

SYNERGETICS

Explorations in the Geometry of
Thinking

by

R. Buckminster Fuller

in collaboration with E. J. Applewhite

First Published by Macmillan Publishing Co. Inc. 1975, 1979.

Synergetics is copyrighted © 1997 by the Estate of R. Buckminster Fuller.

All rights reserved. Reproduction or use of text or pictorial content in any for profit manner is prohibited without express permission.

Contact the Estate of R. Buckminster Fuller for further information.

Address:

Estate of R. Buckminster Fuller
708 Gravenstein Highway, North #188
Sebastopol, CA 95472

Synergetics

Acknowledgment

Acknowledgment is gratefully made to John Entenza, the
Graham Foundation, Hugh Kenner,
Brooke Maxwell, Shoji Sadao, and Edwin Schlossberg
for their assistance in the production of this book.



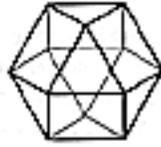


Table of Contents

- [Collaboration by E. J. Applewhite](#)
- [Dedication](#)
- [Scenarios](#)
- [Explicit](#)
- [Preface by A. Leob](#)
- [Moral](#)
- [A Note To The Reader](#)
- [Wellspring](#)
- [Humans In Universe](#)
- [100.00 Synergy](#)
- [200.00 Synergetics](#)
- [300.00 Universe](#)
- [400.00 System](#)
- [500.00 Conceptuality](#)
- [600.00 Structure](#)
- [700.00 Tensegrity](#)
- [800.00 Operational Mathematics](#)
- [900.00 Modelability](#)
- [1000.00 Omnitopology](#)
- [1100.00 Constant Zenith Projection](#)
- [1200.00 Numerology](#)
- [Afterpiece](#)
- [32 Color Plates](#)
- [Evolution of Synergetics: a portfolio
of six drawings made by the author in 1948](#)
- [Index](#)

A Note on Collaboration

The discoveries, concepts, vocabulary, phraseology-every word- and entire writing style of this book originate exclusively in the mind of R. Buckminster Fuller. My role has been strictly editorial: identifying, sorting out, and organizing the presentation of five decades of Fuller's thinking, continually confronting the author with himself.

E. J. A.



THIS WORK IS DEDICATED TO
H. S. M. COXETER
PROFESSOR OF MATHEMATICS
UNIVERSITY OF TORONTO

To me no experience of childhood so reinforced self-
confidence in one's own exploratory faculties
as did geometry. Its inspiring effectiveness in
winnowing out and evaluating a plurality
of previously unknowns from a few given
knowns, and its elegance of proof
lead to the further discovery and comprehension of a
grand strategy for all
problem solving.

By virtue of his extraordinary life's work in mathematics,
Dr. Coxeter is the geometer of our bestirring
twentieth century, the spontaneously acclaimed
terrestrial curator of the historical
inventory of the science of
pattern analysis.

I dedicate this work with particular esteem for him
and in thanks to all the geometers of all time
whose importance to humanity
he epitomizes.



Scenarios

Each scenario is a narrative sequence of geometrical exposition written-and intended to be read-as a separate continuity.

<u>Child as Explorer</u>	<u>100.01-100.63</u>
<u>Nature in a Corner</u>	<u>260.00-269.07</u>
<u>Complex Humans</u>	<u>311.11-311.18</u>
<u>Metaphysics</u>	<u>326.00-326.50</u>
<u>Pattern</u>	<u>505.50-505.83</u>
<u>Space</u>	<u>526.10-526.35</u>
<u>Spherical Gravity</u>	<u>646.10-646.22</u>
<u>Tensegrity</u>	<u>790.10-795.11</u>
<u>Annihilation</u>	<u>935.00-938.16</u>
<u>*Demass Model</u>	<u>986.00-986.874</u>
<u>Multiplication by Division</u>	<u>987.00-987.416</u>
<u>Geometry of Nine</u>	<u>1013.00-1013.64</u>
<u>Involvement Field</u>	<u>1033.00-1033.92</u>
<u>Minimum Topology</u>	<u>1044.00-1044.13</u>
<u>Physical Periodicities</u>	<u>1052.50-1052.71</u>
<u>Growth and Decay</u>	<u>1053.80-1053.85</u>
<u>Geometry of Two</u>	<u>1070.00-1077.11</u>
<u>Typewriter</u>	<u>1130.00-1133.04</u>

* The author suggests that beginning readers should start their explorations at the Demass Model: it presents a broad survey of the evolution of his geometry as well as a model of Einstein's equation.

Explicit: A note to the reader

Synergetics 1 and Synergetics 2 are separate volumes only because of their bulk and the chronology of their composition. They in fact comprise a single integral work. Each chapter in the first volume has been expanded in the second, and the sequence of paragraphs has been numbered to dovetail and provide a shared context.

It is the essence of synergy to produce unpredicted-indeed, unpredictable-results like the surprise geometrical discoveries of this second volume. Synergetics 2 continues the exposition of Fuller's radical geometrical cosmos with its landscapes of unfamiliar models and metaphors; it amplifies and amends-but does not supersede-the earlier volume published in 1975; it makes more explicit the significance of certain geometrical functions that are only implicit in Synergetics 1; and it introduces the term epistemography to describe Fuller's geometry of thinking. The two books together present descriptions that are explicit as well as contextual.

Buckminster Fuller employs the discipline of a lecturer, recommencing his expositions from the beginning, reviewing the previous experiments and recalls of experiences. His written discourse, like his speech, is replete with sustained narrative sequences that recapitulate the geometrical premises, ever starting back from the beginning . . . as Fuller says, like the pole vaulter who always goes back to the end of the cinder track before repeating his sprint.

Although the apparatus of section numbers is handy as a key to context and essential for indexing and for cross-reference, it tends to obscure the logical continuity of certain passages that merit the reader's sustained attention. For this reason the Table of Contents is supplemented with a Table of Scenarios. The new reader seeking an avenue into the work should choose from the list of Scenarios as a guide; those seeking a specific topic may refer to the Table of Contents.

The index and cross-references in Synergetics 2 refer to both volumes; references to Synergetics 1 are in roman numbers and those in Synergetics 2 in italic numerals.

- E. J. Applewhite
Washington, D.C.
19 February 1979

Preface

by **Arthur L. Loeb**

The appearance of this sizable book is symptomatic of a considerable revival of interest in geometrics, a science of configurations. Configurations observed in the sky constitute the laboratory of our oldest science, astronomy. Patterns and regularities were discerned, and speculations regarding the influence of celestial configurations on terrestrial existence gave rise to scientific as well as mystical systems of natural philosophy. The dividing line between these two is at times surprisingly diffuse, and varies throughout history.

Platonic and Archimedean solids and such plane figures as the Pentagram were powerful tools of Applied Magic. The Age of Reason banished such configurations to the realm of superstition: their power was denied. Orthogonality prevailed, being rational and very earthbound. Interest in geometrics declined. Buckminster Fuller's search for a natural and truly rational coordinate system eventually led to the tensegrity concept and the construction of geodesic domes. Polyhedra and pentagrams, being proven useful after all, have been rescued from the limbo of superstition. Now the danger exists that geometrics will become respectable once more, and it behooves us to take a good look at the very unorthodox peregrinations of Fuller's mind before stepping into the inviting straitjacket. One of the most intriguing aspects of the present book is that there are so few *ex post facto* rationalizations; Fuller allows us to share his methods, his meanderings, the early influences.

Like his great aunt Margaret, Fuller is a transcendentalist: he discerns patterns and accepts their significance on faith. His is not the burden of proof: the pattern is assumed significant unless proven otherwise. If Fuller had been burdened by the necessity of proof, he would have been too hamstrung to continue looking for significant patterns. His own biographical notes in *Synergetics* show us a mind that accepts information in a highly unorthodox fashion and refuses to swallow the predigested. In rejecting the predigested, Fuller has had to discover the world all by himself. It is not surprising, in fact rather reassuring, that the obvious should emerge alongside the novel, the obscure together with the useful. Posterity will have to draw the line between the mystical and the scientific, a line that will

certainly have to be redrawn from time to time.

Fuller expresses himself metaphorically: his poems sometimes convey his meaning more lucidly than his prose. Gertrude Stein's language really becomes unintelligible only when analyzed; the sentence "Entropy is not random; it is always one negative tetrahedron" (Synergetics, Sec. 345) is worthy of a place in American literature next to Miss Stein's. And if happiness be a warm puppy, why should not entropy be a negative tetrahedron? I have learned never to reject one of Fuller's outrageous statements without careful consideration, and even hesitated to call "Sum of angels around each vertex" in the rough manuscript a misprint. The truth has usually turned out far stranger than Buckminster Fuller!

Fuller is a Janus: grass-rooted in the past, he creates beacons for the very young. Ivy-trained, he rejected academic discipline and was highly honored by his alma mater. In each of these aspects, there is a strong parallel with an older contemporary, also a latter-day transcendentalist New Englander: composer Charles Ives. Their playful intuitive experiments nowadays inspire the most serious, abstract, and learned of the avant-garde. While there is no evidence of a mutual influence between the two, there appears to be considerable overlap among their apostles. The Compleat Geometrist might think, not of a circle of admirers, but of confocal ellipses of apostles around these two focal men, a dangerous simile if one is to conclude that the inner ellipse would be the most eccentric one!

The appearance of Synergetics seems to mark a watershed; Fuller has this Januslike quality, looking far into the future with an almost old-fashioned intuitive approach. The danger of respectability, alluded to previously, lies in the loss of this innocence, in the guile that kills creativity.

Fuller's hope for the future lies in doing more with less. Again and again he discovers that there is no such thing as continuity and the infinitesimal: with sufficient resolution we find that we look at a very large, but finite number of very small, but finite multiples, put together with very great, but attainable ingenuity. There always appears to be a structure. Computer technology has already moved in the direction of doing more with less. The cost of a modern computer would scarcely be affected if it were made of the most precious metals, for material-wise there is not very much to a computer. What counts is the knowledge of how to put things together to perform usefully. Knowledge is the tool of today and tomorrow and the hope of the day thereafter: education will be the greatest tool-making

industry!

The first prerequisite for continued education is a receptiveness to one's environment. Calluses worn through a faulty environment dull the learning senses. We must educate ourselves to do more with less in creating a suitable environment. Vicious circle? Nonsense: Fuller tells us that no curve can overlap with itself ! This is an upward spiral into which Fuller propels us. There is no alternative.



Moral of the Work

Dare to be naive.

Please do not refrain from reading this book because you have become suspicious that a comprehensive inventory of discovery precludes further discovery.

It is one of our most exciting discoveries that local discovery leads to a complex of further discoveries. Corollary to this we find that we no sooner get a problem solved than we are overwhelmed with a multiplicity of additional problems in a most beautiful payoff of heretofore unknown, previously unrecognized, and as-yet unsolved problems.

A complex of further discoverabilities is inherent in eternally regenerative Universe and its omni-interaccommodative complex of unique and eternal generalized principles. It is inherently potential in the integrity of eternal regeneration and the inherent complexity of unity that god is the unknowable totality of generalized principles which are only surprisingly unveiled, thereby synergetically inaugurating entirely new, heretofore unpredicted-because unpredictable-ages .

Each age is characterized by its own astronomical myriads of new, special-case experiences and problems to be stored in freshly born optimum capacity human brains-which storages in turn may disclose to human minds the presence of heretofore undiscovered, unsuspectedly existent eternal generalized principles.

- R B F

Author's Note on the Rationale for Repetition in This Work

It is the writer's experience that new degrees of comprehension are always and only consequent to ever-renewed review of the spontaneously rearranged inventory of significant factors. This awareness of the processes leading to new degrees of comprehension spontaneously motivates the writer to describe over and over again what-to the careless listener or reader-might seem to be tiresome repetition, but to the successful explorer is known to be essential mustering of operational strategies from which alone new thrusts of comprehension can be successfully accomplished.

To the careless reader seeking only entertainment the repetition will bring about swift disconnect. Those experienced with the writer and motivated by personal experience with mental discoveries-co-experiencing comprehensive breakthroughs with the writer-are not dismayed by the seeming necessity to start all over again inventorying the now seemingly most lucidly relevant.

Universe factors intuitively integrating to attain new perspective and effectively demonstrated logic of new degrees of comprehension that's the point. I have not forgotten that I have talked about these things before. It is part of the personal discipline, no matter how formidable the re-inventorying may seem, to commit myself to that task when inspired by intuitive glimpses of important new relationships-inspired overpoweringly because of the realized human potential of progressive escape from ignorance.

Introduction: The Wellspring of Reality

We are in an age that assumes the narrowing trends of specialization to be logical, natural, and desirable. Consequently, society expects all earnestly responsible communication to be crisply brief. Advancing science has now discovered that all the known cases of biological extinction have been caused by overspecialization, whose concentration of only selected genes sacrifices general adaptability. Thus the specialist's brief for pinpointing brevity is dubious. In the meantime, humanity has been deprived of comprehensive understanding. Specialization has bred feelings of isolation, futility, and confusion in individuals. It has also resulted in the individual's leaving responsibility for thinking and social action to others. Specialization breeds biases that ultimately aggregate as international and ideological discord, which, in turn, leads to war.

We are not seeking a license to ramble wordily. We are intent only upon being adequately concise. General systems science discloses the existence of minimum sets of variable factors that uniquely govern each and every system. Lack of knowledge concerning all the factors and the failure to include them in our integral imposes false conclusions. Let us not make the error of inadequacy in examining our most comprehensive inventory of experience and thoughts regarding the evolving affairs of all humanity.

There is an inherently minimum set of essential concepts and current information, cognizance of which could lead to our operating our planet Earth to the lasting satisfaction and health of all humanity. With this objective, we set out on our review of the spectrum of significant experiences and seek therein for the greatest meanings as well as for the family of generalized principles governing the realization of their optimum significance to humanity aboard our Sun circling planet Earth.

We must start with scientific fundamentals, and that means with the data of experiments and not with assumed axioms predicated only upon the misleading nature of that which only superficially seems to be obvious. It is the consensus of great scientists that science is the attempt to set in order the facts of experience. Holding within their definition, we define Universe as the aggregate of all

humanity's consciously apprehended and communicated, nonsimultaneous, and only partially overlapping experiences. An aggregate of finites is finite. Universe is a finite but nonsimultaneously conceptual scenario.

The human brain is a physical mechanism for storing, retrieving, and re-storing again, each special-case experience. The experience is often a packaged concept. Such packages consist of complexly interrelated and not-as-yet differentially analyzed phenomena which, as initially unit cognitions, are potentially re-experienceable. A rose, for instance, grows, has thorns, blossoms, and fragrance, but often is stored in the brain only under the single word-rose.

As Korzybski, the founder of general semantics, pointed out, the consequence of its single-tagging is that the rose becomes reflexively considered by man only as a red, white, or pink device for paying tribute to a beautiful girl, a thoughtful hostess, or last night's deceased acquaintance. The tagging of the complex biological process under the single title rose tends to detour human curiosity from further differentiation of its integral organic operations as well as from consideration of its interecological functionings aboard our planet. We don't know what a rose is, nor what may be its essential and unique cosmic function. Thus for long have we inadvertently deferred potential discovery of the essential roles in Universe that are performed complementarily by many, if not most, of the phenomena we experience. But, goaded by youth, we older ones are now taking second looks at almost everything. And that promises many ultimately favorable surprises. The oldsters do have vast experience banks not available to the youth. Their memory banks, integrated and reviewed, may readily disclose generalized principles of eminent importance.

The word generalization in literature usually means covering too much territory too thinly to be persuasive, let alone convincing. In science, however, a generalization means a principle that has been found to hold true in every special case.

The principle of leverage is a scientific generalization. It makes no difference of what material either the fulcrum or the lever consists-wood, steel, or reinforced concrete. Nor do the special-case sizes of the lever and fulcrum, or of the load pried at one end, or the work applied at the lever's other end in any way alter either the principle or the mathematical regularity of the ratios of physical work advantage that are provided at progressive fulcrum-to-load increments of distance outward from the fulcrum in the opposite direction along the lever's arm at which the

operating effort is applied.

Mind is the weightless and uniquely human faculty that surveys the ever larger inventory of special-case experiences stored in the brain bank and, seeking to identify their intercomplementary significance, from time to time discovers one of the rare scientifically generalizable principles running consistently through all the relevant experience set. The thoughts that discover these principles are weightless and tentative and may also be eternal. They suggest eternity but do not prove it, even though there have been no experiences thus far that imply exceptions to their persistence. It seems also to follow that the more experiences we have, the more chances there are that the mind may discover, on the one hand, additional generalized principles or, on the other hand, exceptions that disqualify one or another of the already catalogued principles that, having heretofore held "true" without contradiction for a long time, had been tentatively conceded to be demonstrating eternal persistence of behavior. Mind's relentless reviewing of the comprehensive brain bank's storage of all our special-case experiences tends both to progressive enlargement and definitive refinement of the catalogue of generalized principles that interaccommodatively govern all transactions of Universe.

It follows that the more specialized society becomes, the less attention does it pay to the discoveries of the mind, which are intuitively beamed toward the brain, there to be received only if the switches are "on." Specialization tends to shut off the wide-band tuning searches and thus to preclude further discovery of the all-powerful generalized principles. Again we see how society's perverse fixation on specialization leads to its extinction. We are so specialized that one man discovers empirically how to release the energy of the atom, while another, unbeknownst to him, is ordered by his political factotum to make an atomic bomb by use of the secretly and anonymously published data. That gives much expedient employment, which solves the politician's momentary problem, but requires that the politicians keep on preparing for further warring with other political states to keep their respective peoples employed. It is also mistakenly assumed that employment is the only means by which humans can earn the right to live, for politicians have yet to discover how much wealth is available for distribution. All this is rationalized on the now scientifically discredited premise that there can never be enough life support for all. Thus humanity's specialization leads only toward warring and such devastating tools, both, visible and invisible, as ultimately to destroy all Earthians.

Only a comprehensive switch from the narrowing specialization and toward an ever

more inclusive and refining comprehension by all humanity-regarding all the factors governing omnicontinuing life aboard our spaceship Earth-can bring about reorientation from the self-extinction-bound human trending, and do so within the critical time remaining before we have passed the point of chemical process irretrievability.

Quite clearly, our task is predominantly metaphysical, for it is how to get all of humanity to educate itself swiftly enough to generate spontaneous social behaviors that will avoid extinction.

Living upon the threshold between yesterday and tomorrow, which threshold we reflexively assumed in some long ago yesterday to constitute an eternal now, we are aware of the daily-occurring, vast multiplication of experience generated information by which we potentially may improve our understanding of our yesterdays' experiences and therefrom derive our most farsighted preparedness for successive tomorrows.

Anticipating, cooperating with, and employing the forces of nature can be accomplished only by the mind. The wisdom manifest in the omni-interorderliness of the family of generalized principles operative in Universe can be employed only by the highest integrity of engagement of the mind's metaphysical intuiting and formulating capabilities.

We are able to assert that this rationally coordinating system bridge has been established between science and the humanities because we have made adequate experimental testing of it in a computerized world-resource-use-exploration system, which by virtue of the proper inclusion of all the parameters-as guaranteed by the synergetic start with Universe and the progressive differentiation out of all the parts-has demonstrated a number of alternate ways in which it is eminently feasible not only to provide full life support for all humans but also to permit all humans' individual enjoyment of all the Earth without anyone profiting at the expense of another and without any individuals interfering with others.

While it takes but meager search to discover that many well-known concepts are false, it takes considerable search and even more careful examination of one's own personal experiences and inadvertently spontaneous reflexing to discover that there are many popularly and even professionally unknown, yet nonetheless fundamental, concepts to hold true in all cases and that already have been discovered by other as

yet obscure individuals. That is to say that many scientific generalizations have been discovered but have not come to the attention of what we call the educated world at large, thereafter to be incorporated tardily within the formal education processes, and even more tardily, in the ongoing political-economic affairs of everyday life. Knowledge of the existence and comprehensive significance of these as yet popularly unrecognized natural laws often is requisite to the solution of many of the as yet unsolved problems now confronting society. Lack of knowledge of the solution's existence often leaves humanity confounded when it need not be.

Intellectually advantaged with no more than the child's facile, lucid eagerness to understand constructively and usefully the major transformational events of our own times, it probably is synergetically advantageous to review swiftly the most comprehensive inventory of the most powerful human environment transforming events of our totally known and reasonably extended history. This is especially useful in winnowing out and understanding the most significant of the metaphysical revolutions now recognized as swiftly tending to reconstitute history. By such a comprehensively schematic review, we might identify also the unprecedented and possibly heretofore overlooked pivotal revolutionary events not only of today but also of those trending to be central to tomorrow's most cataclysmic changes.

It is synergetically reasonable to assume that relativistic evaluation of any of the separate drives of art, science, education, economics, and ideology, and their complexedly interacting trends within our own times, may be had only through the most comprehensive historical sweep of which we are capable.

There could be produced a synergetic understanding of humanity's cosmic functioning, which, until now, had been both undiscovered and unpredictable due to our deliberate and exclusive preoccupation only with the separate statistics of separate events. As a typical consequence of the latter, we observe our society's persistent increase of educational and employment specialization despite the already mentioned, well-documented scientific disclosure that the extinctions of biological species are always occasioned by overspecialization. Specialization's preoccupation with parts deliberately forfeits the opportunity to apprehend and comprehend what is provided exclusively by synergy.

Today's news consists of aggregates of fragments. Anyone who has taken part in any event that has subsequently appeared in the news is aware of the gross disparity between the actual and the reported events. The insistence by reporters upon having

advance "releases" of what, for instance, convocation speakers are supposedly going to say but in fact have not yet said, automatically discredits the value of the largely prefabricated news. We also learn frequently of prefabricated and prevaricated events of a complex nature purportedly undertaken for purposes either of suppressing or rigging the news, which in turn perverts humanity's tactical information resources. All history becomes suspect. Probably our most polluted resource is the tactical information to which humanity spontaneously reflexes.

Furthermore, today's hyperspecialization in socioeconomic functioning has come to preclude important popular philosophic considerations of the synergetic significance of, for instance, such historically important events as the discovery within the general region of experimental inquiry known as virology that the as-yet popularly assumed validity of the concepts of animate and inanimate phenomena have been experimentally invalidated. Atoms and crystal complexes of atoms were held to be obviously inanimate; the protoplasmic cells of biological phenomena were held to be obviously animate. It was deemed to be common sense that warm-blooded, moist, and soft-skinned humans were clearly not to be confused with hard, cold granite or steel objects. A clear-cut threshold between animate and inanimate was therefore assumed to exist as a fundamental dichotomy of all physical phenomena. This seemingly placed life exclusively within the bounds of the physical.

The supposed location of the threshold between animate and inanimate was methodically narrowed down by experimental science until it was confined specifically within the domain of virology. Virologists have been too busy, for instance, with their DNA-RNA genetic code isolatings, to find time to see the synergetic significance to society of the fact that they have found that no physical threshold does in fact exist between animate and inanimate. The possibility of its existence vanished because the supposedly unique physical qualities of both animate and inanimate have persisted right across yesterday's supposed threshold in both directions to permeate one another's-previously perceived to be exclusive-domains. Subsequently, what was animate has become foggier and foggier, and what is inanimate clearer and clearer. All organisms consist physically and in entirety of inherently inanimate atoms. The inanimate alone is not only omnipresent but is alone experimentally demonstrable. Belated news of the elimination of this threshold must be interpreted to mean that whatever life may be, it has not been isolated and thereby identified as residual in the biological cell, as had been supposed by the false assumption that there was a separate physical phenomenon

called animate within which life existed. No life per se has been isolated. The threshold between animate and inanimate has vanished. Those chemists who are preoccupied in synthesizing the particular atomically structured molecules identified as the prime constituents of humanly employed organisms will, even if they are chemically successful, be as remote from creating life as are automobile manufacturers from creating the human drivers of their automobiles. Only the physical connections and development complexes of distinctly "nonlife" atoms into molecules, into cells, into animals, has been and will be discovered. The genetic coding of the design controls of organic systems offers no more explanation of life than did the specifications of the designs of the telephone system's apparatus and operation explain the nature of the life that communicates weightlessly to life over the only physically ponderable telephone system. Whatever else life may be, we know it is weightless. At the moment of death, no weight is lost. All the chemicals, including the chemist's life ingredients, are present, but life has vanished. The physical is inherently entropic, giving off energy in ever more disorderly ways. The metaphysical is antientropic, methodically marshalling energy. Life is antientropic. It is spontaneously inquisitive. It sorts out and endeavors to understand.

The overconcentration on details of hyperspecialization has also been responsible for the lack of recognition by science of its inherently mandatory responsibility to reorient all our educational curricula because of the synergetically disclosed, but popularly uncomprehended, significance of the 1956 Nobel Prize-winning discovery in physics of the experimental invalidation of the concept of "parity" by which science previously had misassumed that positive-negative complementations consisted exclusively of mirror-imaged behaviors of physical phenomena.

Science's self-assumed responsibility has been self-limited to disclosure to society only of the separate, supposedly physical (because separately weighable) atomic component isolations data. Synergetic integrity would require the scientists to announce that in reality what had been identified heretofore as physical is entirely metaphysical-because synergetically weightless. Metaphysical has been science's designation for all weightless phenomena such as thought. But science has made no experimental finding of any phenomena that can be described as a solid, or as continuous, or as a straight surface plane, or as a straight line, or as infinite anything. We are now synergetically forced to conclude that all phenomena are metaphysical; wherefore, as many have long suspected-like it or not-life is but a dream.

Science has found no up or down directions of Universe, yet scientists are personally so ill-coordinated that they all still personally and sensorially see "solids" going up or down-as, for instance, they see the Sun "going down." Sensorially disconnected from their theoretically evolved information, scientists discern no need on their part to suggest any educational reforms to correct the misconceiving that science has tolerated for half a millennium.

Society depends upon its scientists for just such educational reform guidance. Where else might society turn for advice? Unguided by science, society is allowed to go right on filling its childrens' brain banks with large inventories of competence-devastating misinformation. In order to emerge from its massive ignorance, society will probably have to rely exclusively upon its individuals' own minds to survey the pertinent experimental data-as do all great scientist-artists. This, in effect, is what the intuition of world-around youth is beginning to do. Mind can see that reality is evolving into weightless metaphysics. The wellspring of reality is the family of weightless generalized principles.

It is essential to release humanity from the false fixations of yesterday, which seem now to bind it to a rationale of action leading only to extinction.

The youth of humanity all around our planet are intuitively revolting from all sovereignties and political ideologies. The youth of Earth are moving intuitively toward an utterly classless, raceless, omnicooperative, omniworld humanity. Children freed of the ignorantly founded educational traditions and exposed only to their spontaneously summoned, computer-stored and -distributed outflow of reliable-opinion-purged, experimentally verified data, shall indeed lead society to its happy egress from all misinformedly conceived, fearfully and legally imposed, and physically enforced customs of yesterday. They can lead all humanity into omnisuccessful survival as well as entrance into an utterly new era of human experience in an as-yet and ever-will-be fundamentally mysterious Universe.

And whence will come the wealth with which we may undertake to lead world man into his new and validly hopeful life? From the wealth of the minds of world man-whence comes all wealth. Only mind can discover how to do so much with so little as forever to be able to sustain and physically satisfy all humanity.

Humans in Universe

000.100 Introduction to [10 Color Posters](#)

000.101 The combined land areas of Africa, Europe, and Asia embrace within their perimeters the Mediterranean, Black, Caspian, Aral, China, Arabian, Red, Baltic, and North seas: altogether their area was historically thought of only as a flat Universe sandwiched between heaven above and hell below and seemingly stretching away to infinity in all lateral directions. Yet the total land area of this flat world constitutes less than 17 percent of the subsequently-discovered-to-be-spherical Planet Earth's surface. All the great empires of written history before A.D. 1500 lay well within that "known" flat world: it was and as yet remains the spontaneous theater of popular historical conceptioning.

000.102 How did this pervading historical concept become outdated? What changed the terrestrial conceptionings adopted by the leaders of the world's power structures?

000.103 When the archaeologists' artifact-proven history of mathematics opens 4,000 years ago in Babylon and Mesopotamia, it is already a very sophisticated science. Mathematics may well have had its beginnings much earlier in India or Indochina, as it is an art and science that has traveled consistently westward. Over 3,000 years ago the Greeks made further magnificent contributions to geometry, algebra, and calculation. Then about 2,000 years ago the Roman Empire all but obliterated mathematics. A little more than 1,000 years ago Arabs and Hindus traveling through North Africa began to restore some of the ancient mathematics to the westward-evolving culture. When al-Khwarizmi's original A.D. 800 treatise on algebra was republished in Latin in Carthage in 1200, it required a further 200 years for his elucidation of the function of zero-the cipher-to be diffused into the university systems of Europe .

000.104 The cipher made possible the positioning of numbers, which in turn facilitated division and multiplication. Imagine trying to multiply or divide with Roman numerals . . . impossible! The Renaissance began with the new calculating facility introduced by the cipher. The cipher was not only an essential tool in the work of Copernicus, Kepler, Galileo, and Newton, but it also brought about Columbus' revised concepts of terrestrial navigation. It went on to instrument the mechanical and leverage calculation capabilities of Leonardo; and in the art of ship

design the cipher gave birth to structural and mechanical engineering, which made possible the intertensioning and compressioning calculations of the ribbed structural strength of a sailing vessel as well as that of its vast wind-energy-driven complex of compression and tension spars, sails, and rigging-replacing the trial-and-error guesswork that had previously been used in naval and land architecture. This capability in mathematical multiplication and division opened up a whole new field of safely anticipated structural engineering and navigation.

000.105 This new anticipatory science made large engineering projects possible, but it became known to, and then was employed by, only the world's richest schemers, monarchs, nations, and pirate enterprisers. No others could afford to buy great ships. With more powerfully engineered ships, humans emerged westward through Gibraltar to explore the Atlantic, to sail around Africa, to reach the Orient and the Pacific by water, and to circumnavigate the globe. Thus it became public knowledge that the old open-edged, infinite world system had closed back on itself in all circumferential directions to become a finite system: a closed sphere. The monarchs and merchants realized that, within that closed system, whoever commanded the line of most efficient high seas supply would become the masters of world wealth. Ships could carry cargoes that overland caravans could not.

000.106 In 1600 the East India Company was founded as a private enterprise by Queen Elizabeth and a small group of her intimates. The limited legal liability of their enterprise was granted by royal decree, and its projects were thereafter militarily sustained and protected by Great Britain's Royal Navy and colonial troops. In England the East India Company College was established to train the officers of the enterprise for their world-wide deployment; that college and its handsome campus are still in operation as of 1979. The British Empire became the first in history of which it could be said that the Sun never set.

000.107 As professor of economics at the East India Company College in 1810 Thomas Malthus became the first economic authority ever to receive in toto the vital statistics of a world-embracing spherical empire. At the very end of the 18th century Malthus published his documented thesis that humanity was multiplying its numbers at a geometric (exponential) rate of gain while increasing life-support production at only an arithmetic (linear) rate of gain. And since the Earth is a finite, closed-system sphere, it apparently became scientifically manifest that there is a fundamental inadequacy of life support on our planet. Until then all opinions on such matters had been pure guesses.

000.108 A third of a century after Malthus, Darwin attributed biological evolution to survival of only the fittest species (and individuals within species). Though he denied there was any economic significance in his theory of evolution, the economists insisted that superior physical fitness obviously governed economic survival as well. Karl Marx accepted the scientific viewpoints of both Malthus and Darwin when he declared in effect that the working class is the fittest to survive: they know how to use the tools and to cultivate the fields-the wealthy are parasites. This inaugurated the supranational concept of two world-wide political classes and two competing theories of political organization.

000.109 As a consequence of the discoveries of Malthus and Darwin all the great political ideologies have since adopted a prime philosophy that says: "You may not like our political system, but we are convinced that we have the fairest, most logical, and ingenious method of coping with the inherent inadequacy of terrestrial life support, but since there are others who disagree diametrically about the best method of coping, it can be determined only by force of arms which system is the fittest to survive." Thus survival of the physically fittest became the basis for national departments of defense with their priority of access to the most advanced science and technology. The military took command of all the highest performance materials, brains, instruments, and tools of production.

000.110 Mutually assumed survival-only-of-the-fittest is the reason why the United States and the USSR have for the past 30 years appropriated 200 billion dollars annually to buy ever more effective weapons of potential destruction. The great political and industrial power structures have all become supranational comprehensivists, while the people have been passport-chained to their respective 150 national preserves-the people have become educationally divided into "specialists" for exploitation by the supranational powers who divide to conquer and divide to keep conquered.

000.111 Up until the 20th century reality consisted of everything that humans could see, smell, touch, and hear. Then at the entry into the 20th century the electron was discovered. A century after the time of Malthus much of science became invisible with the introduction of an era of electronics, electromagnetics, and atomics. These invisible micro- and macro-exploring cosmic instruments provided for rearrangements of atomic interpositioning whose metallic alloying and chemical structuring produces ever more powerful and incisive performances per

pound of physical matter employed.

000.112 Structures are complexes of visible or invisible physical events interacting to produce stable patterns. A structural system divides Universe into all Universe outside the structural system (macrocosm) and all Universe inside the structural system (microcosm). Newton's discovery of mass interattraction showed that the interattraction force of atoms, planets, stars, or galaxies increases exponentially as the interdistances decrease arithmetically, and vice versa: halve the interdistance and make fourfold the interattractive integrity of the remotely bodied structural system. That is the law of gravity. Symmetrical, noncontacting, concentric interpositioning of already-symmetrical arrays of atoms produces exponentially increased interatomic coherence of "materials."

000.113 Gravity is the inwardly cohering force acting integratively on all systems. Radiation is the outwardly disintegrating force acting divisively upon all systems.

000.114 All structural systems are comprised of tension and compression components. Stone masonry has a high compression-resisting strength of 50,000 pounds per square inch ultimate. But masonry has low tensional coherence; it can withstand only 50 pounds per square inch tensing. Stone-Age-derived masonry is a thousand times more effective in its resistance to compression than to tension.

000.115 Throughout the three million known years of the Stone Age humans relied on gravity to hold their vertical stone walls together until (as often happened) they were shaken apart by earthquakes against which they had almost no tensionally cohering resistance. Gravity pushed humanity's stone structures inward toward the Earth's center. Humans had to build their structures on bedrock "shoes" to prevent them from sinking vertically into Earth's center. Stone buildings could not float on water. But nature had invented low-weight wood of high self-cohering tensile strength (averaging approximately 10,000 p.s.i.) and of relatively low compression-resistive capability (also approximately 10,000 p.s.i.). Wood floated on water and could move useful loads horizontally; wood made good rafts for transporting humans but not for floating heavy cargoes. Thus the high tensile strength of wood, combined with the human discovery of the intertrussing principles of structuring and the low overall displacement weights involved, made possible for humans to design and fabricate air-enclosing wooden vessels whose structure and space enclosure combined to produce highly successful wooden vessels of the sea that could carry great cargoes.

000.116 In the 1850s humans arrived at the mass production of steel, an alloy of iron, carbon, and manganese having a tensile strength of 50,000 p.s.i. as well as a compression-resisting capability of 50,000 p.s.i. Steel has the same compression-resistance capability as masonry, but it also has a thousand times greater tensile capability than masonry and five times the tensile or compressive strength of wood. Steel brought mankind a structural-tension capability to match stone's previous millions of years of exclusive compressional supremacy. With far higher tensile strength per weight than wood, steel made possible even more powerful watertight, air-containing vessels than did wood, even though steel by itself does not float.

000.117 The technology of metallurgy began developing metal alloys of ever higher strength-to-weight ratios. Out of this came aluminum production by the opening of the 20th century-and aluminum alloys and stainless steel by the 1930s. These new materials made it possible to design and build engine-powered all-metal airplanes (structural vessels), which could pull themselves angularly above the horizontal and ever more steeply aloft. With the advent of successively higher strength-to-weight ratios of metal alloys and glass-reinforced plastic materials, ever more heavily laden airplanes were designed, which could climb ever more steeply and faster. Finally humans developed so much strength per weight of materials capability that they accomplished "vertol" jet plane flight and vertical space-vehicle blastoffs. Since then human scientists developing ever greater strength per weight of material have gone on to carry ever greater useful loads in vertical takeoff vehicles at ever more accelerated rates of ascent.

000.118 As of the 1970s the human mind has developed a practical tensile structuring capability of 600,000 p.s.i. The means of accomplishing this new and overwhelming structural strength has become entirely invisible. Fully 99 percent of humanity has as yet no idea that this increase in tensile capability has come about or how it came about or why it works. While humans cannot see the ever-lessening interatomic proximity of atoms and electrons of electromagnetic events, they can witness the ever more vertical takeoff-angle capabilities manifesting human comprehension of the fundamental structuring principles and their military developments and profitable commercial uses. But only vast money investments or vast governments can afford to exploit the increased technical advantages.

000.119 Before the airplane humans said, "You cannot lift yourself by your bootstraps." Today we are lifting ever lighter and stronger structural vessel "selves"

by ever less effort of our scientific know-how bootstraps. No economist knows this. It is the most highly classified of military and private enterprise secrets. Industry now converts the ever-increasing work capacity per pound of materials invested primarily to yield monetary profits for the government-subsidized private-enterprise producers of weapons.

000.120 Now in the 1970s we can state an indisputable proposition of abundance of which the world power structures do not yet have dawning awareness. We can state that as a consequence of the myriad of more-with-less, invisible, technological advances of the 20th century, and employing only well-proven technologies and already mined and ever more copiously recirculating materials, it is now technically feasible to retool and redirect world industry in such a manner that within 10 years we can have all of humanity enjoying a sustainably higher standard of living-with vastly increased degrees of freedom than has ever been enjoyed by anyone in all history.

000.121 During this 10-year period we can also phase out all further use of fossil fuels and atomic energy, since the retooled world industry and individual energy needs will have become completely supplied by our combined harvests of electromagnetic, photosynthetic, chemical, and biological products of the daily energy income initially produced by Sun and gravity. Industry, retooled from weapons production to livingry production, will rehouse the deployed phases of world-humans by single-family, air-deliverable, energy harvesting, only-rentable dwelling machines. When humans are convergent, they will dwell in domed-over moon-crater cities that will be energy-harvesting and -exporting centers rather than energy sinkholes.

000.122 All of the foregoing makes it possible to say that since we now know that there is a sustainable abundance of life support and accommodation for all, it follows that all politics and warring are obsolete and invalid. We no longer need to rationalize selfishness. No one need ever again "earn a living." Further living for all humanity is all cosmically prepaid.

000.123 Why don't we exercise our epochal option? Governments are financed through taxation and would have no way of putting meters between the people and their directly received individual cosmic incomes. So too, private enterprise should no more meter the energy than it meters the air. But all of Earthians' present power structures-political, religious, or capitalist-would find their interests disastrously

threatened by total human success. They are founded upon assumption of scarcity; they are organized for and sustained by the problems imposed by the assumption of fundamental inadequacies of life support.

000.124 Why does not the public itself demand realization of its option for a revolution by design science? Less than one percent of humanity now knows that the option exists; 99 percent of humanity cannot understand the mathematical language of science. The people who make up that 99 percent do not know that all that science has ever found out is that the Universe consists of the most reliable technology. They think of technology as something new; they regard it as threatening both in terms of modern weaponry and as job-eliminating competition for their life-sustaining opportunities to "earn a living." Ergo, humanity thinks it is against technology and thinks itself averse to exercising its option.

000.125 The fact that 99 percent of humanity does not understand nature is the prime reason for humanity's failure to exercise its option to attain universally sustainable physical success on this planet. The prime barrier to humanity's discovery and comprehension of nature is the obscurity of the mathematical language of science. Fortunately, however, nature is not using the strictly imaginary, awkward, and unrealistic coordinate system adopted by and taught by present-day academic science.

000.126 Nature's continuous self-regeneration is 100 percent efficient, neither gaining nor losing any energy. Nature is not employing the three dimensional, omniinterperpendicular, parallel frame of the XYZ axial coordinates of academic science, nor is nature employing science's subsequently adopted gram/centimeter/second weight/area/time exponents. Nature does not operate in parallel. She operates in radiational divergence and gravitational convergence. She grows outwardly by omniintertriangulated structuring from nuclei.

000.127 Nature is inherently eight-dimensional, and the first four of these dimensions are the four planes of symmetry of the minimum structure of Universe-the omnitriangulated, equi-vector-edge tetrahedron. In respect to the conceptual pre-time-size tetrahedron's volume taken as unity 1, with its six unit-vector-edge structure, the always conceptual-independent-of-size family of primitive, pre-time-size, least complex polyhedra have the following exact volumes-the vector-triangulated cube 3, the octahedron 4, the rhombic triacontahedron 5, and the rhombic dodecahedron 6. When the size information is introduced, it occurs only as

frequency of modular subdivision of each unit vector structuring of the primitive family's respective 1-, 2-, 3-, 4-, 5-, and 6-tetravolumes. Frequency to the third power, F^3 , values then multiply the primitive, already-four-dimensional volumetric values. In physically realized time-size each has therefore $4 + 3 = 7$ dimensions, but since each system is inherently independent in Universe and therefore has spinnability, one more dimensional factor is required, making a total of eight dimensions in all for experientially evidencing physical reality.

000.1271 To define the everywhere-and-everywhen-transforming cosmic environment of each and every system requires several more intercovarying system dimensions-planetary, solar, galactic, intergalactic. Because of the six positive and six negative degrees of freedom governing systems-within-systems intertransforming, we have $8 + 6 = 14$ dimensional systems in cosmic relationship governance.

000.128 Nature is using this completely conceptual eight-dimensional coordinate system that can be comprehended by anyone. Fortunately television, is spontaneously attractive and can be used to teach all the world's people nature's coordinating system-and can do so in time to make it possible for all humanity to favorably comprehend and to exercise its option to attain universal physical success, thereby eliminating forevermore all world politics and competition for the right to live. The hydrogen atom does not have to compromise its function potential by first "earning a living" before it can function directly as a hydrogen atom.

000.129 Nature's coordinate system is called Synergetics-synergy means behavior of whole systems unpredicted by any part of the system as considered only separately. The eternally regenerative Universe is synergetic. Humans have been included in this cosmic design as local Universe information-gatherers and local problem-solvers in support of the integrity of the eternal, 100-percent-efficient, self-regenerative system of Universe. In support of their cosmic functioning humans were given their minds with which to discover and employ the generalized laws governing all physical and metaphysical, omniinteraccommodative, ceaseless intertransformings of Universe.

000.130 At present 99 percent of humanity is misinformed in believing in the Malthusian concept of the fundamental inadequacy of life support, and so they have misused their minds to develop only personal and partisan advantages, intellectual cunning, and selfishness. Intellectual cunning has concentrated on how to divorce

money from true life-support wealth; second, cunning has learned how to make money with money by making it scarce. As of the 1970s muscle, guns, and intellectual cunning are ruling world affairs and keeping them competitive by continuing the false premise of universal inadequacy of life support. If mind comes into supreme power within a decade, humanity will exercise its option of a design revolution and will enter a new and-lasting epoch of physical success for all. If not, it will be curtains for all humanity within this century.

000.131 In complement with Synergetics 1 and 2 the posters at [color plates 1-10](#) may clarify for everyone the few scientific conceptions and mathematical tools necessary for universal comprehension and individual use of nature's synergetic geometrical intertransformings.

Footnote:

Rudyard Kipling labored under the only-you-or-me philosophy, but he was inspired by thoughts that it might some day be otherwise:

And no one will work for money and no one will
work for fame
But each for the joy of working, and each in his
separate star,
Shall draw the Thing as he sees It for the God of
Things as They are!"

- from *When Earth's Last Picture Is Painted*
