WHAT QUALITY OF ENVIRONMENT DO WE WANT?

Buckminster Fuller

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EDDINGTON defined science as "the earnest attempt to set in order the facts of experience." In attempting earnestly to think about our environment we realize gradually that it is not a static stage set. It is the continually changing sum of all our external experiences. It is omni-dynamic. It is a complex of events. Environment is all else of universe but self. Sometimes it feels superbly synchronous—at others, discordant; 99.999% of the events which constitute the physical and metaphysical universe are undetectable directly by our senses.

Considering and reconsidering clues which may permit our setting the complexedly compounding facts of our environment in order requires (unfortunately not too obviously) that we first remind ourselves that many experiences have shown us the ease with which all our perceptual faculties can be deceived. We have also experienced the persistent and lightening-like contagion of misinformation. For instance, it is difficult to intercept and rationalize the two-year-old-to-two-year-old children's innocently relayed infusion of the artificial concept of "that is mine"—at first mimicked from adults but having such excitingly abrupt effect on other children as to induce attitude-forming repetition.

We are also reminded of the fact that our spontaneously developed shortsightedness and frequently deliberate exclusion from consideration of a large proportion of the environmental events have most often precluded discovery of the fundamental evolutionary trends implicit in the nonsimultaneous continuity of our total experiences. Our vision is limited to the tiny, red, orange, yellow, green, blue, violet bands of frequency tunabilities representing far less than one thousandth of 1% of the great electromagnetic spectrum of the thus far discovered vast range of the physical uni-

verse realities. Our *after-image overlapping* which results in our *sense of motion* is even more limited in its perceptual range. We cannot see the hands of the clock move. We cannot see life growing. We cannot see either the stars or the atomic components move though they move at fantastic speeds. We can only see the ultra-slow motions of the clouds, locally running waters, human beings, and other creatures and their parts. No wonder that little man who within his average lifetime has seen only about one millionth of the surface of his planet and has lived but a split second of the astronomical ages does not see and cope spontaneously with the larger evolutionary patternings and life aboard the planet earth. Only through memory plus thought—greatly aided by instruments does man discover the ultra- and infra-motion effects.

Sum totally, we discover that the many different and equally erroneous opinions of humanity regarding life and the world—and how to get along in it—gradually merge into often lethally divergent religions and ideologies—every one of them based on fundamental misconceptions and incomprehensions of the realities of universe—and the universally complex integrity of generalized principles, including for instance, the principles of *irreversibility* and *entropy* which together result in *inexorable evolution* and its myriad of constant local transformations.

The more we learn the more we realize how little we know. That little seems to say: We humans have been successful thus far in history only by virtue of the supreme intellectual capability manifest in the harmoniously scientific design of the *minimum perpetual motion machine,* the infinitely regenerative universe.

But humanity now everywhere around earth is intuitively aware of the increasing threat to human survival—around our planet—that is bound to follow the further promulgation of our egotistically ignorant and illogically opposed individual and group viewpoints.

Let us therefore be as scientifically orderly as is at present feasible in dealing intellectually and practically with that complex scenario of transformations called "environment." To do so, let us first examine our *subjective* macro-cosmic and microcosmic experience apprehending processes and then our deliberate experimental explorations toward comprehending the macro- and micro- environmental event complex. Finally let us scientifically reconsider our intuitively objective formulations for the objective employment of the generalized principles which we seem to have winnowed from our experiences with the environment which in turn may permit us to make life-favoring alterations of the environment scenario.

For a microcosmic example of our spontaneous and superficial misapprehending and mis-comprehending the environmental events we must concede that both theoretically and experimentally we have now learned and "know" that there are no "solids," no continuous surfaces, only "milky way-like" aggregations of remotely interdistanced atomic events. There are no "things"—no particles —only energetic events. Nonetheless society keeps right on "seeing," dealing, and superficially cerebrating in respect to "things" called "solid."

There are over a quadrillion times a quadrillion atoms dynamically intercoordinating in each of our brains, of whose successful local intercoursings within microcosmic dimensions, at 700,000,000 miles an hour, we have no conscious awareness. Nor may we claim any conscious design responsibility for their fantastically successful electromagnetic performances which altogether result in our consciously cerebrating the sensations and thoughts which integrate as our seemingly simple *awareness of* just *being alive*—here and now—and evolving and considering these self-emergent "thoughts." It is not surprising that so exquisitely designed an apparatus can be carelessly and imperfectly tuned in by us, with superficially misleading results.

And as an example of the inadequacy of our *macro-cosmic* apprehending I think of students who say to me. "I wonder what it would be like to be on a spaceship." < Oldsters have for so long assumed that such events were impossible they no longer tend spontaneously to think of participating personally in space travel. >

I always answer the students by saying, What does it feel like? That's all you have ever been experiencing. You are all astronauts, for you live aboard a very little spaceship, illogically called 'Earth.' I say illogically because of the relative meagerness of its exquisitely superficial stardust and radiation supplied, biologically photosynthesised, and chemically composed 'top soil'—ie, the very complex variety of fine particle aggregates generally identified as the substance *earth.*

Once in a while we launch a little spaceship at a velocity of fifteen thousand miles an hour from our bigger, sixty-thousand miles per hour speeding spherical Spaceship Earth which is only 8,000 miles in diameter. We launch our little ships from our bigger Spaceship Earth at only one quarter the speed of our own sun orbiting travel. Our 8,000 mile diameter may seem big to the only-one-thousandth-of-a-mile-high you or *me* but our spaceship's size is negligible in respect to the macro distances of the sky. The nearest space 'gas station' (or energy station) from which we get energy to regenerate life aboard our spherical spaceship is the Sun which is flying in formation

with us at 92 million miles distance. As our Spaceship Earth flies formation in annual circles around the Sun it rotates 365 times per orbit and thereby exposes all of its surface to the Sun's radiation, thus permitting optimum impoundment of this prime life supporting energy. Our next nearest energy supply skyship 'Star' maintains space flight position with us at 100 thousand times greater distance than the Sun as we altogether fly formation through the vast reaches of the ever transforming Galactic Nebula.

I am a constant traveler around our spaceship's spherical deck. Together with several million others I have now in my lifetime-walked, run, ridden, floated, or flown over 3,000,000 miles around the spherical surface of the earth. My travel is one hundred-fold the average distance around the surface of our Spaceship Earth heretofore accomplished in an average lifetime by any one of the generations before our time.

Lots of people say to me, "You know, I don't like travel, I don't like motion. I couldn't stand your kind of life." And I reply, "You apparently don't know what you are doing!" My lifetime's traveling around our Spaceship Earth's surface is but a negligible mileage addition to our mutually accomplished nine million miles annual spinning around our polar axis, plus our six and one-half billion miles annual orbiting around the Sun and our multi-quadrillions of annual miles of milky-way peregrinating and inter-nebulae deploying. Therefore my total lifetime's to and froing around our Spaceship Earth's surface of only three million miles is only one-millionth of one percent of yours and my simultaneously accomplished macrocosmic traveling of *one hundred and forty quadrillion miles* which enormous total is however only one-third of the distance simultaneously accomplished in the microcosmos by each of the six trillion of atoms comprising each of our individual human organic systems.

I then repeat to my unwitting and involuntary co-travelers aboard our Spaceship Earth the admonishment of our once-upon- a-time Harvard cross-country running coach Al Schrub who used to say "Take it easy and go faster."

The utter unreality of our conscious preoccupations is manifest by the foregoing macrophysical-microphysical event reconsiderations. Our misconceptioning is occasioned by the fact that most changes that occur in our entirely dynamic environment do so faster or slower than may be tuned in by our sensory faculties. We cannot see

the hands of the clock move. We cannot see the airplane propellers when they are in motion. We cannot actually see humans, trees and plants growing. As with the clocks hands, we only become conscious in due course that their pattern aspect has changed. We can't see the stars or the atoms "move."

I am going to review a few more of those imperceptible events of our environmental evolution which most people acknowledge only in retrospect. For instance, one of my own experience "scenarios."

I was born in 1895; the airplane was not invented until I was 9 years old. With a lot of other young people, I thought that our parents were wrong when they said "man can't fly." But many 10-year-olders like myself kept on making and throwing paper glider-darts while also trying to make little experimental models of full size man-carrying flying machines and sent them gliding out the attic windows. When flying did come, we expected it while our parents found it almost unbelievable.

The year I was born, the automobile was also born in America. Even though I lived and was brought up in Boston, I didn't see an automobile until I was 7 years old. That is how scarce autos were. The cranking of the car was quite a job and every few minutes some item failed. I grew up thinking of gasoline engines, pneumatic tires, automobile brakes, and storage batteries as being very unreliable. It has, therefore, been quite a change in the environmental verities of my life for motors and brakes to become generally reliable and for man to attain everyday mastery over larger blocks of energy than that of our own muscle or of the muscle of hundreds of horses. How then in contrast to myself and my contemporaries did the 21-year-older of 1967 come to think spontaneously of the automobile as organically reliable. It happened as follows.

At the beginning of World War II, before the United States came officially into the conflict, generally unknown to the public, the US Air Force began using the DC4, as the first transoceanic airplane, to carry all kinds of cargoes overseas, for instance, to the Burma Road. We sent these great skyships outbound around the world—full of various war items. These DC4's were however returning to the United States empty. The air force decided to take scientific advantage of all the home bound cargo space by shipping to Wright-Patterson Field at Dayton, Ohio, the airplane engines from any of our aircraft that had crashed in foreign operation. At Wright-Patterson they took those engines apart. They didn't have inventors looking them over to see "How do we design a better engine?" They simply wanted to know which part had failed and caused the accident.

The aeronautical world maintains not only logs of *all* its flight activities but also detailed, hour by hour records by qualified mechanics of the case histories of every airplane engine. Thus, it was learned at what hour and minute this spark plug or that connecting rod had failed. Thus it was also learned what the *earliest time* was, at which any connecting rod or any category of engine part had ever failed,—say for instance —that the earliest time a connecting rod in a specific type of engine had ever been known to fail was on the 37th hour of use. "Therefore," the air force said, "inasmuch as we have routine overhauls every so many hours, if we always replace each part at the nearest routine overhaul occurring immediately before the earliest known failure for that type part of that special model engine then the probability of such failures will be approximately eliminated."

That proved to be true. Thus, it happens today that when you fly around the world your engines are extremely reliable. Though many as yet feel that flying is hazardous, air travel is far safer than railroading and automobiling. But even the automobile's component technology has been vastly improved as a consequence of the general improvement in design which ensued.

A mechanic will not falsely certify that he has made an airplane repair. If he did, he could not sleep. The imminence of death is too dramatically imaginable to be subconsciously avoided. But the same mechanic working in an auto repair shop might falsely certify that he has fixed an automobile because his subconscious knows well that automobile users are not going to fall out of the sky. But even the automobile technology has improved—in lesser degree—sufficiently to give the youth of today spontaneous confidence in its functioning for reasonably long periods between servicing. Thus, the transportation aspects of our ever evolving environment have greatly altered and with them the spontaneous human reflexing which they condition.

Lindbergh's conquest of the Atlantic with cloth-covered wings occurred in 1927. The first night flight air mail did not start until 1929. The aluminum air transport did not appear until 1930. When our second daughter was born in 1927, I was pushing her in her baby carriage in Lincoln Park in Chicago and a little airplane went overhead. Though I myself had been flying for ten years, to me at that time, the experience of seeing an airplane in flight over Chicago was as yet an exceptional experience. How-

ever, airplanes became, at that initial stage of her life, an a priori part of my daughter's *everyday* environment events—that is to say they became to her what humans speak of as a *natural* everyday phenomenon. To each human, "natural" means the state of the environment as he first encountered and continues to experience it in his youth.

My daughter's daughter—ie, my granddaughter—was born in New York 13 years ago. Her parents lived in an apartment on the top floor of an old three-story wooden house situated at the highest point of the hill section of Riverdale just north of Manhattan. Their house stood directly below the westward flight paths of all the planes landing and taking off from both LaGuardia and Idlewild Airports. By now jets were coming into use. Over the roof of the house several times a minute went the roaring airplanes. As she cocked her head to listen someone would usually say, "an airplane!" It was not surprising that the first word my granddaughter said was not "Mommie" or "Daddy" but "air"—her sound expression for *airplane;* people took her to the window to see those roaring machines fly by overhead.

She was born in the late fall of the year when there were no leaves on the trees. As a consequence she saw thousands of airplanes before she saw one bird. Airplanes became much more "natural" inhabitants of her sky than birds.

My granddaughter also saw hundreds of thousands of automobiles coming up the Westside Expressway *of* New York City. Friends of the family sent her the same children's books that they themselves had received in their childhood. The books were full of pictures of cows and pigs and other of yesterday's "natural," everyday items and events none of which, however, my granddaughter had ever seen. She was as unfamiliar with their appearance as she was with the appearance of a polio virus; but sensing the grown-up's expectant pleasure she accommodated them by laughing at such absurdly "unnatural" pictures.

In other words, the so-called "natural" environment is constantly changing and consists not only of constantly accelerating rates of performance of man's ever-changing everyday tool functions but consists also of progressively occurring, inadvertently negative, by-products of the change, such as the pollutions not only of air and water, but of the whole mental, spiritual, and emotional environment which deteriorates the meanings of our expediently abused vocabularies. Thus, fallacial concepts, superstitions, customs, and shortsighted exploitations frequently pollute the environmental

information and, therefore, “common sense,” and its frequent stimulations of “practical” but shortsighted and worse than worthless decisions or permissions. Thus, the young world has now come to look upon both new events and yesterday’s conditioned reflexes quite differently from the way older people do.

Because of the alteration of fundamental meanings and trend implications, it is difficult for the older people to realize what is motivating the young, for instance at Berkeley, Calif, in 1964 to 1965. The “Berkeley” group—whose predominant numbers graduated in 1966—any may thus be thought of as the world around “class of 1966”—are the first generation in history to have been “brought up” with television. Television is of major importance to them. The “Berkeley Event” age group throughout the United States, as well as their contemporaries in many countries where TV is in operation, have averaged 1,000 hours each year looking at and listening to the TV—more time than they have spent listening to or looking at their “natural” parents. Though the parents know only the well-known movie and TV stars, the children know all the minor actors as well as the famous ones who appear on TV.

We have learned from behavioral science research that the speech patterning of the parents—the way in which the parents employ words—is of greatest importance to the IQ development of children between the ages of 4 and 7. If the parents using their minds seek to formulate their own thoughts and develop a good vocabulary and pronounce their words well, the children also are inspired to do so. If the parents don’t trust their own thoughts and use only other peoples cliches, and echo only other peoples judgments the children are inclined to forsake their highest intellectual capabilities and revert to muscle and cunning.

When I was young, in addition to the family voices and personalities with which all children are familiar, there were also the speech patterns of the postman, the grocer, our family’s cousins, uncles and aunts, and the friends who from time to time came from outside into our home. Television now provides the most prominent of all of these outside speech influences. But the TV personalities, thought of by the grown-ups as coming “from outside,” seem to the new generation to reside realistically inside the home, usually in the children’s own room. I, therefore, combine all the TV personalities into one which I call the “Third Parent.”

The children sense much more spontaneously than do the grown-ups that the people appearing on television in various roles and functions are just playing games which include their attempts to sell some product. The children too can all play games. They play "shoot grandmother" and don't mean it seriously. Nor do they take the TV stories and plays seriously as the parents fear they will.

What the children really sense about the TV actors which appeals to their fundamental survival senses is that those human beings are earning their living by *playing* their roles and the children sense spontaneously that TV actors get their jobs through good diction and verbal versatility. Often the television personalities have much better diction and vocabularies than have the TV viewing children's parents.

Parents are often away at work. The Third Parent—the TV—stays at home. When the blood parents come home, though they may be dearly loved and a welcome sight, their conversation is frequently of little or no informative or inspirational interest to the children who turn to their "Third Parent," who tells them all the major news about the world and not just about local trivia. Thus the "Third Parent" becomes both the most authoritative as well as *most interesting* and best spoken parent.

Lots of people were shocked when the Berkeley students said they felt no sense of loyalty to their college or to the United States. But further inquiry shows that they are not lacking in idealism or in compassion. The young people simply feel loyal to the whole human family. They refuse to accept yesterday's "you-and-me" cultivated biases. They feel that the whole world should be made successful for everybody. The TV bred youth also learn from their "Third Parent" all about the inventions of which men are capable—such as voyaging for thousands of miles under the polar ice and soft landings on the moon. They feel—quite reasonably—that man can produce *anything* he needs and wants.

Learning from the "Third Parent" that the majority of the human family is in trouble, the TV generation feels that its parents are much too locally preoccupied with irrelevant ideas and obsolete customs and are blinded by misinformedly conditioned reflexes. The young people see that we cannot correct such negatives as air and water pollution by local means for obviously the air and water flow everywhere around our planet and affect everybody, and thus, if anything may "belong" to anybody, they realize that the Spaceship Earth's prime resources belong to everybody. The young people

see clearly that we cannot control our environment until we gain enough confidence both in ourselves and others to permit us to use both our physical resources and our higher faculties to induce each one of us to deal as intelligently with all the world and all people as we would with our most trusted and beloved friends.

To be able to coordinate and take the initiative, the TV generation see that they must face up to these facts of the organic, omniinterdependence of our whole Spaceship Earth's component resources and people. The young feel the older ones are no longer capable of such realistic farsightedness. The older generation has been frustrated too long. It is too slavish and lacks fundamental confidence that techno-scientific innovations can be made to work and that man can be both physically and metaphysically successful. The older generation is wrong in its axiomatic assumption that all history teaches us that there is not enough for both of us and that it has to be "you or me to the death as there is not enough for us troth to live." This assumption automatically induces cunning and the conclusion that it is foolhardy to trust the other fellow.

The European people who first settled in North America put up little wooden houses to permit their survival in the rainy days and cold months. To live they had to employ nature's progressively disclosed biological regeneration scheme for maintaining life aboard Spaceship Earth. The heart of this scheme is to obtain energy from the sun by the photosynthetic chemistry of the green vegetation on the land and the algae in the water. Men and animals cannot impound sufficient sun energy directly through their skins to both survive and regenerate. Nor can man eat the energy-capturing trees and grasses. He can eat some of the fruits, a few leaves, nuts, and roots. The vegetation is consumed primarily by insects and animals which in a complex chemical energy relaying system—culminating in animal flesh—can eventually be eaten by man. In his early farmsteading, man had to spend all his daylight time *cultivating* high-bred vegetables, animals, and fruits; his pioneer housing was minimally conceived with just a few windows to enable the wife to see whereabouts in the fields her man might be so that she could find him quickly in an emergency.

As time went on man developed tools to improve and speed his work so that he had more time to spend around his house. He built a front porch to keep off the rain so that he could have a chance to sit, look around, think, and plan. Then with even more time saved by even better tools he found time to screen his front porch. Later with even more time, he glazed it. At first his young people used the parlor to do their courting. Later they resorted preferrably to the new palm-, rubber-tree-, and geranium- filled,

glassed-in porch—the "conservatory." Gradually, evolution, in effect, "put wheels" under the glassed-in front porch concept and. like a hydra's spawned new life, the front porch broke off and went rolling along the road in the form of the "automobile." The automobile, thus, became today's young people's parlor. That is where they do their courting—parked at the drive-in theater or elsewhere in their mini-sized mobile home.

The old farmsteads of a half century and more ago had a great many buildings, each of which employed associative or disassociative phases of energy as positive or negative heat to produce and maintain certain environmental conditions—of dryness, wetness, heat, or cold within which to preserve or process foods, fodder, and materials. The windmill, the woodshed, the icehouse, cowbarn, corncrib, hen house, hayloft, cold frame, and warm cellars, etc, were used to establish and sustain these preferred energy phase conditions. The subsequent development of electric refrigeration brought refrigeration into the house and obviated the wintertime's cutting of ice and its storage in a large separate icehouse from which cut-up cakes were brought progressively indoors and put piece by piece into the ice box. Thus, we were inadvertently innovating mechanizations for no one realized that those *buildings* were indeed machines and as all machines, they converted energy into work which in turn produced and maintained preferred environmental conditions—the environment itself always consisting of a complex interaction of different energy phase events.

Now I would like to get a little more scientific about what I've been saying: in 1927 I began to feel that in this total evolutionary process, man was extremely ignorant and vain. For instance, though our leading scientists have had 500 years opportunity to adjust themselves to their own theoretical knowledge and scientifically disciplined experimental findings they have always realistically "seen" and as yet "see" the sun going "down." All scientists continually use the words *up* and *down* although we know that no unique direction of the universe may be identified as either up or down. These words up and down were invented when mankind admittedly thought the earth was flat and that all perpendiculars to it were parallel to one another with one set of ends pointing up toward the heavens and with the other set of ends pointing in the opposite direction, ie, down toward hell. Today, the aviator finds as he flies around our spherical spaceship to China that his plane is up-side down in respect to the United States but not upside-down to himself or anyone else in the vicinity. Therefore, he has to formulate new terminology to accommodate his experience and eliminate the misconception.

As a consequence he now says that: he *"comes in* for a landing" and "goes *out"* when he "takes off." When people say up they really mean *out,* and when they say down they mean *in*—toward the center—the center of some specific, focal, unitary mass in the universe. Each individual inwardness is *unique* and specifically directional. The outwardness is *common* to *all* the individual in's and is omnidirectional. On televised programs of our manned satellites we frequently hear the ground control scientists and doctors saying to the astronauts in orbit, "How are things *up* there this morning, boys?" often asking this as the astronaut's around-the-earth zooming capsule is at the moment of querying in the direction of the inquiring scientist's feet.

All the foregoing is just to remind us how we are cerebrally booby-trapped by yesterday's misinformation-polluted mental stimulus environment. Possibly the most lethal pollution we have is the information pollution the effect of which is blinding us from seeing the costly eventualities of the more familiarly recognized water and atmosphere pollutions.

Young people have a very great advantage over us oldsters because they have so much less to unlearn. Much of my life has been of necessity invested in unlearning all the erroneous information that has been given to me as both curriculums and extracurriculums *education,* albeit often with the most loving motivations.

In 1927 I decided that all our hope for humanity's survival and possible prosperity lies in the young, because the older people in general are so preconditioned with error and are, conceptually, so statically and locally preoccupied that they are unable to deal competently with our Spaceship Earth as a complex life-regenerating energy processing system. They cannot break away to think and operate in the terms of our whole earth as an organic and entropic machine equipped and continually "refueled" by radiation from our mother spaceship, the Sun.

I had good reason to think that children may have clearer and less damaged brains and minds than grown-ups. Our first child died just before her fourth birthday. She was born at the end of World War I and in rapid succession caught the flu, infantile paralysis, spinal meningitis, and finally a fatal case of pneumonia. She was not able to run around like other children, so she used her brain and mind in most extraordinary ways in order to acquire the environment-comprehending information obtained by the physical experiments of normal children. She often spoke out anticipatorily the sentences about to be spoken by people around her, thus disclosing a degree of sensitivity otherwise unrevealed. I concluded that I was experiencing direct proof

that the young are born with a much greater brain capacity information-tuning range and mind capability than any of us have been accrediting to them. This made me feel, in 1927, when our second child was born five years after our first daughter died, that we had the unbelievable renewed opportunity and vital responsibility of trying to protect these higher capabilities and giving them a chance to develop. At that time, I committed the rest of my life to working on ways of reforming the environment—instead of trying to reform man—intent thereby to accommodate and protect humanity's probably much higher intellectual and productive potentials.

For too long we have been working under the false assumption that the young child's brain is in effect an empty receptable into which we may pour our precautions and know-how. The behavioral sciences are now disclosing that the young have innate faculties of comprehension and wisdom frequently surpassing the damaged cerebral equipment of the nonetheless "acceptably normal" older people.

I have tried to fashion an environment within which it is possible for the young to experiment without getting hurt and within which they can get the information they really need without their parents having to say "Don't" for fear the children may be hurt in one way or another. Within such a completely designed patterning of environmental events the children may experiment without something falling on their heads, when the parents don't say "don't" or are not around to "don't" them. When such accidents happen, the child subconsciously questions: "Why is the home environment so ignorantly organized that when I make experiments I must get hit on the head and be constrained spontaneously or be commanded to abandon my efforts to find out what I need to know regarding successful employment and enjoyment of my faculties and the resources about me?"

The environment is entirely dynamic that is to say it is a complex interaction of physical and metaphysical experiences of varying frequencies and quantum magnitudes. To each of us the environment is *everything that is not "me."*

It is essentially significant that, despite our having learned theoretically about the speed of light and the new thinking of Einstein, very few of us as yet think realistically in those supracomprehensible speed terms. Most people as yet think of universe as a single static, instantaneous, geometrical system whereas our universe is an aggregate of nonsimultaneous and only meagerly overlapping events each of which is continually transforming, disassociating, and reassociating in new ways. We now realize on deeper reconsideration that the *combined physical and metaphysical universe,*

as the aggregate of all humanity's consciously apprehended experiences, must also be taken to be a *complex aggregate of nonsimultaneous and only partially overlapping transformation* events with complementary, positive and negative, non-mirror-imaged, maximum and minimum, microcosmic and macrocosmic, associating and disassociating, compressive vs tensional, concave vs convex, inside-out vs outside-out, etc. limits.

We can clarify that accurate but formidably complex definition. A moving picture scenario is an aggregate of nonsimultaneous and only partially overlapping events. One single picture—one "frame"—does not tell the story. The single picture of a caterpillar does not tell or imply the transformation of that creature first into the chrysalis stage and much later into the butterfly phase of its life.

When people say of universe. "I wonder what is outside its outside?" they are trying to conjure a unitary conception and are asking for a single picture of an infinitely transforming nonsimultaneous scenario. Therefore, their question is not only unanswerable but unrealistic and indicates that they have not listened seriously to Einstein and are only disclosing their ignorance of its significance when they boastfully tell you that the speed of light is 186,000 miles per second.

Realizing that both the inside and outside environmental influences impinging upon man all originate with atoms, and are omnidirectional, I started off by thinking of how all the heretofore unrecognized, or unwelcomed micro-macro events might he turned to advantage. Instead of trying to insulate man against them, it seemed that I should try to learn what must be intercepted, how to intercept them, and how to turn them to human advantage?

Man needs lots of water but he can't use all the water while it rains so we must learn how to intercept that rain and shunt it into holding patterns—in cisterns or reservoirs—and then pipe it and valve it so that it may become controllably available in the increments and at the times most favorable to humanity's schedule of metabolic regeneration processing.

The total environment interaction going on is as beautifully designed as is the Spaceship Earth itself—aboard whose spherical hull men have been able to live for 2,000,000 years unaware that they were aboard ship—simply because they were so physically tiny that they rarely lived to see more than one millionth of its total surface.

Intent upon designing the most effective means of valving the environmental events to humanity's maximum advantage—in 1927 I set out to catalog all the things I could think of that ever happened to man. I thought this inventory might take months but it took only a few weeks. Later on I published this list On looking at it sometime afterwards, in neatly compressed print, my eye saw new patterning that I had not seen before. My eye happened to fall on a part of the list where "tornadoes" were listed next to "mosquitoes." This seemed suddenly to be so incongruous that I rearranged all the items in order of *relative severity* of hazard to human survival. This order ranged from "lethal" through "disastrous," "very dangerous," "fairly dangerous," "bothersome," to "innocuous," to "pleasant".

When all the items were arranged in strict order of relative severity a new pattern of surprising significance emerged. *It became apparent that the larger and more severe the event, the less frequently it occurred.* This is because in the expanding diffusion of ever moving, transforming, disassociating, and newly associating energy islands of universe the number of times that there will be large amounts of energy in one given place to bring about large transformations is inherently less frequent than the number of times there will be small amounts of energy in any one specific place to bring about relatively minute or meager transformations. We have "bugs" much more frequently than we have "earthquakes." Suddenly I realized that what we speak exactly of as "tornadoes" and "mosquitoes" may be very specifically identified in the hierarchy of energy events which form the Quantum Laws of relative *frequency* and *magnitude* of "waves" and "particles." Thus, an environment can really be analyzed and treated in powerfully selective scientific terms and predictable frequencies, magnitudes, and specific longevities of effectiveness. I began to realize that we can scientifically control these omniorginating and self-convergent energy event factors—to high human advantage.

It also became retrospectively visible that the universe is a dynamic continually evolving process within which man himself is continually evolving. Dr. Waddington, the famous animal geneticist of Edinburgh University, points this out when he speaks of what he calls the "epigenetic landscape" in which we have all of the biologicals continually altering the environment and the altered environment continually realtering the biologicals. There is manifest a chain reaction of extraordinary pattern interactions whose consequently progressive intertransforming we recognize as "evolution." Evolution is both you and I *and* the comprehensively dynamic, macro-micro environ-

ment—ie, universe. Due to entropy, the physical evolution of universe is irreversible. There are cyclic patterns which are repeated but not reversed. Only the metaphysical abstract thoughts can review and reconsider the evolutionary transformations, individually or collectively, but cannot "turn back the clock."

In view of all the foregoing we learn that the planning of new cities embodies possibilities for progressive attainment of highly favorable stages of ever more effective environmental event controlling.

I have been retained to develop a large city in Japan (up to possibly a million) and am also on the steering committee of an "Experimental City" to be situated in Minnesota. In studying these two projects, it has become evident that the basic concepts, drives, decisions, and actions of humans, which produced all the *great cities* around our Spaceship Earth occurred long before man had thought of electricity or telephone or any of the present technological advancements which are so greatly changing our lives. Cities developed around yesterday's patterns of caravan and ship trading. These points of exchange generated wealth not as much for the prime producers of the goods and services as for the entrepreneurs and for those who by prowess of physical might "protected" the trading with their swords and thus also sustained their sovereignty claims and deeds to the right to the land.

To sustain their fundamental economic advantage the land manipulating entrepreneurs enacted property laws as arbitrary accessories, only after the fact, of the anarchistic ways of permissive favoring of the independent uncoordinated enterprise multiplication of strategic land exploitations which result in the coral reef like random growths which we call cities.

City planners at university schools learn how to make good theoretical plans, but as practicing professionals they have no power to do anything but suggest. Their plans are continually disrupted and overridden by those who exploit our highly prized rights of free enterprise for exclusively selfish reasons. However, too shortsighted enterprise often takes advantage of society in thoughtless ways. In order to safeguard enterprise which also has many favorable evolutionary transformation advantages for nil of humanity, it is not necessary to allow some men to trespass shortsightedly on the evolutionary developments of their fellowmen. The almost totally anarchistic piecemeal development and remodification of cities exclusively for the benefit of the prime investors and without comprehensive consideration of the total welfare of all mankind for all future time is getting us into ever greater trouble.

In a very realistic sense all of society is beginning to realize that this is so and there is a powerful trend in basic drives of human consciousness towards the swiftest corrections which will not be too disruptive of the total evolutionary welfare of all humanity. In view of that evolutionarily emerging propulsion of human consciousness toward discovery of any other alternative courses of action, which may have hope of fulfillment, it is encouraging to discover at least one other realistic and much more socially promising way of looking at future city designing. This alternative derives from the observation that the *Queen Mary* is of course an extraordinarily beautiful and comprehensively organized small city. This lecture was given to the American Medical Association, April, 1967. Six months later Los Angeles decided to purchase the now competitively obsolete *Queen Mary* for a convention facility.

Such mammoth ships are not only the competent products of, comprehensively anticipatory, design science but are also the prime demonstration of the effectiveness of the general systems theory. General systems theory originated in the design and operation of world encompassing and commanding fleets of navy and merchant ships. For a few centuries the general system theory commanded and operated the world but only as anarchistic exploitation systems whose immediate and directly perceived profits went exclusively to the benefit of less than 1% of humanity.

I found in 1927 that one of the New York hotels happened to have the same number of passengers or occupants and the same amount of private and public space as the Cunard Line steamship, the *Mauretania.* I made a critical general systems theory analysis of their relative performance characteristics which were as follows: the hotel was able to get its supplies of food, linen, power, heat, and light daily for the local suppliers situated in the city—outside the hotel—and therefore did not have to include these capabilities within their structural design, while on the other hand the *Mauretania* did have to store on board a 30-day supply, had to generate its own power and light, and had to structurally support and float the weight of the engines and fuel to drive it through the sea at 30 knots. I found that if I turned the hotel over on its side in a horizontal position like the *Mauretania,* just one of the little waves that the *Mauretania* had to handle would break the hotel into pieces. Yet the hotel weighed 18 times as much per usable cubit foot than the ship. This was fairly typical of the difference between the fundamental technologies of the sea and the superficial and inefficient building contrivances of the land.

On land, men have thought in terms of fortresses and guarding their positions and of hoarding their supplies so the heavier and more durable the building, the more secure they feel. They thought of buildings as permanent while ships were designed for relatively short service.

The ship has first of all to float. Each more useful ship has to do more with less, have greater and greater strength, and be able to continually increase power without increasing its weight. The competition advantage goes always to the latest ship to do even more with less. Therefore, the design evolution is in constant acceleration on the sea and in the air but not on the dry land building.

The foregoing explains why it is possible for a whole organic city to be floated. It is also evident that in an organic floating city—which unlike the *Queen Mary* need not cross the ocean at 30 knots—but can remain anchored at a desirable location—the amount of weight which must be invested per each organic function can be decreased greatly.

We are actually undertaking this in Japan. Since this lecture was given the Japanese patrons have changed their plans and are now going in for a high tower community on the land. Fortunately, the idea of the floating city has been espoused by others and the project is going forward but in other waters than those of Japan.

The Japanese as island people think in terms of the sea so we are planning our first city to float on the ocean. Its floating hollow reinforced triangularly shaped concrete base will reach 100 feet below the water surface. This is well below the ocean turbulence depths. This means that the floating city will not rise and lower with the waves but will hold its "altitude" as does an island or iceberg. The waves will "break" against the floating base as they do on any breakwater. Inside the deep floating triangular base a vast lagoon will act as a large seagoing ship's harbor.

Ships that must be driven economically and swiftly through the seas must be long and sleek and therefore are subject to "beam" and "cantilever" stresses as they first span between waves and a moment later mount one big wave at their mid-length, their ends being partially out of the water. Such stress alternations twist and rack the ships. However bell buoys which remain anchored have no such asymmetric conformation and float integrally with but little redundant stressing even in great storms. The triangular base conformation of our organic floating city is similar to the bell buoy and will not permit any redundant stressing—and will therefore have maximum structural stability with minimum effort and therefore greatest economy.

The organic, floating city starts off with its prime power and water requirements at hand for it can combine atomic power reactor cooling and desalinization of the sea around it—by use of the by-product heat. Therefore, as practical experiment has now shown both water and electricity can be produced at lower costs than in any other known way for producing either independently of one another. The Japanese are not even mildly adverse to using dry packaging toilets instead of liquid "splash-back" toilets, which continually later pollute the conveying waters as the latter are shunted through the plumbing systems, enroute their passage from the sky as rain down the mountain sides, toward and into the sea system. Inasmuch as it is economical and desirable to have the food supplies inbound to our digestive system plastic packed, it becomes equally economical and desirable for the outgoing products to be electronically sealed in plastic packages for dry conveyance to chemical resource collection points, subsequently to chemical processing works, and finally to valuable by-products distribution uses.

I would like to point out here that, in relation to all our pollution problems of the air or water, very valuable chemical products are continually lost. For example, the stack fumes of one nonferrous metals refinery disgourges somewhere around $500 worth of chemical substances a day, but the cost of the precipitation would be about $500 so the company does not attempt to recover it for the cost of the installation could not be amortized. If air pollution control were really enforced, a lot of very valuable products could be salvaged at a real profit if we consider the far more gargantuan costs of society's ultimately coping with the physical ills resulting directly, and much later indirectly, from the fume-polluted atmosphere.

I mention this because, as you doctors begin to study environmental health problems in depth, if you apply general systems analysis—as the computers will now permit you to do—you will begin to know the overall profit and loss to society of doing or not doing thus and so. You also will inevitably encounter much inertia and shortsighted thinking which can be overcome only by education regarding the overall costs or profits to all human society—all of which must be inexorably paid for by some large numbers of humans sometime and somewhere about our Spaceship Earth's surface. It is therefore extremely important for you to be able to point out the ways in which atmospheric control will pay off magnificently and *that* you can now do with the computer's aid.

Dr. Benjamin Bloom, an educator in Chicago, author of the book [Blo64] *Stability and Change in Human Characteristics,* sets forth the results of his investigations of the critical effects of environment on the brains and minds of the young. These results were arrived at by a significant number of periodic tests under controlled conditions. Combining Bloom's observations and these of geneticists, neurologists, and the electromagnetic probers of the brain, we discern that the various apprehending and coordinating capabilities of the brain—as scheduled and actuated in the children by the unique chromosome "ticker-tapes" of each individual—are measurably affected by the environment of the individual. As far as we know by any experiments neither the environment nor anything else can produce a better intellect and brain than that with which we are born—but an unfavorable environment can very greatly impair the functioning of the innate faculties.

I have found that the ability of man to use his highest faculties to cope with his environment is more favorably affected by design science reformation of the inanimate environment than by direct legalistic, punitive, physiological, or psychological attempts to reform human beings. I am convinced that 90% of humanity's problems can be solved only by comprehensively anticipatory design science reformations of the environment.

I have made many experiments with measurably improved environmental controls in over 5,000 structures in more than 50 countries. Concurrently, over a period of 50 years I have continually undertaken to solve those design problems by use of the most advanced technologies for doing ever more with ever less fundamental resource investment per each unit of functional performance. It has, thus, been experimentally evidenced that by such ever more economical and more effective environment reforming means we have the greatest hope of achieving both physiological and economic Prosperity for all humanity. Furthermore, this environmental reformation strategy now seems to be both scientifically feasible as well as economically desirable.

In substantiation of that statement I find that my geodesic prime environment valving controls (this is my scientific identification of structural "dwelling machines." ie, geodesic buildings) are running only about 3% of the weight per enclosed cubic foot of the best known alternative engineering strategies for coping with the same given

magnitude of the omni-hazard events of nature. Furthermore, my geodesic structures can be put in place and in operation in fractions of the time for alternative structural strategies and unlike any other previous buildings are both 100% demountable as well as economically deliverable around the world by air transport.

The US building for Expo 67 was a very large energetic environment-controlling device. I am its architect I can tell you, therefore, that it was not put up there to be pretty or novel but simply to be the most economical tool for coping to advantage with all weather, and earthquake events. It is an effective energetic valve. It lets in what humanity needs and wants, when they most need and want those services in the most acceptable, useful, and necessary quantities, for instance, of light, air, and other chemical conditions of the atmosphere, sound, and olfactory conditions, and as tuned most compatibly with man's complex variety of frequencies and chemical energy increments.

Our Expo 67 geodesic environment valve is 20 stories high and 250 feet in diameter. Istambul's Santa Sophia Mosque or the enclosed volumes of any one of the great cathedrals of the world could be put inside it, for instance, Seville Cathedral in Spain. St. Peter's in Rome, or Notre Dame in Paris. The total US geodesic pavilion building weighs only 800 tons. This is approximately the weight of just one of the many internal stone columns in Seville Cathedral—the second largest such edifice in the world.

I find that I have improved thirty fold the environment valving capabilities of humanity as measured in terms of units of weight of structure per given performance schedule capabilities of that structure. Therefore the aerospace type of building technology which I employed in the Expo geodesic holds real promise to humanity of doing so much more with so much less in all branches of technology as to attain total success for all of Earth's inhabitants. The young world, seeing it, will feel encouraged. This is the first time at a world's fair that we have had a building designed specifically for its scientifically demonstrable high performance per units of invested weight, time, and energy. It is the first time in history that architecture has been presented exclusively in terms of efficiency of weight, energy, and time units of resource investment. The aesthetics of such an undertaking take care of themselves. Not an ounce of weight goes into the design, building, and outfitting of an America's Cup defender. That boat's beauty, as with a snowflake or a human being, is inherent in the exquisite economy of an exactly adequate performance capability.

Inasmuch as humanity on the land has not been thinking of what buildings weigh, it certainly has not been operating its construction industry on a performance per pound basis. Architecture has been superimposing millions of tons of superficial appeals to aesthetic applause to that already overbuilt land structuring.

Between 1900 and 1967 world society has inadvertently and all unpredictably gone from taking care of less than 1% of humanity to taking care of 40% of humanity at a higher standard of living than that known or dreamed of by any king before the 20th century. During the same period the metal resources of the earth, both mined and unmined, have continually decreased per each world human. Therefore the sudden advancement of 40% of humanity's living standards to an unprecedented and previously undreamed of degree has not resulted from finding more resources, but, paradoxically, from the development of weaponry where the inherent design requirements of the waterborne and the airborne and the space-borne weapon carriers—as the evolutionary products of the great international armaments race—have continually been accomplished by doing more with less. It is the unexpected fallout of that more-with-less technology into the domestic economy which alone has brought about the politically and commercially unpredicted improvement of the living standards for an ever increasing proportion of all humanity. This standard of living augmentation for ever larger numbers occurs every time an armaments producing contractor is displaced by a producer of newer and more efficient weapons technology. The displaced contractor then looks around in the domestic market for an outlet for this technologically high productive capability. Thus, for instance, refrigeration which developed in the ships of the navy 30 years earlier was brought ashore to land-based homes. This fallout is specifically responsible for all the great advances in our home technology.

The time has come when you, as medical men for all the people on the land must realize that what we are all faced with is the necessity for a revolution in our education which in turn will result swiftly in an around-the-world design revolution which will progressively rework our environment to favor humanity's innate potentials.

You are faced with the challenge of helping society to know what its problems are. You are going to be implemented by new educational technology which will make it possible to do much more accurate informing with so much less that your admonitions can be heeded. We have the technical wealth capabilities to carry out your suggestions so do not be inhibited or deterred from forthright suggestion as to what we now should

do if we wish humanity to succeed as Spaceship Earth's passengers. Science now says for the first time in history that Malthus is wrong. It is not normal for the majority of humanity to be, both or either, physical or economic failures. Science now realizes that it is normal for all of humanity to be a success. Failure is abnormal. That abnormality is wrought by the unnecessarily hostile conditions of the everyday environment on the majority of humanity.

But all the great ideologies of all the powerful nations are predicated upon Malthus and his assumptions that there is not enough to sustain both you and me. He assumed, erroneously, that eventually one of us must perish—far short of our potential lifespan—wherefore it seems popularly expedient for large sovereign country groups to implement themselves with big guns in preference to individuals seeking to survive independently with their separate little guns. Because of the foregoing all the ideologies on earth mistakenly assume and give highest wealth investment priority toward preparing for an inexorable Armageddon.

Because each department head of every industry in both the socialistic and private enterprise economies must make a "profit" of one kind or another, "this year" industry and commerce are inherently shortsighted. The politician's vision also cannot look beyond the next election. The only long distance-sighted activity of humanity is that which is focused upon Armageddon. Your own medical science has been underwritten first to ward off eventual death. It is toward this assumed eventuality that science has been almost exclusively fostered. Science has never had a mandate to make all of humanity a living success. This is because neither the great dictatorships nor the democratic electorate knew that comprehensive success was feasible. Science now says, however, that physical and economic success for all is feasible but that it cannot be accomplished with continuation of the political sovereignties which inherently frustrate the industrially essential integration of all the world's resources. Only a politically transcendental design science revolution can provide enough for all. The world's resources as now designedly employed can take care of only 44% of humanity. No strictly political act or revolution can per se correct that condition. And that condition attended to only by political leaderships means inevitable war.

Keep all the world's political systems in force and all the world's politicians and political workers at work, and at the same time take all the machinery of industrialization, all the tracks, pipes, and wires and dump them in the oceans away from all the countries of the earth, and within six months 2,000,000,000 people—half of

humanity—will die of starvation. Lacking the industrial tooling no political system could alter that result. Contrariwise, leave all the machinery, wires, pipes, and tracks in place and all the humans, who now operate them, at their daily tasks, but bike away all the world's politicians of any and all ideologies and send them and their party workers on a trip around the sun by a slow speed rocket ship and all those who are now eating will go on eating and with all the sovereign nation's barriers unmanned the foods will begin to cross the borders and the resources will be integrated and soon all of humanity will be eating and prospering.

Quite clearly world literacy of all the world's people regarding what the survival problems are must be placed on highest priority of educational undertaking if we are to avoid blowing ourselves up or so polluting our biosphere that the energetic regeneration of life on Spaceship Earth will soon become impossible.

As the body of professionals having the highest initiative potential your challenge is clear. Is it to be an environment of life or death? Is our Spaceship Earth's biosphere to be an *omnihumanity-sustaining environment* or an omnilethal one?

This is the imperative challenge to all of humanity's intellectual integrity.

It is not your challenge exclusively, but your potential contribution is of the magnitude of the highest order.

Will we muster our self-disciplining capabilities to transcend our ill-conditioned reflexes? Having done so will we go on to cooperate with our fellow men in the realization of our mutually successful potential?

If the design revolution is initiated by a few capable humans—just as Marconi, Edison, and the Wright brothers altered man's environmental advantage to a marked degree—then the inevitable emergencies ahead for humanity may bring the new tools into use which in turn will bring about the physical welfare of all.

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