THE PROSPECT FOR MANKIND

By BUCKMINSTER FULLER

EDITOR'S NOTE: *The following article continues the survey of world trends begun by Buckminster Fuller in the August 29 issue of SR. In the first section Mr. Fuller, a design scientist who invented, among other things, the geodesic dome, wrote about seven current trends and their significance for the future. The first part of this week's instalment continues with Trend No. 8. The article will be concluded in a forthcoming issue.*

SCIENCE, having been employed almost exclusively in weapons development, will find itself progressively unemployed. The weapons-producing companies and the weapons-support industries, having high capabilities but dwindling contracts, are going to struggle ruthlessly to find other profitable enterprises. They will move overnight into the living as opposed to killing arts. We have already noted their probable move into education. Another probable move is into the arts and services usually and mistakenly spoken of as housing.

All you have to do is have a meeting with advanced industrial technology management to realize their inherent ineptitude in respect to the art and science governing the living service industry. Talk about a "house" and the industrialists immediately think about stamping out an aluminum or plastic replica of a Cotswold cottage, or they think of stamping out curtain walls or partitions: "You have to stamp out *something*." That is as far as their brains, conditioned by advertisements and traditions, permit them to go in the byways of categoryitis.

The scientists' "house"-catalyzed concepts are even less imaginative and useful. The carriage, railway, and steamship industries of 1904, and their financial backers, directors, and top industrial managements, did not invent the airplane; nor did the university professors or the scientific societies. There is nothing in the present pattern of building that gives a clue to the ramifications of the upcoming world-habitat service industry.

Just as prototype inventions were the keys to the establishment of the aeronautical industry, so will prototype inventions be the key to this vast new industry. Many of the prototype inventions are already on hand. Others are developing in the U.S. and Russian man-in-space programs. What is most needed now is a clear definition of the functions of the world service industry that must be established to accommodate the forthcoming world citizen, requiring, at some times, living facilities in culture centers around the world and, at others, rest in remote places all the way from the tropics to the poles, which permit man to be intimate with nature's every phase without being punished by the intimacy.

If the professional architects of the world are too slow to support their architectural students' initiative in undertaking scientific redesign, then both industry and science will begin to stumble into the living field and it will become a historical fiasco. That could easily happen within the next five years.

The world architectural profession has just about five years to start the architectural students and design-science students developing the capabilities to take, hold, and develop the world's design-science initiative. Architects are going to have to give themselves powerful mathematical abilities. Fortunately, our research discovery of the omni-rational arithmetic of the tetrahedronally coordinate comprehensive mathematical system, employed by nature in all her transformative inter-accommodations, has now become confirmed by many scientific events. It provides a mathematical means adequate to the historical design-science task of redesigning the world's tools and services.

TREND NO. 9. We must now consider other powerfully favorable historical factors affecting establishment of the world-around living service. Between Russia and the United States, $6 billion has been appropriated to develop the little scientific house in which man will dwell in space or upon the moon. But we note that though architects profess to be master solvers of space problems, thus far they have not been called into any part of the U.S. space program. The professionals who have been called in are space medicine specialists, physicists, mathematicians, geologists, psychologists, chemists, engineers, biologists; but there are no architects.

I am confident, from my direct experiments, that architects can be trained quickly enough and in such a way as to be much more effective in the space program than are those scientists and businessmen who are now handling the program. The architectural scientists will be especially effective in defining the ecological problem and its solution, thus forestalling the fiasco implicit in the scientists', technologists', and industrialists' esthetically-weighted market-analysis misconceptions.

I have familiarity with the space program in the United States and have found that the big contracts given out so far have gone only to large corporations that have dressed themselves up with large staffs of scientists in order to substantiate their lobbying competitively with the universities. The space scientists, of the successful bidders for space contracts, are given the problem of how to develop the space dwelling. They are not design scientists—they are subjective scientists. Design science must be objective.

Scientists are inherently subjective operators. They are trained to make faithful observations and to theorize about the schemes of nature into which their data may fit, but not to consider the significance of their findings as objectively employable. They are too specialized to comprehend complex integration potentials and industrial realizations. Alone among scientists, the medical man is objective. Chemical engineers but not chemists are objective. I have been amazed when I have been called in by the big corporations as a consultant to discover how little they understand of what seems to me to be proper statement of the scientific, structural, chemical, and mechanical aspects of the scientific sky-dwelling problem and its implications for man on earth. The problem is to reduce the dimensions of the ecological pattern from a vast tree-air-earth-worm-bird-bee-rain-wind relay system to a three-foot-diameter, closed-circuit system by which man is able to sustain high health for twelve months without sewer disposal or further input supply besides sun radiation.

In his 1926 introduction to *Brave New World* Aldous Huxley hinted at a possible exception to his theme of an intellect-void, romance-vitiated, atheistic ahumanity. Mankind might, I gleaned, be inspired by a few leaders with a powerful and power-giving conviction of the existence in the universe of an intellect greater than that of man and of a universally operative integrity guarding and guiding all the inadequacies of man. Mankind, thus led, would work through many crises to attain physical success in the universe without cost to

the manifold human freedoms, or any cost of individual joy in creative participation in the universal evolution. In his post-World War II second edition of *Brave New World*, Huxley revised the introduction, saying he tended to have a little more hope that his alternative theme might be realized. And in his succeeding *Brave New World Revisited* he disclosed an even greater hope that the happy alternative could occur.

It is probable that if the world's architect-scientists do gain and maintain the design-science initiative, Huxley's desirable alternative may be realized. If, on the other hand, the architects or students in general fail to gain that initiative within the next five years, then the weapons industry's overwhelming invasion of the livingry field will occur and will swiftly evolve into Huxley's awful dream.

Why is it likely that if the weaponry industry and its scientist-slaves take over the livingry industry, life will move toward Huxley's unhappy dream? And why is it probable that if the world's architectural students take and hold the design-science initiative the world will trend toward Huxley's happy, but to him, improbable dream? To start off with, industrial corporations are too nearsighted while scientists are usually infinitely too farsighted. Industrial corporations tend toward a plastic-flowered heaven with sexy-scented, plastic, call-girl angels. The scientists tend toward test-tube babies and the deflation of the reproductive urge on the psychiatrist's couch. On the other hand, architectural students are realistically idealistic and have well-coordinated vision and a running start on what is needed. Industrial corporations are preoccupied with immediate profits and not with man's total success. They are interested in making money while architectural students are primarily interested in making man a total physical, cultural, and moral success.

Architectural-science students will in due course realize that they are designing an entire family of complementary instruments of livingry—similar in comprehensive functioning to the whole family of musical instruments. They will be willing to allow man the privilege of playing his own instruments and of composing not only one-instrument music but of composing symphonies for the whole family of livingry instruments. The new architect will be wise enough to confine his design science to augmenting the integral organic functioning of man so well that the external organics may be coordinated to operate as unself-consciously as do healthy men's internal organisms. The design-science artist will leave man free to articulate the promptings of his soul in such a manner that each individual may enjoy his newly won and ever-increasing degrees of exploratory and creative freedoms without trespassing on one another and thus frustrating one another.

Optimism is usually thought of as constituting a mildly unwarranted hopefulness in respect to the future. But there is a reverse projection of optimism in the nostalgia-generated myths that recall only the rare and sublime moments of yesterday. Forgetting the negative, reverse optimism overemphasizes, thus deliberately shuts its eyes to reality, and is therefore unable to see the values immediately present.

I am convinced that we are swiftly emerging from the abysmal conformities of yesterday's illiterate, spit-punctuated profanity and monosyllabic verbalism, in which rags, filth, diseased bodies, prevalent stenches, devastating superstition, and local bias reigned supreme.

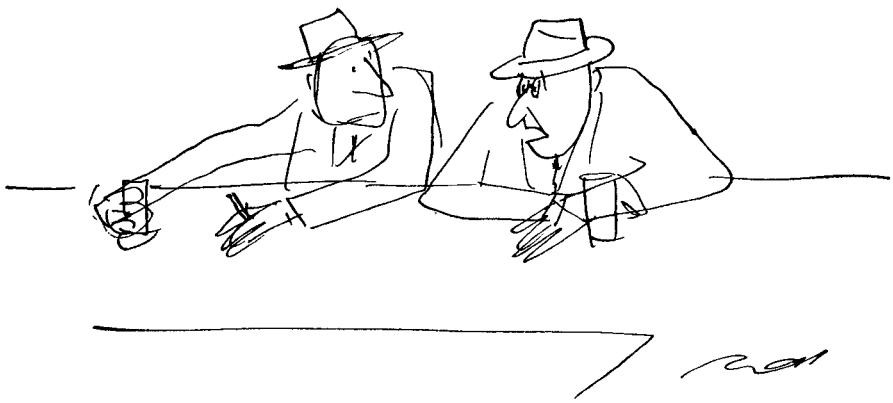
Beginning with World War I, science, technology, and industry began the epochal and ever-accelerating shift from track to trackless, from wire to wireless, from visible to invisible, and from Newton's norm of changelessness to Einstein's norm of constant, disynchronous, evolutionary transformation. Man entered into the vast ranges of the electromagnetic spectrum. Within the electromagnetic spectrum, visible light is exquisitely minute. At the present moment in history 99.9 per cent of humanity's important physical evolution —scientific, technical, industrial, and biological—is taking place in that major portion of the universe of which man has no direct apprehension, but with which he does have exquisite instrumental hook-up.

THIS brings us to the historical era of invisible architecture. In invisible architecture the harmonics are apprehensible only by our intuitions and subconscious esthetics, and operative only in the twilight zone between conscious and subconscious awareness. This is the area of intuitive and esthetic formulation. Just as we may instruct ourselves to wake up in three hours and thirty-seven minutes and do so with reasonable accuracy, so also does the subconscious measuring capability of man's eye judge, at considerable distances, to a sixty-fourth of an inch accuracy, the diameter of the female leg.

One of the last trends of humanity that we take up is this ephemeral esthetic, its intuitive apprehending and conceiving capability, and its now looming major importance in the guidance of human affairs. I will discuss this trend from the viewpoint of my own experience with geodesic domes, which are so relatively ephemeral as to weigh an average of only 3 per cent of the weight of the best alternate clear-span solutions of structural engineering.

There are about 3,000 geodesic structures in fifty countries around the world today. They have all gone to their sites in the last ten years. Many, both near and far, have been delivered economically by air. In Ghana, Nigeria, and other tropical African countries people find that geodesic domes work nicely as large umbrellas. The air circulates in through the top and outward around the wide open bottoms. Geodesics in the Arctic and Antarctic, though light enough for air delivery, are strong enough to handle nature's fiercest winds, snow loads, and temperature extremes.

My kind of work deals with how to find out the ecological problems involved and how to solve them, hoping thereby to bring about the occupant's satisfaction at the earliest possible moment. That is, I deal with the hows of mathematics and economics, the hows of industrial production and distribution, assembly, and service. I don't even consider how any structure is going to look until after it is finished. If, when finished, the structure seems beautiful, I know it is all right. To me, "beautiful" apparently emerges as an ejaculation, spontaneously released by my total set of subconscious control coordinates. "Beautiful" is probably ejaculated when my entire chromosomic neuron bank is momentarily in "happy" correspondence with my entire experience (memory) neurons bank. I speak of my brain as if it were a computer. It is.



"Those were my salad years. Now I'm in the soup."

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Quiet Crisis or Lost Cause?

Editor's note: *The author of the following guest editorial, Wallace Stegner, is a novelist and historian who teaches at Stanford University. He has written widely on conservation.*

IT IS said of the boy who twisted the mule's tail that he isn't as pretty as he once was, but he knows more. And it is assumed by many Americans that having made catastrophic errors in land use during our occupation of this continent, we have now learned to take care, and conserve, and preserve, and use wisely. No more Michigan cut-over lands, we think; no more Dust Bowls; no more obliterations of whole species; no more overgrazing or over-cutting of watersheds; no more short-sighted raids on resources; no more failures to reserve open space for health and recreation.

So we think, and with some justification. Conservation has come a long way since Theodore Roosevelt and Gifford Pinchot and W J McGee gave the term currency in 1908. And for the past four years we have had, in Stewart Udall, the most active and imaginative Secretary of the Interior since Harold Ickes. His *Quiet Crisis* is a handbook of the mistakes we have made and the lessons we should have learned, and to the two Kennedy-Johnson Congresses he has presented—and pushed—a systematic and comprehensive plan of conservation legislation.

To him must go much of the credit for acquiring, at a time when open space dwindles in quality and amount and rises steadily in price, the only substantial national park areas since the FDR era. He has helped create four national seashores—Cape Cod, Point Reyes, Padre Island, and Fire Island; the first national riverway, Ozark National Riverway in Missouri; and the thirty-second national park, Canyonlands in Utah. He was strongly behind the Wilderness Bill, the Land and Water Conservation Fund Bill, and the Wet Lands Bill designed to save breeding and resting places for wildfowl. He has pressed preliminary work that could result in a cluster of new National Parks: hopefully the Allagash in Maine, the Sawtooth in Idaho, the Northern Cascades in Washington, the Channel Islands off the California coast, a Redwood National Park in northern California, and the Oregon and Indiana Dunes.

It sounds impressive, and is. Yet even the saving of these remnants, the last lands we are going to get of real national park caliber, is fought at every step by resource-devouring industries and by "development"-minded Western politicians. The Wilderness Bill is a sample. It was blocked for eight mortal years of hearings and debate; it was the most discussed bill in American legislative history; and it finally went up for the President's signature with a good many of its guts gone. The exploiters of timber, grass, and minerals persist among us and have not even yet given up hope of continuing to carry their operations onto federal reserves. But some federal agencies, including some within the department whose Secretary is a conservation champion, turn out to be as dangerous to conservation principles as the old-fashioned cowboys and loggers.

The first sort of threat, whose justification is strictly economic, may be illustrated by the lumber companies that are clear-cutting the last great stands of virgin redwoods, the second by the Bureau of Reclamation, once a great force in the conservation of Western water, now a politically potent bureau whose continued existence depends on its continued building of dams, with or without justification.

Most controversial of current Reclamation Bureau projects are the proposed Marble Gorge and Bridge Canyon dams in the Grand Canyon of the Colorado River, part of the river-taming system that already includes Hoover, Davis, Parker, Imperial, Morelos, and Glen Canyon dams on the Colorado and Flaming Gorge dam on the Green River, its principal tributary. The system would also have included, if conservationists had not mounted a massive opposition in 1956, two dams in Dinosaur National Monument. A principal argument against the Dinosaur Monument dams is identical with an argument against the Bridge Canyon dam: it would have impounded water and created a drawdown reservoir within the boundaries of a national park area, land which by the act of 1916 is dedicated to "use without impairment" by the public. Both Dinosaur and the Grand Canyon National Monument were created with a power withdrawal embedded in them. In Dinosaur that adverse use was voided because of the damage it would have done to a magnificent canyon. The argument is as valid for the high Bridge Canyon dam, which would back water all the way through the Grand Canyon National Monument and thirteen miles into Grand Canyon National Park.

AND the benefits of a Bridge Canyon dam are at least as dubious as those of the one conservationists kept out of Dinosaur. Its purpose is not water storage, but power: the "Parker Lift," which would pump water from Havasu, behind Parker dam, into the Salt River Valley of Arizona. It is conceived as the financial wheelhorse for the whole regional project. But at the present moment there is not water enough running down the Colorado to come close to filling even the Hoover and Glen Canyon dams, much less two new ones. Since May, Secretary Udall has had to issue orders releasing up to 20,000 second-feet of water from Glen Canyon in order to maintain the power head at Hoover.

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