



World Livingry Service Industry

By R. Buckminster Fuller, 1982

A fourteen page typed manuscript, with edits in Bucky's hand, was found on Buckminster Fuller's desk the day he died, in July, 1983. The copy received from the Special Collections Department at Stanford was faded and nearly illegible, but it has been transcribed below in its entirety. Any actual typos are most likely mine, and not Bucky's. He was quite precise, as visionary genius inventors can be. -P. Ravasio

“I was convinced in 1927 that humanity's most fundamental survival problems could never be solved by politics. That was the year when a human first flew alone across an ocean in one day. It was obviously the beginning of the swift integration of all humanity which in all its previous millions of years had existed remotely deployed as relatively isolated separate nations with ways of life approximately unknown to one another.

It was obvious that the integration would require enormous an ounce of energy; it was also obvious that the fossil fuels were exhaustible. It was obvious that a minority of selfish humans would organize themselves to exploit the many transitional dilemmas. I was convinced that was in the 20th century all of humanity on our planet would enter an unprecedented crisis. I could see that there was an alternative to politics and its evermore wasteful warring, and inherently vain attempts to solve one-sidedly all of humanity's basic economic and social problems.

That realizable alternative was through invention, development, and reduction to practice and physically working, mass production prototypes of human-circumstance-advantaging technology. This complete family of inter-complementary artifacts I determined must be designed – structurally, mechanically, chemically, metallurgically, electromagnetically, and cybernetically -- to provide so much performance per each erg of energy, pound of material, and second of time invested as to make it eminently feasible and practicable to provide a sustainably high standard of living for all humanity. It must be a standard of living more advanced, pleasing, and inspiringly productive than any experience or dream down by anyone in all history.

It was also clear that this advanced level could be entirely sustained by our daily income of sun energy. In 1982 the total energy being consumed daily by all humanity amounts to less than 1/500,000ths of 1% of our planet's daily sun energy income.

It was also clear that the advanced standard of living I foresaw could be attained and maintained by artifacts that would emancipate humans from piped, wired, and metered exploitation of the metabolic processes of the many by the few.

This family of artifacts leading to such comprehensive human success I identify as autonomous 'livingry' in contradistinction to politics' weaponry. I called it technologically reforming the environment, instead of trying politically to reform the people.

I describe the design science revolution that leads to this computer-persuadable veering of big business from its weaponry fixation to accommodation all humanity at an aero-space level of technology, with the vastly larger, far more enduringly profitable for all, entirely new world Livingry Services Industry, in my most recent book Critical Path, which was published in the U.S. in 1981 and will be published in Japan, West Germany and Great Britain this year (1982).

Most importantly I set out 55 years ago, at age 32, to see what a penniless, unknown human individual, with a dependent wife and newborn child might be able to do effectively on behalf of all humanity in realistically developing such a technological program.

Such a program would be impossible of accomplishment by great nations, great religions, or private enterprise no matter how rich or powerfully armed. With the average sovereign nation occupying less than one twelfth of one percent of the planet Earth's surface, the sovereign prerogatives of any one nation have been, and as yet are, meager. Great private enterprises are capital gambles whose "ships must come in" within a reasonably short time or their backers will go bankrupt.

Enterprise is too narrowly focused and shortsighted -- too narrowly focused on money making to be concerned with its side effects, and too shortsighted to address those biggest, most important, long time tasks that are vital to sustaining humans onboard our planet.

Being human, I made all the mistakes there were to be made but I learned to learn by realistic recognition of the constituent facts of the mistake-making and attempted to understand what the uncovered truths were trying to teach me.

With the trained-in viewpoint of a regular U.S. Navy officer in World War I, I saw that there was nothing to stop me from thinking comprehensively about our total planet Earth, its total physical resources and most advanced total know-how. Nor was there anything to stop me from thinking realistically about how to operate this magnificent spaceship Earth on a sustained basis for all the passengers onboard.

It is now technically feasible with presently proved technology, to impound and distribute to humanity the vast overabundance of our cosmic energy income -- from the sun, the vegetation-produced alcohols, and Sun-derived windpower and wavepower. Through foresight and design it is possible to phase out all further use of all fossil fuels and atomic energy which comprise nature's cosmic energy savings account.

Having committed ourselves to solving humanity's problems with artifacts, we must sort out which comes first of various artifacts -- all of which are going to be needed to get spaceship Earth operating omnicooperatively on behalf of all.

In my Philadelphia archives there are approximately 40,000 original articles published and often reprinted in newspapers or magazines in the last sixty years which successfully document my own individual family of schedule artifacts invented and prototyped, for later adoption by a World Livingry Service industry. These livingry items include the following:

The Dymaxion House: The autonomous, mass-producible, air-deliverable dwelling machine weighing only 3 tons which was only 3% of its conventional, single-family dwelling counterpart. First designed, 1927; Model, 1928; full scale prototype in 1945 at Beach aircraft; helicopter delivered, 1954.

Tensegrity: The continuous tension/Discontinuous compression structuring principle of universe (i.e. stars not touching planets, electrons not touching their atomic nuclei) introduced to planet Earth to replace the continually compressed, secondarily tensioned structuring in present world-around engineering. Designed 1929; prototyped 1929. and then the bathroom can stop.

The Dymaxion Bathroom: A one piece, 250 pounds bathroom. Designed, 1928 prototype, 1936; mass produced in polyester fiberglass in West Germany 1970. Equivalent conventional bathroom: with fixtures installed weigh altogether two tons.

Synergetics: Exploration and publishing of the four-dimensional geometrical coordinate system employed by nature. (See Synergetics and SYnergetics 2, Macmillan, New York, 1975, 1979.) Discovered 1927; published, 1944.

Dymaxion World map: Discovery and development of a new cartographic projection system by which humanity can view the map of the whole surface of the earth as one-world island in one-world ocean, without any visible distortion in the relative size and shape of any of the masses, and without any breaks in the continental contours. This is the undistorted map for studying world problems and displaying in their true proportion resources and other data. Discovered 1933; published, 1943.

World game: A grand strategy program developing the design science of solving all problems with artifacts, invented by self or others, which take advantage of all scientific and technological development through studies of their effects on the total world's social and economic affairs as ascertainable from the Dymaxion World Map. A means of assessing the feasibility of realizing various initiatives in solving world problem. Invented, 1927

Trends and Transformation Charts: These depict the total history of all the metalurgical, chemical, electromagnetic, structural, and mechanical trendings to greater performance per given amounts of give materials, time and energy. A compendium of all the scenarios of science and technology evolving advances.

Chronological chart of total history of scientific discoveries, and technical inventions.
Chronological chart of the mining of all metals and recirculation of the scrap. Chronological charts of all major industry performance assessed in terms of per capita human use. These charts, begin in 1928; first published 1937, at Bureau of Standards, Washington, D.C.;

published in Nine Chains to the Moon ,1938; published in Fortune Magazine's 10th anniversary issue 1940. This issue of Fortune went into three printing and it from red to black ink status. It changed U.S.A. and world economic health assessment from a tonnage criteria to one based on energy consumption.

The Dymaxion Omnitransport: (for land, air, water surface and submarine travel): The first full-scale working prototype stage of which was the Dymaxion car produced to test the crosswind, ground taxiing behaviors of an omni streamlined, ultimately to be twin-orientable-jets-stilts-flown, wingless, flying device which would take off and land like an eagle or duck, without any prepared landing fields (similar in principle to the forty-years-later descent and take-off, multi jet system of the Apollo Moon Landing Craft.) Design 1927; Prototype 1933.

Geodesic Dome: The unlimited clear span, omni-triangulated, tensegrity structures to accommodate both humanity's converging and deploying activities. Invented 1938; prototyped, 1947. Since then, over 300,000 have been produced installed around the world from northernmost Greenland to the exact South Pole; over 100,000 installed in children's playgrounds.

Octet Truss: the flooring or room things drop here for a minute to stand you sign, 1933; For out of time, 1949. Specified by mass for US base platform construction.

The Fog Gun: The pneumatic means of cleaning human body, dishes, clothing, etc. without using plumbing's piped in water supply.

Compact, odorless toilet equipment: For anaerobic conversion of human wastes and garbage into methane gas and fertilizer. Designed, 1928; long proving in India and China; now being refined for mass-production use as dry-packaging-fed system.

Carbon blocks-inserted, copper disc-breaks: Invented and successfully demonstrated at Phelps – Dodge, 1937.

Oxy-acetylene flame-melted, water-cooled centrifuge: For processing low-grade tin ore. Invented and successfully demonstrated at Phelps Dodge, 1937.

Hanging book shelves, and other furniture: Invented, 1928; prototyped, 1930.

Modeling of all geometric developments of energetic-synthetic geometry: Including tensegrity models of all geometrical structures and the hierarchy of primate structural systems. The minimum, all-space-filling module. The foldable, seven unique great circle models. The tetrahelices. Discovered, 1927; demonstrated, 1936.

Twin-hull rowing and sailing devices: Invented, 1938; Prototyped, 1954. Triangular Geodesic framing of ocean sailing hulls: Invented 1948; successfully demonstrated, I.O.R racing sloop "Imp," 1979.

Floating break water: for use when building from bottom is too expensive. Desirable for harborless islands and open shoreline mooring protection. Invented, 1960; first invention proved effective but swiftly overstressed materials employed; principles employed proved valid; invention number two avoids breakdown of materials, 1979.

Water wavepower machine: Developed in connection with floating breakwater number two, in which each wave-lifting elevates and entraps a large bulk of water, whereafter gravity impels in the linear direction through a turbine. Invented, 1970.

Hydraulic and pneumatic structures: Whereas pneumatics are compressible, they prove highly successful in filling shaped fabric containers where shock loadings are to be absorbed by the pneumatic compressibility in circular forms as in automobile tires. Pneumatics will not prevent buckling in a hollow tube column – but hydraulics will do so due to hydraulics non-compressibility. Throughout 55 years since first employing them, I have made many successful uses of both pneumatic and hydraulic structures. Invented, 1927.

Interior and exterior aerodynamics of structures: Throughout 55 years since inception, I have made many successful applications of aerodynamics in streamlining my omni-medium transport to reducing wind-drag on buildings and preventing drag-exhaustion of controlled environment heat conservation, to using wind drag of buildings to operate exhaust-air turbines accommodating hurricane-speed winds. Developed from 1927 on.

Integrated world-around ultra-high-voltage electrical energy conducting grid: Grid closed via Bering Straits between U.S.A. Alaska grid and U.S.S.R. Kamchatka grid. Conceived, 1950.

Windmill systems: First designed into Dymaxion Ten-deck tower building using Fletner vertical blade systems; build into and field-proven in Beech Aircraft Fuller House as a dome-drag turbine. Developed also as propeller bladed system in 1960 which operation evolved into Windworks of Mukwanago, Wisconsin, which first developed electronic conversion of direct into alternating current and arranged feed-into electric utility power lines whenever wind blows. Conceived, 1927; adopted by Wisconsin Power & Light, 1982.

Chronofile: The chronological record of all my to-and-from correspondence of 87 years. Now, in 1982, contains over 800 volumes (filed in 8 ½ X 11 X 3” containers), documenting my livingry artifact development program.

Publications: Twenty four books, authored and published; circa. 200 magazine and newspaper articles; circa. 1,000 tape recorded lectures; circa. 500 universities and colleges visited on my 49 trips around the world since 1058.

Often my artifacts are adjudged by critics to be failures because I did not get them into mass production and make money with them. Such critics who see making money as the criteria of success you not realize moneymaking was never my goal. Nor was getting into the business of mass production. I learned very early and painfully that you have to decide at

outset whether you are trying to make money or to make sense – they are mutually exclusive.

I saw that nature has various categories of unique gestation rates – lags between conception of something and its birth. In humans, conception to birth is nine months. In electronics, it is two years between inventive conception and industrial production. In aeronautics, it is five years between invention and operating use. In automobiles, it is 10 years between conception and mass production. In railroading, the gestation period is fifteen years. In big city skyscraper construction, the gestational lag is 25. Depending on size and situation, the period of gestation in the single family residence can be between 50 and 75 years. There seems to be a correlation between the gestation rates and the speed at which the development operates -- for example the electron moves at 186,000 miles per second, transport airplanes at 500 mph, the automobile at 80 mph and the skyscraper only a fraction of an inch per minute during a mild breeze.

Because of these lags, the earlier I could introduce the conception model, the earlier its birth could take place. I assumed that the birth into every day life of livingry artifacts whose working “conceptual prototypes” I was producing would be governed by those respective-category gestation lags.

I also assumed my livingry inventions’ progressive adoptions by society would occur only in emergencies. I called this operative principle “emergence through emergency.” I observed that only in emergencies when solutions “at any cost” were needed, were the necessary funds made available for research and development (usually in the area of weaponry).

No scientists have ever been employed by the housing “industry” to research and develop plumbing. For all of humanity to begin to break away from its conditioned reflexes regarding living facilities (home customs and styles), allowing them to be advanced by my livingry artifacts, would take a minimum of half a century to get underway. Since this was clearly a half to three-quarters of a century undertaking, I saw in 1927 at outset that I best not attempt it if I was not content to go along with nature’s laws.

Evolution’s inauguration of the World Livingry Service Industry had to wait until capitalism had graduated from its for-centuries-held assumption that physical land property constituted capitalism itself. Now capitalism has come to the startling realization that the strictly metaphysical technological “know how” is the most profitable property, and the key to exploitation of the invisible industries of chemistry and biochemistry, metallurgy, electromagnetics, and atomics.

Recognizing all its strategies, capitalism has now unloaded its real estate property on to the people by refusing to rent and forcing people to buy their condominium or co-op homes. Evolution had to wait upon the government-guaranteed, forty-year mortgage-financing of housings cost to exceed human financial capability to acquire.

Evolution had to wait until the United States’ mass production of automobiles or automobiles exclusively as moneymaking businesses had been made obsolete by the

technological felicity of manufacturing by other countries' producers. Major U.S. productivity is now free to reorient itself to the necessity of rehousing all humanity in mass-produced, aerospace-level-of-technology livingry, as the housing emergency blooms on the horizon.

My "Fly's Eye" domes were designed in 1977 as components of a "livingry" productions and service. The basic hardware components will produce a beautiful full equipped, here do you live girl will house that ways and costs about as much as the good on mobile. Not only will it be highly efficient in its use of an energy and materials, it will also capable of harvesting incoming son and when and or cheese Wind energies. The software are of the product will include a service industry to hair or highway transport, Install, lease, maintain, remove, and relocate the homes or their separate hardware components. They will be semi on talking this I E have no sewer waterpipe or electric power connections like telephones and rental automobiles they will not likely be sold.

Having undertaken the solution by artifacts of the world's great housing crisis, I also came to regard the history of cities. Cities developed entirely before the thought of electricity or automobiles or before any of the millions of inventions registered in the United States Patent Office. For eminently mobile man, cites have become obsolete in terms of yesterday's functions -- warehousing both new and formerly manufactured goods and housing immigrant factory workers. Rebuilding them to accommodate the new needs of world man requires demolition of the old buildings and their replacement now obsolete real estate, streets, water and sewer lines, and yesterday's no longer logical overall planning geometries. I sought to take this challenge and developed plans for an entirely feasible and practical new way for humans to live together economically. My floating cities plan for Toyko Harbor and my Old Man River City project are two such designs.

Evolution was clearly intent on postponing in section of the world Livingry Services Industry until humanity had graduated from its pre-twentieth^{do not}-century condition as a planet of remote nations to an integrated global society all of which waited upon completion of a world around network of highways, airlines, and telephones, and the automobiles and jumbo jet liners.

The same humans will converge for entertainment, idea exchanging, education, and will diverge and individually deploy for our play such as skiing, sailing, surfing, and other health and research developments. When they converge it will be under great domes. Every time we double a dome's diameter we halve the amount of surface through which an interior molecule of atmosphere can lose or gain heat.

As a scientist I am greatly interested in all that goes on in the political- economic scene and in the impact of one unforeseen technological evolutionary event after another upon that scene. I see development of one miniscule computer chip completely altering the whole world patterning. As the half century of utterly unpredicted technological discoveries have occurred, accompanied by an ever greater familiarity with all the world by humanity, I have become increasingly confident that my 55-years-ago judgments and predictions were sound.

All the evolutionary events requisite to the livingry Industry have now taken place or about to take place in the very near future. If the political systems do not eliminate humanity with their weapons, the half-century gestating, World-around Livingry Services Industry will be born. I know with all confidence that technologically humanity now has the opportunity, for the first time in its history, to operate our planet in such a manner as to support and accommodate all humanity at a substantially more advanced standard of living than humans have ever experienced.

This is now possible not because we have found more physical resources. We have always had enough resources. What has happened that now makes the difference is that we have fast Lee increased our know how I specialized innovations, all of which invisible realization integrates to make possible success for all. I also know that this can be realized only by a technological revolution involving total Spaceship Earth using all the resources and know-how as an integrated regenerative system as in the design of any successful sea-going or space- penetrating ship or of any biological organism.

Spaceship Earth now has 150 admirals. The five admirals in the staterooms immediately above the ship's fuel tank claim that they own that oil. The admirals with staterooms surrounding the ship's kitchen, dining rooms, and food refrigerators claim that they own all the food. Those with staterooms next to lifeboats claim that they own the lifeboat, and so forth. They've been having on board game called balance of trade. Very shortly the majority of our models have a deficit balance. All while the star board side admirals are secretly planning to list the ship port so far as to drown the port side's, and vice versa. Nobody is paying any attention to operating the ship itself or steering it into some safe port. They run out of food and fuel. They discover they can no longer reach a port for supplies. Or their dangerous waste disposal problems threatened to scuttle the ship or poison the passengers. Finis.

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