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"Navigating Systems"

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We don't sail much anymore. This fact helps explain the particular distance that lies between our world and that of R. Buckminster Fuller. For, despite Fuller's incessant, often prescient, projections of the future, and despite the fact that, speaking strictly chronologically, our present is that future, we live neither in Fuller's world nor in any of the futures he imagined. Sailing, the essential reference of Fuller's long, prolific career, is gone from our common experience. Instead of ocean liners we have airliners. And although Fuller was a pioneering frequent flier, he would never have found inspiration in the banal, maddening, cut-rate trial of air travel today. Where in sailing Fuller saw the face of a reliable, well-ordered, technological god that could carry humanity past the chaos of both raw nature and raw capitalism, we have in flying only the mundane devils of deicing and one-quart zip-top bags.

Inasmuch as Fuller often seemed to channel the twentieth century itself (or at least its optimistic American version), the distance between him and us provides an important measure of our separation from that rapidly receding era. The engaging exhibition "Buckminster Fuller: Starting with the Universe," curated by K. Michael Hays and Dana Miller, which premiered in New York at the Whitney Museum of American Art this past summer and will travel to Chicago's Museum of Contemporary Art in March, has provided the best chance since Fuller's death to assess the man and his times. Complemented by an insightful catalogue, a companion symposium, and reprints of three Fuller

texts by publisher Lars Müller, the Whitney show makes a strong case for thinking about Fuller today. The pressing question is, What to make of him?

The athletic but extremely poor-sighted son of an old New England family with transcendentalist ties, Fuller—twice expelled from Harvard—seems to have discovered himself at sea. He was a lifelong sailor, a navy commander and radio officer, whose most permanent base in life lay off the coast of Maine on a small island his family owned in Penobscot Bay. He would eventually come to believe that mathematics, science, economics, and politics had all been created by sailors, or what he called "Great Pirates." All new ideas came from the "Outlaw Areas" of the seas, beyond the inhibiting customs of land-based societies. Yet if the Great Pirates were figures of free thought and action, for Fuller there was also discipline and honor among these thieves. Where fellow Yankee Herman Melville had seen ships as roiling buckets of greed, lust, comedy, superstition, and hubris, Fuller saw ideally ordered societies in which each man's role was clear and necessary—self-contained mechanisms of technological discipline.

Without the navy, he was lost. After accompanying Admiral Albert Gleaves to the signing of the Versailles Treaty in 1919, Fuller resigned from active duty and entered the single dark decade of his life. His daughter died of polio at age three; his attempts to succeed as a businessman failed; he began drinking heavily and contemplating suicide. An ingratiating letter to fellow navy veteran Vincent Astor is shot through with Fuller's disgust at "the disorderly and colossal ramification of business . . . its blustering thick-headed feudal leaders" and "the colossal bunkum that hid . . . the fact that there is little or no system in business in comparison to the orderliness and efficiency of the Navy." But standing on the shores of Lake Michigan in 1927, Fuller received a revelation that saved his life: Instead of allowing himself to be crushed by the irrational customs of the land

dwellers, he would, in effect, devote himself to remaking life on land in the image of life at sea.

Out of this resolution flowed the designs, experiments, lectures, writings, and ceaseless activity of the next five decades, beginning with a radical reformulation of land dwelling's primary totem: the house. Inspired by reading the English translation of Le Corbusier's *Vers une architecture* (1923), Fuller produced a series of endearingly adolescent sketches that depict the globe as a "One Ocean World Town," surrounded by an "air-ocean" filled with airplanes and dirigibles (coming from a self-proclaimed "comprehensive anticipatory designer," Fuller's drawings uniformly demonstrate precious little sense of *disegno*). Rising through this atmospheric sea, new types of residential buildings were born from the hybridization of lighthouses, electrical towers, airship pylons, and tall ship rigging. By April 1928 Fuller had arrived at a fairly definitive design for a single-family house along these lines and applied for a US patent to cover what he would soon be promoting as the "Dymaxion House" (the word itself was a portmanteau of "dynamic," "maximum," and "ion" created by the adman Waldo Warren for an exhibition of Fuller's house at Chicago's Marshall Field's department store in 1929). Widely exhibited and published (though sometimes mockingly), the Dymaxion House brought Fuller his first fame. It was a point-by-point inversion of a traditional house. Lifted off the ground by a central service mast, its hexagonal floors were suspended on a lattice of tensioned cables and, in early versions, were not solid but forgiving pneumatic leatherette membranes. The house was enclosed not by walls, but by more tensioned cable lattices supporting an insulating double layer of transparent material. Bathroom, kitchen, and communication services were to be provided integral units clipped onto the central mast through standardized connections. The entire house was to be mass-produced and delivered anywhere

in the world by air or trailer for rapid installation (the old-fashioned term *construction* would not apply). Architects would cease to work for individual clients, becoming industrial designers of a sort, whose influence would be greatly increased by the wide distribution of their works.

In the same years that Fuller began promoting this vision, Le Corbusier was completing the culminating work of his early career, the Villa Savoye at Poissy, near Paris. Between these two houses runs one of the major fault lines of twentieth-century architecture. Famously mapped by Reyner Banham in his 1960 *Theory and Design in the First Machine Age*—a dissertation written under, and to some extent against, Nikolaus Pevsner—the opposition is understood to be this: Le Corbusier stands for a conservative avant-garde formalism that assimilates technological advances into the historical body of Western architecture, interpreting these advances metaphorically through shifts in architectural forms; Fuller, in contrast, represents a radically direct engagement with new technologies, one that is free from historical or formal preconceptions and that, therefore, is able to move fearlessly into territory beyond the limits of architecture itself. The political implications for Banham and his followers in the 1960s were also clear: Where Le Corbusier stood for a self-avowed “return to order,” Fuller explored ways to reconfigure society radically in the interest of personal freedom. So, although Le Corbusier’s Villa Savoye was also an inversion of the traditional house, it exemplified an inversion from *within* architecture, which was explicitly intended to help prevent a wider cultural revolution beyond architecture. In response to Le Corbusier’s famous ultimatum, “Architecture or Revolution,” Fuller seemed to choose the latter; but, given the ticking of his technological god, the valence of Fuller’s radical visions is ambiguous: Although advocating decentralization (physical, professional, and political),

he was also surely looking for a "return to order," albeit via technology rather than form.

Le Corbusier too had a thing for ships. He repeatedly used them as models for his buildings, from the Villa Savoye, with its extended gangplank and horizontal apertures, to the concrete land liner of his postwar Unité d' Habitation in Marseille. Yet where Fuller understood the ship from the viewpoint of a captain or radio operator, as a piece of equipment for accomplishing a task, Le Corbusier saw it through the eyes of a passenger, as an environment, a set of forms, a lifestyle. Banham and his followers of the '60s would argue that Fuller understood nautical technologies, among others, deeply and authentically, whereas Le Corbusier—ever the painter—remained on the surface. The irrational hyperrationalism of Fuller's own later work, however, would offer some of the strongest evidence that Banham was in some crucial way mistaken, that architects needed to do more than simply "run with technology," and that, since a house is occupied more like a ship's cabin than its engine room, Le Corbusier's "superficial" understanding may have offered better clues to architects than Fuller's "deep" one. Thankfully, life on land does not yet require the technological discipline needed at sea.

The Dymaxion House was followed in 1933 by the Dymaxion Car—essentially a boat for driving—with a rear-mounted engine, a single rear "rudder" wheel for steering, and a periscope for a rearview mirror. Though Fuller characteristically extolled the technical superiority of his car, the transfer of watercraft concepts to pavement was fundamentally misguided and only three working prototypes were built. With the onset of World War II came increased governmental interest in prefabricated housing, which Fuller used to develop two new models: the Dymaxion Deployment Unit of 1941, a converted metal grain bin, and, four years later, the streamlined Dymaxion Dwelling Machine (known as the Wichita House), which was intended to be produced by a

retooled Beech Aircraft factory. But metal housing remained a difficult sell and, like many other postwar attempts to manufacture houses, Fuller's models were soon abandoned. (Ultimately it would be the Levitt company's extension of assembly-line principles to the building site itself that would demonstrate how to successfully mass-produce houses—and suburban anomie—in America.)

The Second World War was a turning point in Fuller's career, as it was for many others. While his experiments in prefab domesticity were ending, he began work at a new, much larger scale that would occupy him for the remainder of his life. Like any devoted sailor, he had always had an interest in maps and charts; the war and a stint as a technical adviser at *Fortune* encouraged new efforts to represent the world "comprehensively." As a basis for these representations, Fuller developed a novel system of cartographic projection, dubbed the "Dymaxion Map," which translated the geography of the spherical planet onto a collection of flat triangular and square map elements. All maps require distortions, but by projecting onto a set of elements rather than onto a single rectangular surface, Fuller could control these distortions so that the relative size of land masses remained fairly proportional to reality. Because the elements could be rearranged, this method also allowed the earth to be "peeled" in numerous ways. A 1943 *Life* article explained that the "layout may be centered on any world power, and it will suggest at once the geographical considerations that dictate its strategy and ambitions." As evidence, the accompanying spread displayed rearrangements of the Dymaxion Map with titles like "North Pole Layout," "British Empire," and "Jap Empire," as well as a version devoted to Hitler's "Heartland" concept for Central Eurasia. Clearly, rough waters lay ahead.

Fuller's most iconic creation, the geodesic dome, was a direct extension of the Dymaxion Map geometry into a structural system. Fuller has

been so closely identified with geodesic structures that a 1964 *Time* cover simply collapsed the distinction between man and work, portraying his close-cropped skull as a geodesic dome. (When a new family of geodesic-like carbon molecules was discovered in 1985, they were even named "fullerenes.") In the late '40s, after the failure of the Wichita House, Fuller spent a few years pursuing pure geometric research that grew out of the Dymaxion Map—a period that included an important stint teaching beside John Cage, Merce Cunningham, and Josef and Anni Albers at Black Mountain College in North Carolina. Out of this research came the geodesic spheres and domes (hemispheres): polyhedrons whose vertices lay along the great circles, or geodesics, of a sphere. Although seemingly regular, all but the simplest geodesic domes are actually composed of elements of varying lengths combined in a complex pattern of subtly different triangular faces. So, while strongly iconic, the geodesic dome or sphere is not in fact a single shape, but a strategy, a method for triangulating spheres.

After revealing a series of smaller models, Fuller oversaw construction of his first full-size geodesic dome in December 1950. (In fact, Fuller's was not the first geodesic dome to be built—the German engineer Walther Bauersfeld completed one as a planetarium for the Zeiss company in Jena, Germany, in 1923.) Geodesic structures proved to be remarkably strong and light, and Fuller finally achieved technical and financial success by promoting them for use in unusual architectural situations: as train maintenance sheds, as portable helicopter shelters (light enough to be carried by the helicopters themselves), as radar installations for the Distant Early Warning Line along the Arctic Circle, and as exhibition spaces—the most famous of which was the US pavilion for the 1967 International and Universal Exposition in Montreal. Designed by Fuller and Shoji Sadao for the United States Information Agency, the Montreal pavilion was a 250-foot-

diameter three-quarter geodesic sphere with a skin of transparent acrylic panels. Punctured by a monorail and sheltering a multitiered exhibition of handicrafts, space capsules, contemporary art, and Hollywood icons, the pavilion was an unequalled monument to the American Century.

Fuller, however, had originally envisioned a tool for transcending, not promoting, cold-war propaganda. Since the Dymaxion Map, he had continued developing ideas for new "maps" of global resources and needs. Working with American and British students and with the artist John McHale, he had explored various "Geoscopes" or "Minni-Earths": geodesic spheres covered with tiny computer-controlled lights, which could display geographic data and animate global trends. For Expo '67 Fuller and McHale initially proposed the construction of a large Geoscope as the basis for interactive simulations that they called "World Games" (obviously a rejoinder to the war games that loomed over those decades). Fantastically, Fuller imagined an active-display globe, one hundred feet in diameter, that—following the strategy of the Dymaxion Map—would periodically transform into an icosahedron and then flatten itself onto the floor of the pavilion as a "board" for the World Game. "The objective of the game," Fuller explained, "would be to explore for ways to make it possible for anybody and everybody in the human family to enjoy the total earth without any human interfering with any other human and without any human gaining advantage at the expense of another." A computer beneath the pavilion would run the simulation based on the comprehensive inventory of the world's resources that Fuller had been gathering at his home base in Carbondale, Illinois. Practical issues aside, this was hardly the sort of information that the sponsoring agency had in mind, and the plan was stripped down to the large geodesic shell—its structural daring taken to be an appropriate sign of American technical superiority. (Ironically, the Dymaxion Map did make an appearance in the pavilion, but only as represented

in the first version of Jasper Johns's painting *Map [Based on Buckminster Fuller's Dymaxion Air Ocean World]*, 1967-71.)

While the Expo dome was pitched politically in opposition to the Soviet pavilion, its formal rival was the free-form hanging structures of Frei Otto and Rolf Gutbrod's West German pavilion. The comparison suggests that Fuller's design became an icon not because its interior was programmed with patriotic propaganda, but because its geodesic form presented just the sort of extraterrestrial clarity—echoed in those conical reentry vehicles and their spherical parachutes—that was helping the United States win the space race. The absurd and terrifying limit of the geodesic logic had already appeared in the hovering spherical cities of Fuller and Sadao's *Project for Floating Cloud Structures (Cloud Nine)*, circa 1960: miniature spaceships on Earth. The geodesic domes' high degree of abstraction also produces an important temporal effect: The domes rest almost entirely outside of architectural history, neither referencing past forms nor, because of their strict geometry, accommodating further formal development. This isolation makes the domes not just utopian, but atemporal—the quality that underpins their sci-fi character (while science fiction is ostensibly concerned with the future, it is a future that itself has no future, a state outside of history).

Detached from architectural history, the geodesic dome was a signifier adrift in the rough waters of the '60s (its many meanings are insightfully described by Felicity Scott in her recent book, *Architecture or Techno-utopia* [2007]). This was especially true of the smaller-scale domes, where geodesics met domesticity. Fuller's own "Dome Home," built in 1960 in Carbondale, was furnished with a tactful collection of midcentury furniture, older pieces of solid design, and an array of "primitive" statuettes—no one-piece molded bathroom units or pneumatic furniture, just the restrained, practical good

taste of an old New England line. Five years later, domes became the shelter of choice for the pioneering Drop City commune in Colorado; and soon—largely via the *Whole Earth Catalogue* and other alternative publications—the geodesic dome became an icon of late-'60s and early-'70s counterculture. By not being “square” (literally) the cheap and sturdy domes were believed to encourage and reflect alternative worldviews.

Then they began to leak. The translation of the geodesic geometry from a cartographic device to a residential structure provides compelling evidence of Fuller's failings as a designer. The geodesic dome may be an incredibly efficient and stable means of enclosing a volume, but it requires a complex set of precise yet varied pieces, and it ignores the fundamental forces that shape buildings: gravity, weather, and the demands of our all-too-human bodies. In defiance of Fuller's rhetoric of efficiency, the domes quickly became notorious for their unusable spaces, awkward entrances, and leaking seams (precision was not a highly valued trait among those dropping out). Soon even early dome supporters turned against the structures. Unlike the precisely adapted ships that Fuller admired, the domes were entirely abstract, seemingly designed only for the weightless void of space. Having arrived at their structures via the purely geometric problems of cartography, Fuller lost the human-scaled sensibility of the Dymaxion House.

Nonetheless, the association between Fuller and the counterculture was mutually beneficial and represented, for a time, one of the oddest alliances of the period. The relationship that emerged in the '60s between high-tech “Uncle Bucky” and the hippie kids was based largely on a paternal humanism. As the veteran outsider, he offered an endlessly unfurling theory of everything, giving assurance that it all—the complete postindustrial late-capitalist world—could be comprehended and, once comprehended, could be changed. That Fuller hoped to change the world into a well-disciplined,

pervasively technological navy vessel did not seem to weaken the counterculture's interest in his explanations (or perhaps their technopolitics were always less counter- than we imagine: Many of the writers and editors who shaped the *Whole Earth Catalogue* became the founding contributors of *Wired*).

One of the most popular, and legible, versions of Fuller's theory, *Operating Manual for Spaceship Earth*, was published in 1969 at the height of the cultural revolution. The book contains much to support the claim, made then and now, that Fuller was a pioneering theorist of the environment and sustainability. Expanding his favorite trope to a global scale, Fuller argued that in order to survive the effects of industrialization we need to understand the earth as a unified, self-contained vehicle—a ship—traveling through space. The resources of this ship, he argued, are limited, and we need to stop consuming them (especially fossil fuels) faster than they are regenerated. Having dug deep into our "fossil-fuel savings account" in order to get industrialization up and running, we need to shift quickly to wind, hydro, and solar energies.

While recognizing the clarity of these points, we must again also acknowledge the limitations of Fuller's thinking. Describing the earth as a spaceship, Fuller himself comes across as something of an alien, unfamiliar with the fact that most terrestrial problems are not fundamentally technical, or cartographic, but political and economic (see recent US energy policy). Straining his metaphor, Fuller acknowledges that "our Spaceship Earth is in the perilous condition of having the Russians sitting at one set of the copilot's flying controls while the Americans sit at the other. France controls the starboard engines, and the Chinese control the port engines, while the United Nations controls the passenger operation." Sounding like a radical free marketeer, Fuller offers a solution to this disarray that

involves not less, but more technology; and not more, but less politics. The book's conclusion comes straight out of Big Blue: "You may very appropriately want to ask me how we are going to resolve the ever-acceleratingly dangerous impasse of world-opposed politicians and ideological dogmas. I answer, it will be resolved by the computer. . . . While no politician or political system can ever afford to yield understandably and enthusiastically to their adversaries and opposers, all politicians can and will yield enthusiastically to the computers [sic] safe flight-controlling capabilities in bringing all of humanity in for a happy landing." Such political naïveté would be risible if—after two world wars and in the shadow of nuclear annihilation—it were not so appallingly dangerous.

Armed with his novel maps and charts, and logging every event in his "Dymaxion Chronofile" scrapbook, Fuller sailed through the mid-twentieth century on a continuous circuit of speaking gigs. He identified himself as the first example of a new type, the World Man, an exuberant version of today's disoriented globe-traversing management consultants, "starchitects," and art fair attendees:

I began to leave my cars at airports—never or only infrequently getting back to them. My new pattern requires renting new cars at the airports as needed. . . . I travel between Southern and Northern hemispheres and around the world so frequently that I no longer have any so-called normal winter and summer, nor normal night and day, for I fly in and out of the shaded or sun-flooded areas of the spinning, orbiting Earth with ever-increased frequency. I wear three watches to tell me what time it is at my 'home' office, so that I can call them by long distance telephone. One is set for the time of day in the place to which I am next going, and one is set temporarily for the locality in which I happen to be.

Fuller's naval training and his belief in a "fundamental orderliness ticking along" seem to have allowed him to keep his heading in such conditions. Yet, by the last decades of his life in the '60s and '70s, this mechanical technology had nearly disappeared, and it began to seem not that nature was a precision clockwork, but that technology was as pervasive, invisible, and unpredictable as nature. Fuller may have been a visionary, but he had early-twentieth-century sight. He could not envision that the technology he worshipped would swell to surround us, to become not our vessel but our environment, over which we surf rather than sail, hoping only for a brief moment of orientation before the next inevitable wipeout.