
The wide notice given to Marshall McLuhan's work in recent years is in large measure the result of his holistic, comprehensive approach toward science, technology, and culture. Although similar, R. Buckminster Fuller's method of intellectual investigation is fragmented because he places far less emphasis on the relation of technology to culture. His philosophical interests stem from his intense fascination with modern science and technology as exterior environmental controls. These controls began to emerge in their present form with the development of writing in Greek civilization. Whereas preliterate man sought to control the energies of the cosmos by merging with it, Western man has until very recently set himself apart from his surroundings and used science and technology to analyze, harness, and manipulate...
natural forces and objects in an attempt to become superior to his environment. In order for this act of abstraction of self from the external world of live process to occur, it was first necessary to discover Nature.

In his classic work, Empire and Communications, Harold Innis notes that the Greek discovery of nature has been described as one of the greatest achievements of the human mind since it was the basis of the idea of universal law. It assumed the detachment of self from the external object, the concern of intelligence with the practical needs of action in dealing with the object, and a belief in unseen supernatural powers behind or within the object. Separated from theology, science denied the distinction between experience and revelation, the natural and the supernatural (1972, 65).

Marshall McLuhan maintains that "the detachment of self from the external object" which took place in Greek culture was a result of their adoption of phonetic literacy. With the introduction of the phonetic alphabet into the oral culture of Greece, there began that substitution of the eye for the ear that inevitably reduces all order to visual order:

Visual space is both the hidden assumption and the 'natural' space of Western man. It imposes a visual framework of separate centers with fixed boundaries, clear perspectives, and private points of view upon all existence. Visual space structure is continuous and either contains or excludes definable components or specified properties. It demands yes - or - no matching of 'case-hardened' categories. It transforms 'magic' into science or 'reverse magic'. It eliminates all but visual premises 'scientifically' by reducing diversity and uniqueness to the uniformity
of common denominators. In visual space everything is logically connected, and sequentially ordered in its proper time and proper place. It is the space of Euclid, Descartes, and Newton (1972 b).

As the discipline of the Greek alphabet began to impose its new visual order upon the "buzzing confusion" of the old aural-oral world, literate Greeks invented Nature by abstracting it out of total existence. Literate culture created cosmos out of chaos by producing psychic detachment, the repeatable "second look." It was this perceptual habit induced by phonetic literacy and later reinforced by typography that created Western philosophy, science, and industry.

During the Industrial Revolution of the eighteenth and nineteenth centuries, the functioning of industry, the market, and society alike became based on mechanical principles of abstract visuality. Adam Smith and the classical economists equated the market with nature itself. This gave rise to the doctrine that every value was for exchange and every soul had its price. The old Greek world of Nature had become the content of the new mechanical environment. The clock, the printing press, and subsequent mechanization translated feudal man out of depth involvement in social role into the replaceable part or fragmented job-holder of industrial society.

Today as the new electrical environment of organic interdependence and inclusiveness rapidly encompasses the old mechanical environment of isolation and exclusiveness, we become increasingly aware of the fact that each new environment is, in effect, a new social process that transforms people. In the past our failure to study and to anticipate the psychic and social consequences of human-made environments has meant that, unwittingly, we have been processed by our own technological extensions.
In his encyclopedic study of our own culture, *The Gutenberg Galaxy*, Marshall McLuhan demonstrated how the agents of phonetic literacy and typography alone were sufficient to urge Western societies toward uncontrolled growth or "progress" and rampant technological change. In *Understanding Media*, he elaborated on the role of the human sensorium as the medium responsible for all psychic and social change. He maintains that "a theory of cultural change is impossible without knowledge of the changing sense ratios effected by various externalizations of our senses" (1962, 42). Sense ratios change when any sense or bodily or mental function is externalized in technological form. Because the human sensorium is the only medium between exterior environments, "natural" or technological, and the mind, our mental processes vary in response to quantitative and qualitative changes in sensory inputs. These changes affect human apprehension and judgment through stimulation and sedation of the organs and faculties of perception, memory, and cognition. Thus when one sense becomes an environmental figure, it transforms the ground of human consciousness, both private and corporate. Since any extension of the sensorium by technological dilation has an appreciable effect in setting up new ratios and proportions amongst and between our senses or "wits" and faculties, any dominant technology will alter the ways in which entire populations feel, think, and act.

McLuhan's definition of imagination is "that ratio among the perceptions and faculties which exists when they are not embedded or outered in material technologies. When so outered, each sense and faculty becomes a closed system. Prior to such outering there is entire interplay among experiences" (1962, 265). Medieval philosophers knew that full interplay or synesthesia among sensory modalities and mental faculties is prerequisite to creative
intuition and basic to all cognitive processes. It was St. Thomas Aquinas who explained how the modalities of Being are proportional to our modalities of intellection. And it is Francis Bacon in *The Advancement of Learning* who reminds us of Aquinas when he states that "the truth of being and the truth of knowing are one, differing no more than the direct beam and the beam reflected" (1959, 191).

Speech Is The Original Technology of Redemption

According to Bacon, Adam before the Fall possessed powers of unblemished intuition which he used to pierce all mysteries and to name them like a nominalist magician. After the Fall, Adam's faculties for metaphysical contemplation were impaired and he became imprisoned and impassioned by physical needs and desires. McLuhan emphasizes that "Bacon's conception of applied knowledge concerns the means of restoring the text of the Book of Nature which had been defaced by the Fall, even as our faculties have been impaired" (1962, 189). As the last of the patristic humanists, Bacon shared the belief of the Fathers of the Church that all of the arts are forms of applied knowledge for the sake of diminishing the effects of the Fall. Of first importance to the patristic humanists was the art of speech. Innumerable arguments from Christian revelation were brought to support the Greek and Roman conceptions of the great value of excellent speech. McLuhan stresses that one of the most frequently expressed concerned Adam before the Fall. Adam possessed not only eloquence but great metaphysical knowledge, as evident in his first work, the imposition of names on all parts of creation. After the Fall man was permitted to recover some of his former excellence by painful cultivation of the arts. Speech was the first which enabled
men to rise from the brutishness in which they were sunk (1943, 48).
The Fathers believed that the cultivation of excellent speech would bring men into closer association with the supreme eloquence which is the Word of God.

In discussing the ancient doctrines about the nature and value of the art of speech, the young McLuhan affirms what was to be a lifelong dedication to Christian humanism and exhibits his early abhorrence of industrialization. He states that:

the art of speech is the most immediately practical concern of life, the acquisition of which is inseparably associated with the acquisition and exercise of moral and political virtue. It naturally looks to, and leads on to, the speculative virtues of Wisdom and Science. But nothing could be more expressive of the confusion of the orders of knowledge, nothing could be more disastrous for the moral and political welfare of free men than the view of eloquence and the cultivation of letters as ends in themselves, as a dilettante concern of impractical men, or the view that Mechanica or technology affords the key to practical knowledge.

Technology cannot bring in the century of the common man. It can merely reduce man to his lowest common denominator as a consuming animal. If technology is to minister to free men, men must struggle to acquire the practical disciplines related to speech as they have never struggled before. For in acquiring excellent speech men acquire the heritage of our entire civilization. They acquire the ability to act freely and critically and to recreate daily the social freedoms which reflect their rational natures (1943, 49).

McLuhan here takes the traditional humanistic
approach towards culture and technology. Humanism subordinates technical efficiency to culture and distinguishes between technical knowledge and power and true culture.

To a technocrat like Buckminster Fuller, however, science and technology are comprehensive disciplines which in themselves afford the keys to practical knowledge and to human welfare. Fuller sees the beginnings of industrialization in the spoken word because it is a communications medium including at least two people: "Words are the first industrial tools, for inherently they involve a plurality of men and are also inherently prior to relayed communication and integration of the respective experiences of a plurality of individuals" (1969, 39). Although McLuhan agrees that words are tools, he argues that vernacular languages are superior to all other technological forms because speech is the most inclusive means of uttering or outering human sensation and awareness. No other single technology encompasses a comparable range of sensibility, thought, and environmental action. As the collective embodiments of the wisdom and experience of the race, languages provide the raw materials with which the disciplinal poet or humanist constructs anti-environments or counter-environments to the sensory, psychic, and social effects of any and all other technologies.

Is Comprehensive Non-Specialism the Province of the Scientist or the Humanist?

Fuller's indifference to the achievements of literary poets and humanists stems from his awareness that many writers have had an aversion to industrialization and mass production. He agrees with C. P. Snow's observation that the languages and interests of the scientists and literary intellectuals have drifted apart because poets of the early nineteenth century and
afterwards failed to comprehend the significance of industrialization. Many, indeed, "abhored industrialization's every symptom. This occurred despite the fact that the Royal Society of Arts was formed in England in the 1750's by the literary intellectuals and learned scientists for the very purpose of anticipating and fore-stalling this dichotomy" (Fuller, 1969, 67). What Fuller does not realize, however, is that the invention of printing had much to do with the separation of art and science and with the development of the scientific method. Since this method was the means through which universal laws were now revealed, it was inevitable that science would claim superiority over literature and the arts. In discussing Bishop Sprat's History of the Royal Society (1677), McLuhan observes that "it follows from Sprat's position (which tries to follow Bacon) that the modern scientist or philosopher is the true poet"(1962, 235). Fuller agrees with this view and emphasizes his poetic role. He also shares the old belief of the members of the Royal Society in the progress of society through the illumination of science and technology.

Fragmentation of sensibility and thought brought about by phonetic literacy and typography made it possible for art and science to go their specialist, divergent ways from the sixteenth century onwards. The Founders of the Royal Society merely gave institutional recognition to a psychic and social process that was already well-established. The view that science and technology alone afford the keys to the progress of man reminds us that the word "progress" must always be thought of in the context of man's fallen condition. It might be said that whereas the goal of the patristic humanists had been to remove the curse of the Fall, the goal of modern science and technology is to remove the curse of being human.

As we shall see later, Fuller is convinced
that science and technology are the principle means of raising humanity from its depraved condition. McLuhan, on the other hand, regards the ongoing process of technological innovation as a kind of cannibalism by which the human user becomes the content of his or her own extensions. Any invention or technology is an extension or self-amputation of our physical bodies which sets up new ratios or equilibriums among other technologies and among our inner senses and faculties. The process of technological displacement and accommodation in the outer world brings about cultural readjustments as human beings adapt to the sensory and psychic characteristics imposed by new communications media. This transformation occurs automatically and subliminally. It is a kind of "closure" of experience and imagination that forces us to embrace any extension of ourselves in technological form. McLuhan states that "it is this continuous embrace of our own technology in daily use that puts us in the Narcissus role of subliminal awareness and numbness in relation to these images of ourselves. By continuously embracing technologies, we relate ourselves to them as servomechanisms" (1964, 46).

To understand and control technological environments, McLuhan advocates an encyclopedic program of studies. He takes the Baconian position that "the text of Nature can be restored by great encyclopedic fact-finding sweeps. Man's wits can be reconstructed so that they can once again mirror the perfected Book of Nature" (1962, 185). As a means to an end, McLuhan studied the model of the Ciceronian program of applied studies in vogue during the Renaissance. He admires the Ciceronian concept of the doctus orator and the idea of eloquence as a kind of wisdom, as knowledge in action. Like Cicero, he regards the complete orator as the ideal philosopher, ruler, citizen. The encyclopedic poet employs metaphor and analogic to speak elo-
quently as a non-specialist on all subjects or branches of learning. He makes highly specialized disciplines such as logic subordinate to grammar and rhetoric. It is here worth noting that McLuhan's ideal of eloquence as a learned wisdom is "inseparable from *Egklios Paideia* (encyclopedia, the circle of the sciences). It was this conception of the integral nature of knowledge as a total field that led to the program called the *trivium* and the *quadrivium*," a program which continued during the Renaissance and which persisted in England and Europe well into the eighteenth century (1968b, 53). Gradually, however, new scientific knowledge created specialisms that broke up the unity of the encyclopedic ideal.

Antithetic to Ciceronian humanism is the specialist notion of human activity based on the scholastic disciplines of logic and dialectics. These form the philosophical basis of the scientific method and of modern bureaucracy and industry. Buckminster Fuller grew up in New England where Puritanism and abstract methods of science, technology, and high finance have formed a curious amalgam. The scholastic current was particularly strong there and, in general, education in "the North has followed scholastic lines, showing more concern for abstract method and technology than for the *res publica*" (McLuhan, 1969a, 226).

Fuller is unique in that he is an inventor who is fascinated with abstract methodology and technology, yet dedicated to what he thinks is comprehensive non-specialism. He stresses that whereas the functioning of science is exclusive, the functioning of design is comprehensive (1969, 189). He shares McLuhan's enthusiasm for holistic, non-specialist, interdisciplinary approaches to learning. He knows that human knowledge can no longer be compartmentalized.

Fuller regards himself as a Comprehensive
Designer who is "an emerging synthesis of artist, inventor, mechanic, objective economist, and evolutionary strategist" (1969, 176). The Comprehensive Designer sees the production of more and more consumer goods and services as the means to a greater social good: his goal is to use greater technical efficiency and productivity to provide continuously advancing standards of living for a steadily increasing percentage of the world population in order that mankind can enjoy more ease and self-development.

Although he knows that all the "profound developments in the exterior and interior relationships of man and his privately inter-communicated intelligence are precisely bound up with the mechanics of his environment," (1969, 117) Fuller does not explore adequately the relationships that exist between human beings and their technological creations. In concentrating on man's "external disorders" of material production and consumption brought about by malfunctioning of the technological organism, he ignores those interior ills of man that arise from unchecked technological innovation. "Comprehensive design science" is, in fact, a fragmented discipline. Fuller leaves the "internal organism of man" in the hands of medical doctors, thus brushing aside the work of modern poets and humanists.

The Medium of the Senses Is the Vital Link Between Ourselves and the World, the Interior and the External Landscapes

Unlike Fuller, McLuhan, by focusing on the medium of the human senses, explores the relationship of the interior world of human consciousness and sensibility to the outer landscape of our everyday activities. This interest relates to his earlier literary studies of the external landscapes of the English Romantic poets and the interior landscapes of the French
symbolists, especially Baudelaire and Rimbaud, who had developed all sorts of new literary techniques as a way of capturing the multifacetedness of speech. Symbolism attempted to capture a much larger portion of human speech and awareness by breaking up sentences and language and by reassembling the bits into new patterns. The techniques worked out by the symbolists enabled them to begin exploring the anatomy of consciousness itself about the same time that medical science discovered the many facets of man's inner landscape. McLuhan observes that over a century ago, in 1868, Claude Bernard, the French pioneer of interior medicine, was elected to the French Academy. His phrase le milieu intérieur came at the same time that the French Symbolists were inventing le paysage intérieur. This interior landscape, the successor to the external landscape of the Romantic poets, was deliberately programmed as a teaching machine, as it were, as appears in the very opening lines of Eliot's 'Love Song of J. Alfred Prufrock':

Let us go then, you and I,
When the evening is spread out against the sky
Like a patient etherised upon a table;
These lines wittily summarize both the first and second Romantic movements. The outer world of the setting sun is juxtaposed with the inner landscape of the patient's interior (1968 b, 115).

Three centuries before Claude Bernard's pioneering discoveries in internal medicine and the shift by Rimbaud and Baudelaire to the paysage intérieur, "the arts and sciences were engaged in the conquest of the milieu extérieur, by means of new visual quantity and homogeneity derived from the printed word. And it was print that enabled letters and numbers to go their specialist ways to the confusion of art and
science ever since" (1962, 182). The stress and prominence given to the visual sense above the other senses by phonetic literacy and typography preoccupied the Western world for 2,500 years. In the process of creating an environment built on visual assumptions alone, Western humanity lost its sensitivity to the psychic and social characteristics generated by the other senses.

To a great degree, Buckminster Fuller is still engaged in the old conquest of the **milieu extérieur**. His appreciation of what he calls "the literary intellectuals" extends no further than the time of the first Romantic movement. According to Marshall McLuhan, this movement is concerned mainly with Euclidian and Newtonian space. The second one takes us 'through the looking glass' into the space-time world of modern physics. The first space is continuous and connected and uniform. It is a visual space. The second space is discontinuous and not uniform and not connected. It is auditory or tactile space or kinetic or proprioceptive. As D. H. Lawrence wrote of it:

Still, and sensitive, and active,
Audile, tactile, sensitiveness as of a tendril which orientates and reaches out,
Reaching out and grasping by an instinct more delicate
than the moon's as she feels for the tides.

The first space is one that permits detachment and objectivity. The second kind demands empathy and involvement. The second Romantic movement naturally concentrated upon the effect (1968b, 115).

The work of Marshall McLuhan belongs to the **second Romantic movement**. For him psychogenesis results from the activities of our senses, interior and proprioceptive and exterior and receptive. Synesthesia creates those mental
events or psychic happenings which trigger the life of things within the mind.

Do Noumenalism and Puritanism Take Us Out of the Human Dimension?

Both the poets of the first and second Romantic movements emphasize the role of the senses in opening the doors of perception. Fuller rejects this approach. His attitude toward human experience and knowledge is noumenal rather than phenomenal. He stresses that one "now has to think beyond the limits of yesterday's politics, beyond the limits of yesterday's personal ambitions. By 'personal' we mean the limited dimensions of the lower order senses" (1969, 203). His thinking corresponds to that of the Greek Parmenides who concluded that the sensate life is out of touch with true reality. In abstracting visual principles of uniformity, continuity, and connectedness from the natural world, literate Greeks discovered visual or pictorial space. When such space was interiorized and dilated in the mind, its characteristics became the basis of the new "rational" thought, a peculiar reality seemingly unaffected or unblemished by sensory phenomena.

Fuller ranks the receptive senses according to the speeds at which they relay data to us. In placing vision at the top of his sensorial hierarchy, Fuller exhibits the typical bias of Western societies: "Fortunately for man, he has always subconsciously asked to see the vital phenomena. Thus he 'witnesses'" (1969, 202). For Fuller, the tactile sense is our "lowest-order faculty" and any velocity less than the speed of light is scarcely worth our notice:

Man's voice travels the telephone circuit, wired or wireless, at one hundred and eighty-six thousand miles per second. Sunbathing, he 'sees' heat waves with his skin, received at one hundred and eighty-
six thousand miles per second which is distinctly normal to his reality. Man spontaneously relegates his other sensorial faculties to secondary consideration. He can only hear by air-waves arriving at the tawdry velocity of one fifth of a mile per second. He can rarely smell events occurring at a mile's distance, but, aided by a hurricane, may receive his 'whiffed' report at one fiftieth of a mile per second. Man can acquire tactile report at ranges no greater than that of his fingertip. He can grope no faster than one thousandth of a mile per second. Held to apprehension of the phenomena of the universe by his groping tactile faculty alone, the velocity factor becomes approximately nil (1969, 202).

Even 186,000 miles per second is "relatively very slow compared to the man-invented nonsense called "instantaneous," that is, infinite - super-billions-of-miles-in-no-time-at-all"(1969, 202). Although Fuller considers the word "instantaneous" to be a meaningless term of measurement, electronic communication at the speed of light is indeed instantaneous insofar as life on this planet is concerned. Relative to individual perception and cognition, even the speed at which the central nervous system functions (about 300 mps) is instantaneous. To value our sensory modes merely according to their respective capacities for fast, exterior informational transfer is whimsical.

Fuller believes in a process of "delimited thought" divorced from the "paltry dimensions of life as serviced preponderantly by hearsay, smellsay, and touchsay" (1969, 202). Our faculties of sense perception must be subordinated to "the faculties of highest order -- instrumented science" (1969, 202). Fuller maintains that most of sensuous experience is irrelevant to scientific progress because "better than ninety-
nine percent of modern technology occurs in the realm of physical phenomena that is sub or ultra to the range of human sensibility" (1969, 275). This does not mean, however, that modern science and technology have no important relation to the human sensorium.

McLuhan believes that major scientific paradigms themselves reflect sensory biases. For example, he regards the space-time world of modern physics as audile-tactile in its very nature. Its discontinuities and heterogeneities have succeeded the continuous, connected, static, and uniform (visual) space of Euclid and Newton. The discontinuous and dynamic properties of acoustic space are also apparent in the microcosmic realm where, according to Linus Pauling, the basis of chemical bonding is resonance. When physicists discovered the duality of field and particle, they tried to determine which was prime, not realizing that "they had discovered acoustic space in the sub-atomic world" (McLuhan, 1969 b, n.p.). McLuhan also states that number, the language of science, is an extension and separation of our most intimate and interrelating activity, our sense of touch.

Since the human sensorium is the only medium between ourselves and the external world, there can be no human rationality or "scientific objectivity" separate from sense perception. Changes in interrelationships between the arts and sciences and conflicts between various cultures can be explained in terms of sensory events. For it is in the interplay of the sense ratios themselves that all processes of psychic and social growth and transformation are born.

In pointing out that "our ability to apprehend galaxies and sub-atomic structures, as well, is a movement of faculties that include and transcend them," (1964, 35) McLuhan draws our attention to the miraculous activity of the common sense or sensus communis, the lattice or sense ratio that includes and transcends the
life of the senses. Via this medium our experiences of inner and outer worlds are transformed into metaphysical happenings -- the acts of human perception and cognition. James Joyce saw "that the dance of being, the nature imitated by the arts, has its primary analogue in the activity of the exterior and interior senses," and was also "aware that this doctrine (that sensation is imitation because the exterior forms are already in new matter) is implicit in Aquinas" (McLuhan, 1969 a, 32).

By denigrating the value of our sensory modes of apprehension, Fuller undermines his role as a social engineer. While it is true that his program of applied studies, comprehensive design science, favors an organic, non-specialist interrelation of exterior phenomena, he has no comparable program for man's inner life. He seeks to remedy the "maladies of the industrial organic evolutionary growth" without having any knowledge of the effects that technological innovation and proliferation have on man's organs, senses, and functions, and on his cultural evolution. He therefore has no appreciation of the nature of the internal maladies brought about by various technologies. Since industrialization is "the external organism of man" and thus part of our integral Beings, it affects all aspects of our lives. McLuhan insists that new technologies change sensory inputs, sense ratios, and mental processes, thereby altering human apprehension and judgment, private and collective. If this is so, it is pointless for Fuller to rank the senses merely according to what he describes as their respective velocities of informational report. The reader who seeks to find an explanation of Fuller's hostile attitude toward the senses will find it in the strong influence that New England Puritanism has had on his work.

It is evident that Fuller sees modern technology as the vehicle for embodying Puritan
theology on a mass scale. He believes that "when the environment is scientifically conceived and rendered, the human occupants can then divest themselves of the necessity of one-rous and Puritanic hardship of conduct and yet accomplish successful and happy living in naturally engendered sanity" (1969, 114). He says "that the words sane and sanitary, which both derive from the Latin sanus, meaning healthy, sound or wholesome, originally intended to communicate that the integrity of original process or phenomena remained unblemished" (1969, 115). The phrase "the integrity of original process" is, of course, an allusion to the life of Adam before the Fall, a life uncontaminated by the physical and spiritual degradation of sensory involvement. Until such time as the environment is scientifically controlled, we must rise above the "cycles of initial purity, subsequent corruption, degradation and reform" (1969, 115) by "exercising a strict schedule of self-limitation, together with an immaculate discipline of person and premises" (1969, 114).

It is obvious that Fuller embraces the Puritan doctrine that cleanliness is next to Godliness. In the following passage McLuhan discusses how this doctrinal obsession has affected the cultural and technological evolution of the Western world:

Implied in the cult of hygiene is a distrust with the human organism which is linked with our treating it as a chemical factory. D. H. Lawrence, rebelling against the puritan culture in which he was reared, insisted all his life that industrialization was linked to the puritan hatred of the body and detestation of bodily tasks. This, he claimed, not only was reflected in our hatred of housework and physical tasks but in our dislike of having servants smel-ling up our houses while helping with that work. So that the small, hygienic family
unit of our cities and suburbs is, from this viewpoint, the realization of a Calvinist dream.

There is an old Huguenot hymn which goes: 'Everybody stinks but Jesus.' And Kenneth Burke, in his *Ideas in History*, argues that the very synonym for scrupulous cleanliness, 'a Dutch kitchen,' means a Calvinist kitchen, and that the puritan world has merely substituted soap for the confessional (1951, 61).

In *Ideas and Integrities*, Fuller not only links the progress of civilization with the increasing use of machines to perform hated bodily tasks, but also rejoices in the substitution of soap for sermons. He claims:

that the modern disaffection from religious dependence decried by the sect proprietors springs from the release from sanitary precaution in its broader, necessitous sense, provided by modern mechanics and science, through which shower baths, sulfa compounds, steri-lamps, and radio-summoned air-ambulances, and scientifically pooled cooperative blood banks, have retained people nearer to God than they have ever been returned by the moral sanitation of the sect proprietors, whose original founders gained their popular strength through effective admonition in these fundamental problems of sanitation and survival... (1969, 116).

As a Puritan, Fuller believes that one's salvation depends upon the adoption of the most simply effective scientific control of our environmental processes. By means of scientific design, humanity will be able to "protect the original radiant beauty of curious energetic life, of truthful process, of paradise never lost" (1969, 116). In other words we can again enjoy prelapsarian bliss. In *Operating Manual for Spaceship Earth*, Fuller announces that "a
new, physically uncompromised, metaphysical initiative of unbiased integrity could unify the world" (1969b, 35).

What Fuller does not realize is that human-made technological environments inevitably impoverish our awareness and establish cultural biases by daily imposing exterior sensory constituents on all aspects of our private and corporate lives. It is precisely the importance of these sensory constituents of experience that Fuller chooses to downgrade. By adhering to the puritanical belief that the sensory life is depraved, he tosses aside the key to an objective evaluation of the psychic and social effects of various technologies, including his own inventions.

The dymaxion bathroom is an obvious example. McLuhan notes that in our puritanical culture "the bathroom has been elevated to the very stratosphere of industrial folklore, it being the gleam, the larger hope, which we are appointed to follow" (1951, 62). The Dymaxion bathroom, of course, is merely one component of the austere, sterile, mechanical shell which a Fuller-designed house is. Of late he has extended his ideas for housing beyond the limit of the small, hygienic family unit. He has proposed as a mass-residence an air-conditioned Geodesic Dome, two miles in diameter, that would cover midtown Manhattan. One of the effects of such a dwelling would be to create a large-scale communal environment in which privacy would be virtually non-existent. On a global scale Fuller believes in the homogenization of all races and cultures through science and technology. Phonic literacy and typography made such sensory sterilization possible, but the advent of electric technology has fostered tribalism or regionalism.

The focusing of this essay on the concepts of Romanticism and Puritanism and on their sensorial relation to technology and culture in
North America is merely a new application of an old literary theme. Works of American literature from Hawthorne's *The Scarlet Letter* to Steinbeck's *The Grapes of Wrath* occur against a backdrop of North America as the New Eden where man could overcome his fall from grace. The Puritans and their successors embraced technological know-how as the means to salvation. In the process they succeeded in ravaging the natural environment and, according to McLuhan, impoverishing psychic and social consciousness. He believes that the fall from grace in the Western world resulted in a fragmentation of consciousness through successive technological dilations of integral human functions. (Examples of dominant, human extensions are speech, the wheel, script, and printing.) Fuller takes the opposite tack, maintaining that technological know-how, comprehensively applied, will restore the metaphysical integrity of humanity. He stresses the metaphysical perception of generalized principles governing universe and shares with McLuhan an apocalyptic vision of the effects of current technologies. For McLuhan the metaphysical acts of perception and cognition have a physiological basis in the workings of the exterior and interior senses. Fuller sees the human intellect as a thing autonomous from the physical world. Although McLuhan the man is profoundly conservative and dedicated to literate traditions and values, his poetic imagination sometimes displays an uncritical enthusiasm for the organicism of electronic modes of communication. This attitude potentially leads to the annihilation of the self.

McLuhan can, like a German romantic, celebrate the power of electric technology to create an unified corporate consciousness, something which Fuller sees evolving from integrated scientific knowledge. But whereas McLuhan's Catholicism and Romanticism require multi-sensuous participation and involvement, Fuller's
Puritanism rejects the sensorial universe as debilitating and degrading. He lacks McLuhan's medieval sense of communion and community.

Cosmic Ontology Supplants Darwinian Biology In An Electro-Magnetic Universe.

In spite of their different sensuous assumptions and intellectual orientation, the two generalists do hold similar views about life in the global village, Spaceship Earth. Fuller, for example, states that we are living in "a one-town world" (1969, 78) in which "the whole globe will become every man's backyard" (1969, 133). But whereas McLuhan emphasizes the shrinking of the globe to village size by means of instantaneous, electronic "software" communication, Fuller focuses on the fast, physical transportation of people and mechanical "hardware."

Both men understand that the Electric Age is one of discontinuity and decentralization. McLuhan posits that whereas the old visual space that emerged from the phonetic alphabetic fusion is continuous, connected, and static, the acoustic space of modern physics is discontinuous and dynamic. He would agree with Fuller's observation that "there are no continuous 'links' in industry or elsewhere in the universe because the atomic components are, interiorly, spatially discontinuous" (1969, 178). The idea of continuous links in industry emerged from the visual space of Greek culture. Phonetic literacy and typography later joined forces to bring about the centralized production and marketing techniques of mechanical industry. Electricity has now rendered those techniques obsolete. Like McLuhan, Fuller knows that decentralization of production is essential for survival in the global village. He is dedicated to bringing about a world-flow system of resources and information (The World Game) in order to overcome
the present inequities and inefficiencies of resource allocation and product manufacture and distribution.

Another aspect of the second industrial revolution noticed by both is the trend toward doing more with less. McLuhan sees this happening through the "etherealization" of mechanical "hardware" by electronic "software" (1972 b, 86) Fuller refers to the process of doing more with less as "empheralization." He remarks that "science continually does more with less each time it obsoletes and scraps old inventions. Scrap is resolved to some part of the inventory of the ninety-two regenerative chemical elements" (1969, 142). Science and technology achieve the maximization of the minimal by discovering new forms of synergistic relationships amongst and between the ninety-two chemical elements.

Fuller also agrees with McLuhan's observation that the future of work consists of learning a living in the automation age: "As automation eliminates physical drudgery, we will spend more time in the future in intellectual activity. The great industry of tomorrow will be the university, and everyone will be going to school" (1969, 302). McLuhan, however, stresses that relevant learning now takes place in the global classroom, not in our bureaucratic and fragmented educational institutions where the young are compelled to interrupt their education. For McLuhan "change itself is the only constant in an electronic world of communication" (1958, 67). Paradoxically, constant change now acts as a gyroscopic factor of stability. In this regard Fuller notes that Albert Einstein's universal norm of "constant change" has replaced Isaac Newton's universal norm of "at rest." He says that we must accept "the concept of change itself, relative to which equilibrium is the word which describes controlled design arrangements of dynamically
desirable complementary associations. This constant change and progressive equilibrium is the propagative key to the infinite vitality of the democratic principle..." (1969, 105). Fuller here restates his idea of progress and reaffirms his faith in technological change as the means to individual freedom. McLuhan, of course, has oft remarked on the power of technology to ever fecundate new forms. Whether, in fact, "constant change and progressive equilibrium" lead inevitably to the betterment of the human condition is a matter open to debate.

As change itself becomes the main staple of existence, we become increasingly aware of the importance of technological innovation to the evolution of mankind. Since the nineteenth century, mechanization and the total field of electromagnetic interprocess have combined to unleash evolutionary forces whose scope and magnitude far exceed those of Darwinian biology. Charles Darwin advanced his theory of the evolution of the species and his doctrine of the survival of the fittest at a time when the mechanical environment had encompassed the old world of Nature invented by the Greeks. From this time onwards, the self-amputations of humans (the extensions of the body and most recently, the nervous system) became the dominant environmental or evolutionary controls, supplanting those of Greek Nature. Processes of natural selection now occur largely as a result of the actions of human-made technological environments. Physiologically, psychically, and socially, people in the normal use of technology are perpetually modified by it and in turn find ever new ways of modifying technology.

Although Fuller does not understand how technology alters one's interior characteristics, he does realize that industrialization has become a powerful evolutionary force. In Operating Manual for Spaceship Earth, he argues that "the physical environment changes effecting
all humanity's evolution are transpiring in the realms of the electromagnetic spectrum realities which are undetectable directly by the human senses" (1969, 104). Electromagnetic technologies help to further the creation of a collective consciousness existing outside of the body. This consciousness evolves from "the slowly accumulating total world experience and total literate knowledge regarding all the discovered physical resources and generalized patterning principles" (1969, 282). Fuller has given the name "continuous man" to this "world-around interlinked and continuously intercommunicating continuity of consciousness" (1969, 283). He says that:

the individual is linked...to continuous man by the extra-corporeal intellections recognized by individual intellect. Continuous extra-corporeal or industrial man is an extra-corporeal tool or pattern inducing continuity which renders industrialization identifiable as an extra-corporeal universal chromosome common to all men's post-natal evolutionary transforming beyond the patterning corporeally induced by the integral genes and chromosomes. The latter have so far failed to disclose any integral memory capable of inhibiting new pattern conceiving potentials; therefore industrialization may well be the second derivative, synergetic-surprise capability to remember and teleologically realize evolutionary pattern controlling (1969, 283).

Fuller believes that the successful design science of continuous man will make the Darwinian and Malthusian frustrations irrelevant. Although comprehensive design science may alleviate the political, technological, and biological difficulties of production, consumption, and overpopulation, Fuller is also aware that the old problems of physical and spiritual well-being now have to be dealt with in a different
evolutionary context. The advent of electronic
technology has accelerated the progress of that
psychogenetic process through which we have
become detached progressively from our organs,
senses, and functions. By transporting us out
of our bodies at the speed of light, new media
populate the global theatre with a large and
ever changing cast of transubstantiated indivi-
duals who communicate constantly. With the aid
of electronic media, "we are there and they are
here," instantly. We become discarnate minds.

McLuhan perceives new environments as "mac-
roscoptic enlargements of our own self-amputa-
tions" which "can today provide the beginnings
of a new science of man and technology" (1968 c,
186). This new science would stress that
all media or technologies, languages as
much as weaponry, create new environments
or habitats, which become the milieu for
new species or technologies. The evolu-
tionary habitats of the biologists since
Darwin were the old nature which has now
been transcended by satellite and radar....

At present the entire mammalian world
has become the micro-organismic. It is the
total individual cultures of the world,
linguistically and politically, that have
become the mammals, according to the old
classifications of evolutionary hypothesis.
It is the cultural habitat in which we have
long been accustomed to think that people
were contained that has now become the
mammal itself, now contained in a new mac-
rocosm or 'connubium' of a super-terres-
trial kind. Our technologies, or self-
amputations, and the environments or habi-
tats which they create must now become that
matrix of that macrocosmic connubial bliss
derided by the evolutionist (1968 c, 190).

With industrialization as an "extra-cor-
poreal universal chromosome" in an electromag-
netic universe, our old habitat of Greek Nature
becomes the content of a new evolutionary process. Spaceship Earth has been transformed into an art form by the rim spin of satellites and by electronically configured data. Electric media literally take us out of our skins as they shift the evolutionary focus from planetary Darwinian biology to cosmic ontology. As the corporate consciousness of mankind is extended technologically to the far reaches of interplanetary and interstellar space, we face the immediate prospect of being translated out of the fallen world and out of the human dimension altogether.

Summary

R. B. Fuller and H. M. McLuhan approach the technological extensions of humanity from opposing humanistic and scientific traditions which themselves reflect the sixteenth-century divorce between art and science. Although both Fuller, the self-proclaimed epic poet, and McLuhan, the encyclopedic doctus orator, wish to exercise conscious control over the effects of technological environments, their methods and goals are different. While McLuhan believes that sensory ratios can be programmed technologically to create sensory, psychic, and social equilibrium and fulness of being, Fuller wishes to use the principles of scientific design to divorce humanity from the degradation of sensory involvement in order, as it were, to create an environment of pure information that will restore us metaphysically to prelapsarian glory in a New Eden. Just as this attitude stems from Fuller's puritan heritage and beliefs, McLuhan's view of the sensate world relates to his Catholicism and to his place in the second Romantic movement, with its emphasis on the interior landscape of one's being and consciousness. The key to understanding his universe of percepts is the transcendental common sense or sensus communis, the action of
which demonstrates the ancient view that sensation is imitation because the exterior forms are already in new matter. By contrast, Fuller actualizes his noumenal universe of concepts in the various forms of his designs and practical inventions. In his preoccupation with the physical design of the external landscape, however, he overlooks the neurophysiological effects of media and language patterns on the central nervous system. These effects demand systematic study, especially at a time when the central nervous system itself has been extended around the planet technologically by means of satellites and modern telecommunications. McLuhan and Fuller argue that such technological extensions represent new evolutionary forces in a world in which we must re-examine the meaning and very nature of human identity and private existence.

REFERENCES


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