Duke lifted his arms at a gesture, said: 'Most interesting.'

'Breathe deeply,' Kynes said.

The Duke obeyed.

Keynes studied the underarm seals, adjusted one. 'Motions of the body, especially breathing,' he said, 'and some osmotic action provide the pumping force.' He loosened the chest fit slightly. 'Reclaimed water circulates to catchpockets from which you draw it through this tube in the clip at your neck.'

The Duke twisted his chin in and down to look at the end of the tube. 'Efficient and convenient,' he said. 'Good engineering.'

Kynes knelt, examined the leg seals. 'Urine and feces are processed in the thigh pads,' he said, and stood up, felt the neck fitting, lifted a sectioned flap there. 'In the open desert, you wear this filter across your face, this tube in the nostrils with these plugs to insure a tight fit. Breathe in through the mouth filter, out through the nose tube. With a Fremen suit in good working order, you won't lose more than a thimbleful of moisture a day – even if you're caught in the Great Erg.'

'A thimbleful a day,' the Duke said.

Kynes pressed a finger against the suit's forehead pad, said: 'This may rub a little. If it irritates you, please tell me. I could slip-patch it a bit tighter.'

'My thanks,' the Duke said. He moved his shoulders in the suit as Kynes stepped back, realizing that it did feel better now – tighter and less irritating.

Kynes turned to Paul. 'Now, let's have a look at you, lad.'

*A good man but he'll have to learn to address us properly*, the Duke thought.

Paul stood passively as Kynes inspected the suit. It had been an odd sensation putting on the crinkling, slick-surfaced garment. In his force-consciousness had been the absolute knowledge that he had never before worn a stillsuit. Yet, each motion of adjusting the adhesion tabs under Gurney's inexpert guidance had seemed natural, instinctive. When he had tightened the chest to gain maximum pumping action from the motion of breathing, he had known what he did and why. When he had fitted the neck and forehead tabs tightly, he had known it was to prevent friction blisters.

Kynes straightened, stepped back with a puzzled expression. 'You've worn a stillsuit before?' he asked.

'This is the first time.'

'Then someone adjusted it for you?'

'No.'

'Your desert boots are fitted slip-fashion at the ankles. Who told you to do that?'

'It . . . seemed the right way.'

'That it most certainly is.'

And Kynes rubbed his cheek, thinking of the legend: '*He shall know your ways as though born to them.*'

'We waste time,' the Duke said. He gestured to the waiting 'thopter, led the way, accepting the guard's salute with a nod. He climbed in, fastened his safety harness, checked controls and instruments. The craft creaked as the others clambered aboard.

Kynes fastened his harness, focused on the padded comfort of the aircraft – soft luxury of gray-green upholstery, gleaming



instruments, the sensation of [illegible]d washed air in his lungs as doors slammed and vent fans whirred alive.

*So soft!* he thought.

'All secure, Sire,' Halleck said.

Leto fed power to the wings, felt them cup and dip – once, twice. They were airborne in ten meters, wings feathered tightly and afterjets thrusting them upward in a steep, hissing climb.

'Southeast over the Shield Wall,' Kynes said. 'That's where I told your sandmaster to concentrate his equipment.'

'Right.'

The Duke banked into his air cover, the other craft taking up their guard positions as they headed southeast.

'The design and manufacture of these stillsuits bespeaks a high degree of sophistication,' the Duke said.

'Someday I may show you a sietch factory,' Kynes said.

'I would find that interesting,' the Duke said. 'I note that suits are manufactured also in some of the garrison cities.'

'Inferior copies,' Kynes said. 'Any Dune man who values his skin wears a Fremen suit.'

'And it'll hold your water loss to a thimbleful a day?'

'Properly suited, your forehead cap tight, all seals in order, your major water loss is through the palms of your hands,' Kynes said. 'You can wear suit gloves if you're not using your hands for critical work, but most Fremen in the open desert rub their hands with juice from the leaves of the creosote bush. It inhibits perspiration.'

The Duke glanced down to the left at the broken landscape of the Shield Wall – chasms of tortured rock, patches of yellow-brown crossed by black lines of fault shattering. It was as though someone had dropped this ground from space and left it where it smashed.

They crossed a shallow basin with the clear outline of gray sand spreading across it from a canyon opening to the south. The sand fingers ran out into the basin – a dry delta outlined against darker rock.

Kynes sat back, thinking about the water-fat flesh he had felt beneath the stillsuits. They wore shield belts over their robes, slow pellet stunners at the waist, coin-sized emergency

Richard Brautigan:
The Pill Versus the
Springhill Mine Disaster
(1967)

## All Watched Over by Machines of Loving Grace

I like to think (and
the sooner the better!)
of a cybernetic meadow
where mammals and computers
live together in mutually
programming harmony
like pure water .
touching clear sky.

I like to think
(right now, please!)
of a cybernetic forest
filled with pines and electronics
where deer stroll peacefully
past computers
as if they were flowers
with spinning blossoms.

I like to think
(it has to be!)
of a cybernetic ecology
where we are free of our labors
and joined back to nature,
returned to our mammal
brothers and sisters,
and all watched over
by machines of loving grace.

Sidney Goldfarb:
Speech, for Instance (1969)

## On my way to

meet the astrologer
I noticed my fly
was down.
An interesting sign, I,
in my innocence, thought.
The sky was out.
The stars were off.
My yellow wool socks
were invisible
under brown leather boots
which were not.

Grass and beds
and beds of grass
and vibrating centers
and indelible soul
and indefinite ass,
what did I do with my toes?

What was my generation coming to?

O Lady
my generation was coming
to you of all people!

For my hands had become very small,
and, when I touched you,
my nose fell off.

## Solar-heated-rhombic-dodecahedron

*for Steve Baer*

A man
is blessed
who assists
in the building
of a solar-heated-
rhombic-dodecahedron.

I don't mean
to say technology
itself is holy
(though that too
may be
an element.)

I mean
heat rises.
Rocks preserve heat.
Asymmetrical dwellings
can stand by themselves
if properly
arranged.

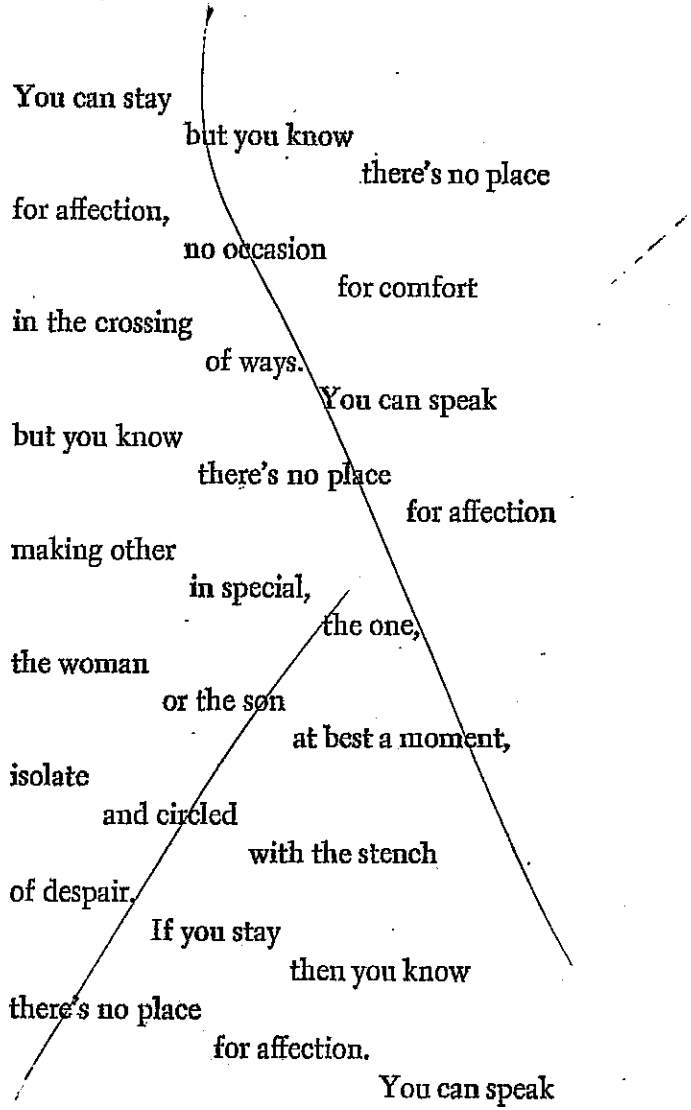
No.
I mean
the shovel
in my hands.
I mean
the cottonwoods
by the river.

I mean the dark
scent of dust
nudged up
by a few
new drops
of rain.

Dammit!
What I mean is the cloudburst!
(Which drenches us
and makes us huddle together
in the cold
pickup our
only shelter.)

## Border Song

*for Martin Diskin*



**1979** Verlesung des Manifests »Die heilige Scheiße« in Pfäffikon am Zürcher See.

## Friedensreich Hundertwasser

# Scheißkultur – die heilige Scheiße

Ich möchte über die Hauptursache des Zerfalls unserer Zivilisation sprechen.

Die Vegetation hat Jahrmillionen gebraucht, um die Schleimnis, die Giftstoffe, zuzudecken mit einer Humusschicht, einer Vegetationsschicht, einer Sauerstoffschicht, damit der Mensch auf Erden leben kann.

Und dieser undankbare Mensch holt eben diese mit langwieriger kosmischer Mühe zugedeckte Schleimnis und eben diese Giftstoffe wieder an die Oberfläche.

So wird durch die Untat des verantwortungslosen Menschen das Ende der Welt zum Anfang aller Zeiten. Wir begehen Selbstmord. Unsere Städte sind Krebsgeschwüre. Von oben sieht man das genau.

Wir essen nicht das, was bei uns wächst, wir holen Essen von weit her, aus Afrika, Amerika, China und Neuseeland.

Die Scheiße behalten wir nicht. Unser Unrat, unser Abfall wird weit weggeschwemmt. Wir vergiften damit Flüsse, Seen und Meere, oder wir transportieren sie in hochkomplizierte teure Kläranlagen, selten in zentralisierte Kompostfabriken, oder aber unser Abfall wird vernichtet. Die Scheiße kommt nie auf unsere Felder zurück, auch nie dorthin, wo das Essen herkommt.

Der Kreislauf vom Essen zur Scheiße funktioniert. Der Kreislauf von der Scheiße zum Essen ist unterbrochen.

Wir machen uns einen falschen Begriff über unseren Abfall.

Jedesmal wenn wir die Wasserspülung betätigen, im Glauben, eine hygienische Handlung zu vollziehen, verstoßen wir gegen kosmische Gesetze, denn in Wahrheit ist es eine gottlose Tat, eine frevelhafte Geste des Todes.

Wenn wir auf die Toilette gehen, von innen zusperren und unsere Scheiße wegspülen, ziehen wir einen Schlußstrich. Warum schämen wir uns? Wovor haben wir Angst? Was mit unserer Scheiße nachher geschieht, verdrängen wir, wie den Tod. Das Klosettloch erscheint uns wie das Tor in den Tod, nur rasch weg davon, nur schnell vergessen, die Fäulnis und Verwesung. Dabei ist es gerade umgekehrt. Mit der Scheiße beginnt erst das Leben.

Die Scheiße ist viel wichtiger als das Essen. Das Essen erhält nur eine Menschheit, die sich massenweise vermehrt, an Qualität sich vermindert und eine Todesgefahr für die Erde geworden ist, eine Todesgefahr für die Vegetation, die Tierwelt, das Wasser, die Luft, die Humusschicht.

Scheiße aber ist der Baustein unserer Wiederauferstehung.

Seit der Mensch denken kann, versucht er, unsterblich zu sein. Der Mensch will eine Seele haben.

Die Scheiße ist unsere Seele. Durch die Scheiße können wir überleben. Durch die Scheiße werden wir unsterblich.

Warum haben wir Angst vor dem Tod? Wer eine Humustoilette benützt, hat keine Angst vor dem Tod, denn unsere Scheiße macht unsere Wiedergeburt möglich.

Wenn wir unsere Scheiße nicht schätzen und in Humus umwandeln zu Ehren Gottes und der Welt, verlieren wir unsere Berechtigung, auf der Erde anwesend sein zu dürfen.

Im Namen falscher Hygienegesetze verlieren wir unsere kosmische Substanz, verlieren wir unsere Wiedergeburt....

Als Pasolini in einem Film Schauspieler Scheiße essen ließ, war das ein Symbol des Kreislaufschließens, ein verzweifeltes Beschleunigen-Wollen.

Dieselbe Liebe, dieselbe Zeit und Sorgfalt muss aufgewendet werden für das, was 'hinten' herauskommt, wie für das, was 'vorne' hineinkommt.

Diesselbe Zeremonie wie beim Speisen, mit Tischdecken, Messer, Gabel, Löffel, chinesische Eßstäbchen, Silberbesteck und Kerzenlicht.

sacred

Wir haben Tischgebete vor und nach dem Essen. Beim Scheißen betet niemand.

Wir danken Gott für unser tägliches Brot, das aus der Erde kommt, wir beten aber nicht, auf dass sich unsere Scheiße wieder in Erde umwandle.

Abfälle sind schön. Das Sortieren und Wiedereingliedern der Abfälle ist eine frohe Tätigkeit.

Diese Tätigkeit spielt sich nicht in Kellern und Hinterhöfen, auf Miststätten, Toiletten und Aborten ab, sondern dort, wo wir leben, wo Licht und Sonne ist, im Wohnzimmer, in unserem Prunkraum.

Es gibt keine Abfälle. Abfälle existieren nicht.

Die Humustoilette ist ein Statussymbol.

Wir haben das Privileg, Zeuge zu sein, wie sich mit Hilfe unserer Weisheit unser eigener Abfall, unsere eigene Scheiße in Humus umwandelt, so wie der Baum wächst und die Ernte reift. Bei uns zu Hause, als wärs unser eigenes Kind.

Homo – Humus – Humanitas, drei Schicksalswörter gleichen Ursprungs.

Humus ist das wahre schwarze Gold.

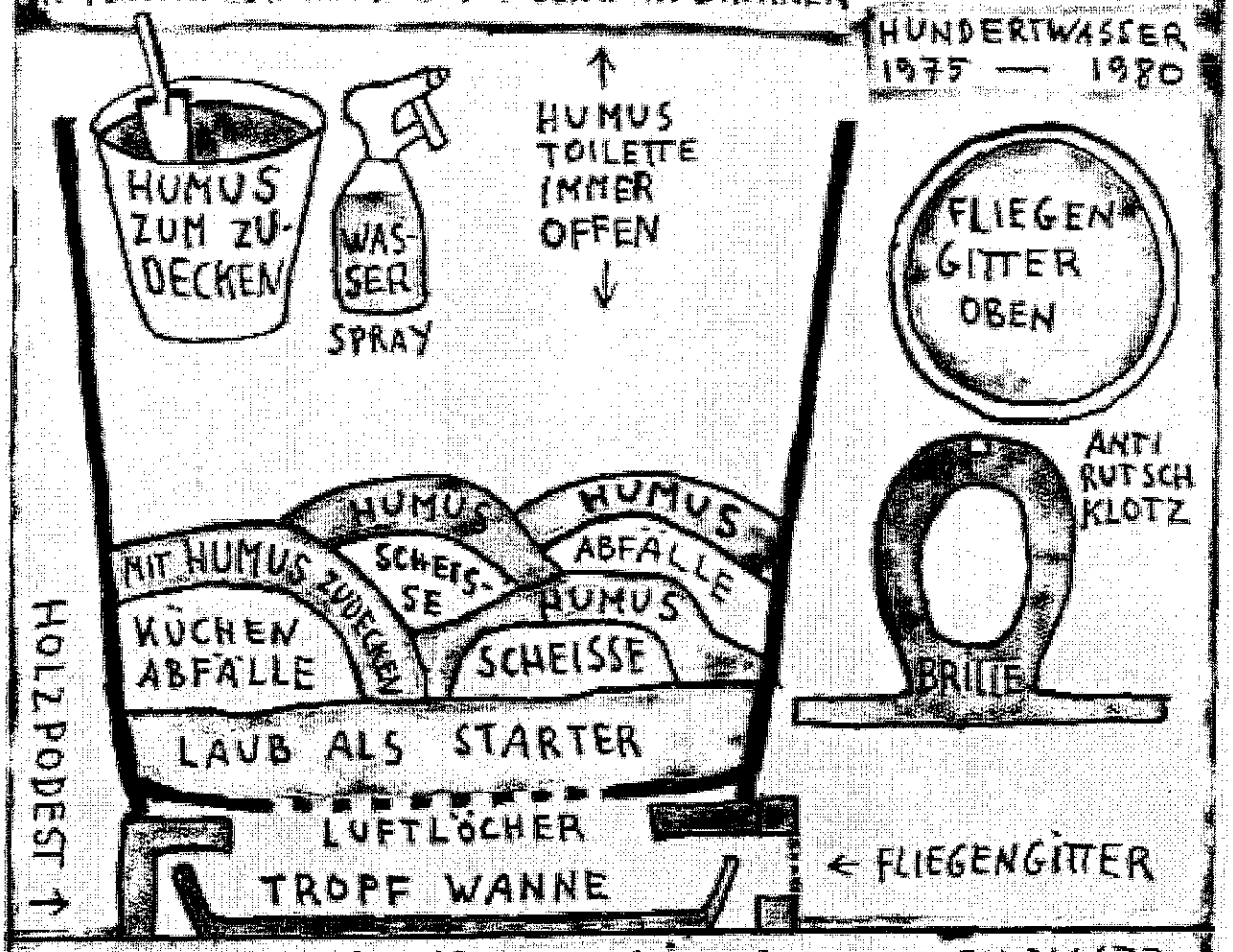
Humus hat einen guten Geruch. Humusduft ist heiliger und Gott näher, als der Geruch von Weihrauch. Wer nach dem Regen im Wald spazieren geht, kennt diesen Geruch.

Natürlich ist es etwas Ungeheuerliches, wenn der Abfallkübel in den Mittelpunkt unserer Wohnung kommt und die Humustoilette auf den schönsten Platz zum Ehrensitz wird.

Das ist jedoch genau die Kehrwendung, die unsere Gesellschaft, unsere Zivilisation jetzt nehmen muss, wenn sie überleben will.

Der Humusgeruch ist der Geruch Gottes, der Geruch der Wiederauferstehung, der Geruch der Unsterblichkeit.

DIE HUMUSTOILETTE ARBEITET AEROBISCH MIT HUMUSBAKTERIEN FEUCHTIGKEIT WÄRME UND LUFT ● LUFT MUSS VON UNTEN UND OBEN DURCHZIEHEN KÖNNEN ● WENN FLÜSSIGKEIT IN WANNE KOMMT: ZU NASS ● AUFHÖREN FLÜSSIGKEIT ZUZU GEBEN ● WENN ZU TROCKEN MIT WASSER GUT VERTEILT BESPRÜHEN BIS FLÜSSIGKEIT IN WANNE KOMMT ● Z.B. MIT WASSERSPRAY ● WASSER IN WANNE WIEDER OBENDRAUF GEBEN ODER PFLANZEN GIESSEN ● SCHEISSE SOFORT, KÜCHENABFÄLLE WENN SIE RIECHEN MIT FEUCHTEM HUMUS SORGFÄLTIG ABDECKEN ● GERUCH UND FLIEGEN VERSCHWINDEN SOFORT ● WENN VOLL (2 PERSONEN 2 MONATE) EIN MONAT STEHEN LASSEN ● DANN EINMAL PRO WOCHE UMSCHAUFELN BIS LOCKERER GUTRIECHENDER HUMUS ENTSTEHT ● INZWISCHEN EINEN ZWEITEN BEHÄLTER BENUTZEN ● GEWONNENER HUMUS ZUM ABDECKEN WIEDER VERWENDEN ● ZUM BEGINN BRAUCHT MAN EINEN SACK FEUCHTEN HUMUS VOM WALDBODEN MIT HALBVERROTTETEN BLÄTTERN ODER VOM BLUMENHÄNDLER ● GEWONNENER HUMUS TEILWEISE WIEDER IN DEN WALD ZURÜCKLEGEN ● BODENLÖCHER IN PLASTIKBEHÄLTER MIT EISENROHR BRENNEN



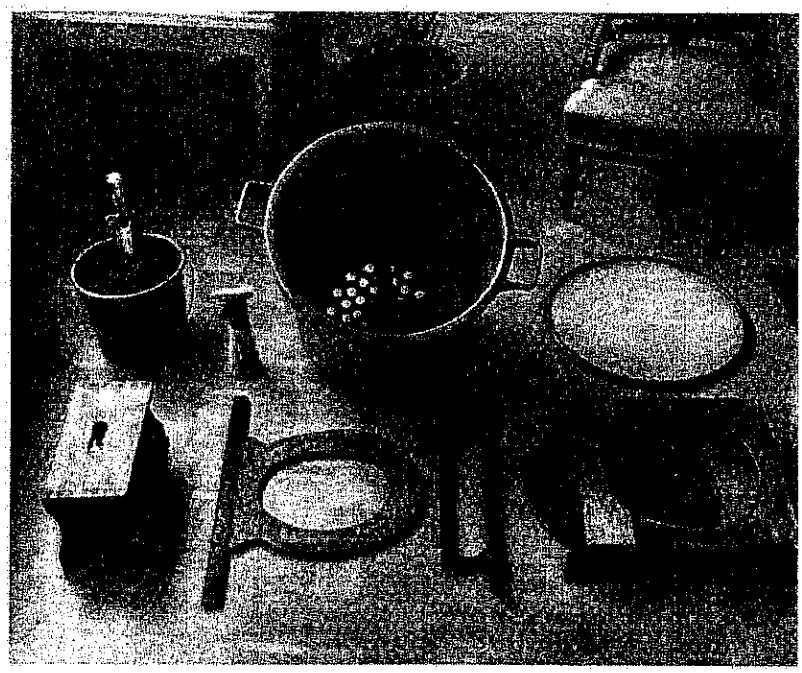

INFORMATION BURO HAREL 1013 WIEN POBOX 145 TEL 344673

Humus Toilet, 1980

## SHIT CULTURE - HOLY SHIT

VEGETATION HAS TAKEN MILLIONS OF YEARS TO COVER THE SLUDGE, THE TOXIC SUBSTANCES WITH A LAYER OF HUMUS, A LAYER OF VEGETATION AND A LAYER OF OXYGEN, SO THAT MAN CAN LIVE ON EARTH. BUT UNGRATEFUL MAN THEN FETCHES THE SLUDGE AND THE TOXINS, COVERED WITH PAINSTAKING COSMIC CARE, BACK UP TO THE EARTH'S SURFACE. THUS THE ATROCIOUS ACT OF IRRESPONSIBLE MAN MAKES THE END OF THE WORLD THE SAME AS THE BEGINNING OF TIME. WE ARE COMMITTING SUICIDE. OUR CITIES ARE CANCEROUS ULCERS. YOU CAN SEE THAT CLEARLY FROM THE AIR. WE DO NOT EAT WHAT GROWS IN OUR OWN COUNTRY, BUT IMPORT OUR FOOD FROM FAR AWAY, FROM AFRICA, AMERICA, CHINA AND NEW ZEALAND. NOR DO WE KEEP OUR SHIT. OUR EXCREMENT, OUR WASTE IS WASHED FAR, FAR AWAY, WHEREBY WE POLLUTE RIVERS, LAKES AND OCEANS, OR WE TRANSPORT IT TO HIGHLY-COMPLEX, COSTLY SEWAGE WORKS, AND ONLY RARELY TO CENTRALIZED DECOMPOSITION PLANTS, OR OUR WASTE IS DESTROYED. SHIT NEVER RETURNS TO OUR FIELDS. NOR TO THE PLACES WHERE OUR FOOD COMES FROM. THE CYCLE FROM FOOD TO SHIT IS WORKING. THE CYCLE FROM SHIT TO FOOD HAS BEEN BROKEN. WE HAVE A FALSE NOTION OF OUR WASTE. EVERY TIME WE FLUSH THE TOILET, THINKING IT A HYGENIC ACTION, WE VIOLATE COSMIC LAWS. FOR IN TRUTH IT IS A GODLESS DEED, A WANTON ACT OF DEATH. WHEN WE GO TO THE TOILET, LOCK OURSELVES IN AND FLUSH AWAY OUR SHIT, WE SIGN AND SEAL THE MATTER. WHY ARE WE ASHAMED? WHAT ARE WE AFRAID OF? WHAT ACTUALLY HAPPENS TO OUR SHIT AFTERWARDS IS SOMETHING WE IGNORE, LIKE DEATH. THE BOTTOM OF THE PAN IS LIKE A DOOR OPENING ONTO DEATH; WE SIMPLY WANT TO GET AWAY AS FAST AS WE CAN, FORGET THE DECAY AND PUTREFACTION. BUT WE ARE QUITE WRONG. IT IS WITH SHIT THAT LIFE FIRST BEGINS. SHIT IS MUCH MORE IMPORTANT THAN FOOD. FOOD NOURISHES ONLY MANKIND, WHICH REPRODUCES ON A MASSIVE SCALE, DIMINISHES IN QUALITY AND HAS BECOME A DEADLY THREAT TO THE EARTH, A DEADLY THREAT TO VEGETATION, THE ANIMAL WORLD, WATER, AIR, THE HUMUS LAYER. BUT SHIT IS THE FOUNDATION OF OUR RESURRECTION. EVER SINCE MAN COULD THINK, HE HAS SOUGHT IMMORTALITY. MAN WANTS TO HAVE A SOUL. SHIT IS OUR SOUL. SHIT WILL ENABLE US TO SURVIVE. SHIT WILL ENABLE US TO BE IMMORTAL. WHY ARE WE AFRAID OF DEATH? THE PERSON WHO USES A HUMUS TOILET HAS NO FEAR OF DEATH, FOR OUR SHIT MAKES FUTURE LIFE AND REBIRTH POSSIBLE. IF WE FAIL TO VALUE OUR SHIT AND TURN IT INTO HUMUS TO THE GLORY OF GOD AND THE WORLD, WE LOSE OUR ENTITLEMENT TO BE PRESENT ON THIS EARTH. IN THE NAME OF FALSE HYGENIC LAWS WE LOSE OUR COSMIC SUBSTANCE, WE LOSE OUR REBIRTH. DIRT IS LIFE. STERILE CLEANLINESS IS DEATH. THOU SHALT NOT KILL, AND YET WE STERILIZE ALL LIFE WITH POISON AND CONCRETE. THAT IS MURDER. MAN IS JUST A TUBE. HE PUTS THINGS IN AT ONE END AND PASSES THEM OUT, DIGESTED, AT THE OTHER. THE MOUTH IS AT THE FRONT, THE ANUS AT THE BACK. WHY? IT SHOULD BE THE OTHER WAY ROUND. WHY IS EATING POSITIVE? WHY IS SHIT NEGATIVE? WHAT COMES OUT OF US IS NOT WASTE, BUT THE MATERIAL OF WHICH THE WORLD IS MADE, OUR GOLD, OUR BLOOD. THE LUNATIC INTERRUPTION TO THE CYCLE OF LIFE MAKES US BLEED, OUR CIVILIZATION BLEED, OUR EARTH BLEED. THE PERSON WHO SIMPLY LETS BLOOD, ONLY LOSES BLOOD AND NEVER REPLACES IT, WILL BLEED TO DEATH. FREUD WAS RIGHT WHEN HE SAID IN HIS INTERPRETATION OF DREAMS THAT SHIT IS A SYNONYM FOR GOLD. WE MUST NOW REALIZE THAT IT IS NOT JUST A DREAM, BUT A REALITY. WHEN PASOLINI HAD ACTORS EAT SHIT IN A FILM, IT WAS A SYMBOL OF THE CONTINUATION OF THE CYCLE, A DESPERATE SHORT CUT. WE MUST DEVOTE THE SAME LOVE, THE SAME TIME AND ATTENTION TO WHAT COMES OUT FROM "BEHIND" AS TO WHAT GOES IN "IN FRONT". THE SAME CEREMONY AS FOR MEALS, WITH TABLE-LAYING, KNIVES, FORKS AND SPOONS, CHOPSTICKS, SILVER CUTLERY AND CANDLE-LIGHT. WE SAY GRACE BEFORE AND AFTER MEALS. NO ONE SAYS GRACE WHEN THEY SHIT. WE THANK GOD FOR OUR DAILY BREAD, WHICH COMES FROM THE EARTH. BUT WE DO NOT PRAY FOR OUR SHIT TO BE TRANSUBSTANTIATED. WASTE IS BEAUTIFUL. THE GRADING AND REINTEGRATION OF WASTE IS A JOYOUS ACTIVITY. AN ACTIVITY WHICH TAKES PLACE NOT IN CELLARS AND REAR COURTYARDS, DUNG HEAPS AND TOILETS, BUT WHERE THERE IS LIGHT AND SUNSHINE, IN OUR LIVING ROOMS, OUR BEST ROOMS. THERE IS NO SUCH THING AS WASTE. WASTE DOES NOT EXIST. THE HUMUS TOILET IS A STATUS SYMBOL. WE HAVE THE PRIVILEGE OF BEING WITNESSES, WITH THE HELP OF OUR OWN WISDOM, TO THE TRANSFORMATION OF OUR OWN WASTE, OUR OWN SHIT INTO HUMUS, JUST AS A TREE GROWS AND THE HARVEST RIPENS. AT HOME WITH US, AS IF IT WERE OUR OWN CHILD. HOMO - HUMUS - HUMANITAS, THREE FATEFUL WORDS WITH THE SAME ORIGIN. HUMUS IS TRUE BLACK GOLD. HUMUS HAS A GOOD SMELL. THE FRAGRANCE OF HUMUS IS HOLY AND CLOSER TO GOD THAN THAT OF FRANKINCENSE. ANYONE WHO WALKS IN THE WOODS AFTER THE RAIN KNOWS ITS SMELL. IT IS NATURALLY SOMETHING OF A PRODIGIOUS STEP TO PLACE THE RUBBISH BIN IN THE CENTRE OF OUR APARTMENTS AND TO SITE THE HUMUS TOILET ON THE MOST BEAUTIFUL SPOT AS THE SEAT OF HONOUR. BUT THIS IS PRECISELY THE ABOUT-TURN WHICH OUR SOCIETY, OUR CIVILIZATION MUST NOW MAKE IF IT IS TO SURVIVE. THE SMELL OF HUMUS IS THE SMELL OF GOD, THE SMELL OF RESURRECTION, THE SMELL OF IMMORTALITY.

FRIEDENSREICH HUNDERTWASSER
ALGAJOLA, VENICE, NEW ZEALAND, 1979-1980



## THE HUMUS TOILET

WORKS INDOORS, INCLUDING IN THE LIVING ROOM. NO SMELL, NO FLIES (WHEN WASTE IS CAREFULLY COVERED WITH DAMP HUMUS). NO SEWAGE PIPES, NO FLUSHING. NO CHEMICALS, NO OUTLET PIPES. NO POWER SUPPLY (FOR HEAT AND VENTILATOR SUCH AS IN THE SMALL SCANDINAVIAN UNITS ON SALE; ONLY CLIVUS MULTRUM REQUIRES NO ELECTRICITY). ONLY DISADVANTAGE COMPARED TO PURCHASABLE HUMUS TOILETS REQUIRING ELECTRICITY: ONLY A LIMITED AMOUNT OF URINE CAN BE ABSORBED. WHEN FLUID DRIPS INTO THE SAUCER, STOP ADDING FLUID (POUR BACK ON TOP OR USE FOR PLANTS). COVERING WASTE WITH HUMUS MEANS THE HUMUS TOILET WILL BE FULL WITHIN A SHORTER TIME (IN 2 MONTHS INSTEAD OF 4 FOR 2 PEOPLE WITH KITCHEN WASTE). IN RETURN YOU ARE ENTIRELY INDEPENDENT OF THE POWER GRID. IF POSSIBLE, DRY ANY LEAVES OR FRUIT AND VEGETABLE PARINGS (E.G. IN THE SUN) BEFORE ADDING THEM TO THE HUMUS TOILET. THIS ACCELERATES THE HUMUS PROCESS, AND BULK IS REDUCED BY FASTER LOSS OF WATER CONTENT. WATER ACCOUNTS FOR 90-95% OF VOLUME AND WEIGHT. ONLY 5-10% REMAIN AS HUMUS. ENQUIRIES TO HUNDERTWASSER, C/O HAREL, POSTFACH 145, A-1013 VIENNA. TO CLEAN URINE AND DOMESTIC WASTE WATER, A BIOLOGICAL TREATMENT PLANT SHOULD BE EMPLOYED. IN LIGHT AND WARM INTERIORS, USE AQUATIC PLANTS: CALLA, CYPRESS GRASS, WATER HYACINTHS, CYPERUS TEXTILIS, PAPYRUS, SCOURING-RUSH, TRADESCANTIA ZEBRINA, ALOCASIA, BAUMEA ARTICULATA (NEW ZEALAND RUSH), FICUS PUMILA. OUTDOORS, USE RUSH, REED, CAT'S TAIL, WATER MINT, WATER FLAG. THE DIRTY WATER MUST FLOW THROUGH THE ROOT AREA OF THE AQUATIC PLANTS AND THROUGH THE COLONIES OF BIODEGRADING BACTERIA, AND IN THIS WAY IS NATURALLY PURIFIED. THE DIRT IS CONVERTED IN PART INTO PLANT MATERIAL AND IN PART INTO MINERALIZED SOIL.

# Environmental Heresies

The founder of *The Whole Earth Catalog* believes the environmental movement will soon reverse its position on four core issues.

By Stewart Brand
Illustration by Alex Ostroy

**OVER THE NEXT TEN YEARS,** I predict, the mainstream of the environmental movement will reverse its opinion and activism in four major areas: population growth, urbanization, genetically engineered organisms, and nuclear power.

Reversals of this sort have occurred before. Wildfire went from universal menace in mid-20th century to honored natural force and forestry tool now, from "Only *you* can prevent forest fires!" to let-burn policies and prescribed fires for understory management. The structure of such reversals reveals a hidden strength in the environmental movement and explains why it is likely to keep on growing in influence from decade to decade and perhaps century to century.

The success of the environmental movement is driven by two powerful forces—romanticism and science—that are often in opposition. The romantics identify with natural systems; the scientists study natural systems. The romantics are moralistic, rebellious against the perceived dominant power, and combative against any who appear to stray from the true path. They hate to admit mistakes or change direction. The scientists are ethicalistic, rebellious against any perceived dominant paradigm, and combative against each other. For them, admitting mistakes is what science is.

There are a great many more environmental romantics than there are scientists. That's fortunate, since their inspiration means that most people in developed societies see themselves as environmentalists. But it also means that scientific perceptions are always a minority view, easily ignored, suppressed, or demonized if they don't fit the consensus story line.

Take population growth. For 50 years, the demographers in charge of human population projections for the United Nations released hard numbers that substantiated environmentalists' greatest fears about indefinite exponential population increase. For a while, those projections proved fairly accurate. However, in the 1990s, the U.N. started taking a closer look at fertility patterns, and in 2002, it adopted a new theory that shocked many demographers: human population is leveling off rapidly, even precipitously, in developed countries, with the rest of the world soon to follow. Most environmentalists still haven't got the word. Worldwide, birthrates are in free fall. Around one-third of countries now have birthrates below replacement level (2.1 children per woman) and sinking. Nowhere does the downward trend show signs of leveling off. Nations already in a birth dearth crisis include Japan, Italy, Spain, Germany, and Russia—whose population is now in absolute decline and is expected to be 30 percent lower by 2050. On every part of every continent and in every culture (even Mormon), birthrates are headed down. They reach replacement level and keep on dropping. It turns out that population decrease accelerates downward just as fiercely as population increase accelerated upward, for the same reason. Any variation from the 2.1 rate compounds over time.

That's great news for environmentalists (or it will be when finally noticed), but they need to recognize what caused the turnaround. The world population growth rate actually peaked at 2 percent way back in 1968, the very year my old teacher Paul Ehrlich published *The Population Bomb*. The world's women didn't suddenly have fewer kids because of his book, though. They had fewer kids because they moved to town.

Cities are population sinks. Although more children are an asset in the countryside, they're a liability in the city. A global tipping point in urbanization is what stopped the population explosion. As of this year, 50 percent of the world's population lives in cities, with 61 percent expected by 2030. In 1800 it was 3 percent; in 1900 it was 14 percent.

The environmentalist aesthetic is to love villages and despise cities. My mind got changed on the subject a few years ago. Urbanization is the most massive and sudden shift of humanity in its history. Environmentalists will be rewarded if they welcome it and get out in front of it. In every single region in the world, including the U.S., small towns and rural areas are emptying out. The trees and wildlife are returning. Now is the time to put in place permanent protection for those rural environments. Meanwhile, the global population of illegal urban squatters—which Robert Neuwirth's book *Shadow Cities* already estimates at a billion—is growing fast. Environmentalists could help ensure that the new dominant human habitat is humane and intrudes on less of the surrounding environment.

Along with rethinking cities, environmentalists will need to rethink biotechnology. One area of biotech with huge promise and some drawbacks is genetic engineering, so far violently rejected by the environmental movement. That rejection is, I think, a mistake. Why was water fluoridization rejected by the political right and "frankenfood" by the political left? The answer, I suspect, is that fluoridization came from government and genetically modified (GM) crops from corporations. If the origins had been reversed—as they could have been—the positions would be reversed, too.

### A Shrug Is as Good as a Wink

Ignore the origin and look at the technology on its own terms. (This will be easier with the emergence of "open source" genetic engineering, which could work around restrictive corporate patents.) What is its *net* effect on the environment? GM crops are more efficient, giving higher yield on less land with less use of pesticides and herbicides. That's why the Amish, the most technology-suspicious group in America (and the best farmers), have enthusiastically adopted GM crops.

There has yet to be a public debate among environmentalists about genetic engineering. Most of the scare stories that go around (Monarch caterpillars harmed by GM pollen!) have as much substance as urban legends about toxic rat urine on Coke can lids. Solid research is seldom reported widely, partly because no news is not news. A number of leading biologists in the U.S. are also leading environmentalists. I've asked them how worried they are about genetically engineered organisms. Their answer is "Not much," because they know from their own work how robust wild ecologies are in defending against new genes, no matter how exotic. They don't say so in public because they feel that entering the GM debate would strain relations with allies and would distract from their main focus, which is to research and defend biodiversity.

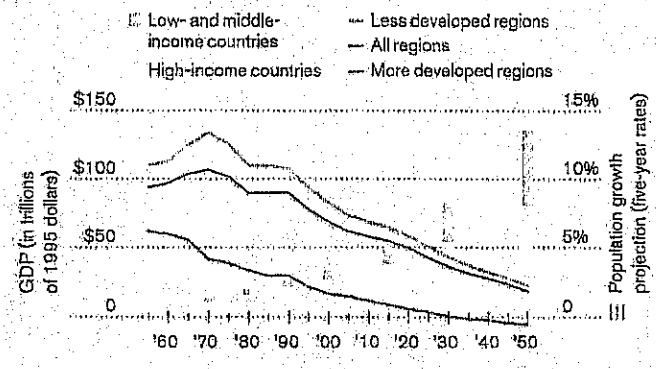
> The best way for doubters to control a new technology is to embrace it, lest it remain in the hands of enthusiasts.

The best way for doubters to control a questionable new technology is to embrace it, lest it remain wholly in the hands of enthusiasts who don't see what's questionable about it. I would love to see what a cadre of ardent environmental scientists could do with genetic engineering. Besides assuring the kind of transparency needed for intelligent regulation, they could direct a powerful new tool at some of the most vexed problems in their field.

For instance, invasive species. About 80 percent of the current mass extinctions of native species are caused by habitat loss, a problem whose cure is well known: identify the crucial habitats and preserve, protect, and restore them. The remaining 20 percent of extinctions are coming from invasive species, with no solution in sight. Kudzu takes over the American South, brown tree snakes take over Guam (up to 5,000 a square kilometer), zebra mussels and mitten crabs take over the U.S. waterways, fire ants

**Malthus Was Wrong**

As wealth grows and is increasingly distributed toward low-income countries, population growth rates are expected to continue to fall, approaching replacement rates by 2050.




SOURCES: UNITED NATIONS, WORLD BANK

and fiendishly collaborative Argentine ants take over the ground, and not a thing can be done. Volunteers like me get off on yanking up invasive French broom and Cape ivy, but it's just sand castles against a rising tide. I can't wait for some engineered organism, probably microbial, that will target bad actors like zebra mussels and eat them, or interrupt their reproductive pathway, and then die out.

Now we come to the most profound environmental problem of all, the one that trumps everything: global climate change. Its effect on natural systems and on civilization will be a universal permanent disaster. It may be slow and relentless—higher temperature, rising oceans, more extreme weather getting progressively worse over a century. Or it may be "abrupt climate change": an increase of fresh water in the north Atlantic shuts down the Gulf Stream within a decade, and Europe freezes while the rest of the world gets drier and windier. (I was involved in the 2003 Pentagon study on this matter, which spelled out how a climate change like the one 8,200 years ago could occur suddenly.)

## Let's Go Nuclear

Can climate change be slowed and catastrophe avoided? They can to the degree that humanity influences climate dynamics. The primary cause of global climate change is our burning of fossil fuels for energy.

So *everything* must be done to increase energy efficiency and decarbonize energy production. Kyoto accords, radical conservation in energy transmission and use, wind energy, solar energy, passive solar, hydroelectric energy, biomass, the whole gamut. But add them all up and it's still only a fraction of enough. Massive carbon "sequestration" (extraction) from the atmosphere, perhaps via biotech, is a widely held hope, but it's just a hope. The only technology ready to fill the gap and stop the carbon dioxide loading of the atmosphere is nuclear power.

Nuclear certainly has problems—accidents, waste storage, high construction costs, and the possible use of its fuel in weapons. It also has advantages besides the overwhelming one of being atmospherically clean. The industry is mature, with a half-century of experience and ever improved engineering behind it. Problematic early reactors like the ones at Three Mile Island and Chernobyl can be supplanted by new, smaller-scale, meltdown-proof reactors like the ones that use the pebble-bed design. Nuclear power plants are very high yield, with low-cost fuel. Finally, they offer the best avenue to a "hydrogen economy," combining high energy and high heat in one place for optimal hydrogen generation.

The storage of radioactive waste is a surmountable problem *(see "A New Vision for Nuclear Waste," December 2004)*. Many reactors now have fields of dry-storage casks nearby. Those casks are transportable. It would be prudent to move them into well-guarded centralized locations. Many nations address the waste storage problem by reprocessing their spent fuel, but that has the side effect of producing material that can be used in weapons. One solution would be a global supplier of reactor fuel, which takes back spent fuel from customers around the world for reprocessing. That's the kind of idea that can go from "Impractical!" to "Necessary!" in a season, depending on world events.

The environmental movement has a quasi-religious aversion to nuclear energy. The few prominent environmentalists who have spoken out in its favor—Gaia theorist James Lovelock, Greenpeace cofounder Patrick Moore, Friend of the Earth Hugh Montefiore—have been privately anathematized by other environmentalists. Public excoriation, however, would invite public debate, which so far has not been welcome.

Nuclear could go either way. It would take only one more Chernobyl-type event in Russia's older reactors (all too possible, given the poor state of oversight there) to make the nuclear taboo permanent, to the great detriment of the world's atmospheric health. Everything depends on getting new and better nuclear technology designed and built.

Years ago, environmentalists hated cars and wanted to ban them. Then physicist Amory Lovins came along, saw that the automobile was the perfect leverage point for large-scale energy conservation, and set about designing and promoting drastically more efficient cars. Gas-electric hybrid vehicles are now on the road, performing public good. The United States, Lovins says, can be the Saudi Arabia of nega-watts: Americans are so wasteful of energy that their conservation efforts can have an enormous effect. Single-handedly, Lovins converted the environmental movement from loathing of the auto industry to fruitful engagement with it.

Someone could do the same with nuclear power plants. Lovins refuses to. The field is open, and the need is great.

Within the environmental movement, scientists are the radical minority leading the way. They are already transforming the perspective on urbanization and population growth. But their radicalism and leadership will have to increase if humanity is to harness green biotech and step up to its responsibilities for the global climate. The romantics are right, after all: we are indivisible from the earth's natural systems. ■

*Stewart Brand founded* The Whole Earth Catalog *and cofounded the Well, the first electronic community. His books include* The Media Lab, How Buildings Learn, *and* The Clock of the Long Now. *Today, he works with the Global Business Network and the Long Now Foundation.*