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Education and the Technostate

This is about technology, its implications for society, for the individual, hence for education. The present purpose is fourfold: (1) to contribute to a clearer understanding of the technology, (2) to review the relationship of technology to other sectors of the culture, (3) to observe the individual's life-space in the Technostate,[1] (4) to suggest some conclusions about education for the citizen and for the specialist. Compression of the subject into the space allotted here is not undertaken without sensitivity to the violence that brevity might do to homage. Yet the attempt is prompted by a certain urgency currently arising from the involvement of technology with education, particularly in the secondary school. Statements are made and developments undertaken which appear to reflect pressing necessity for better understanding and wider agreement about fundamental meanings and issues.

"Technology means the systematic application of scientific or other organized knowledge to practical tasks."[2] The technology, as accumulated throughout man's long experience is a set of arts and processes which facilitate the organization as well as the purposes of human endeavor applied to physical objects. Technology extends and elaborates human capacities for acting upon, reacting to, and interacting with a given environment. Technology[3] embraces processes applied to: (1) animate objects, (2) inanimate objects, (3) energy, (4) communication, (5) transportation. Technology changes the milieu in which society functions; it changes society; it changes the life-space of man.

What is technology? It is that heritage, the accumulation of 25 million years, from eolith to iron, which secured for the Greeks a stance whence to contemplate the cosmos. It is the store to which illustrious complement was made by Ktesibios and Archimedes and Heron. It is the transport, the construction and the military for which Roman genius is celebrated. Was it not also technology that, nurtured by the mood of innovation lingering from Rome and allied with the Christian ethos of will and action, survived, and was even notably incremented, by land-use techniques, water-wheels and windmills during the "dark dismal patch . . . wedged between the shining days of the Golden Greeks and the bright galaxy of light given out jointly by the Renaissance and the Re-

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[1]The writer coined the term Technostate for the emerging form of society, a form that, as will be shown, is unique in man's experience.

[2]J. K. Galbraith, *The New Industrial State,* (Boston, Mass.: Houghton Mifflin Co., 1967).

[3]See N. H. Frank, *American Vocational Journal* (April 1967).

formation?"[4] And the technology of Gutenberg and gunpowder combined to batter down the ramparts of feudalism exploding its human remnants in a thousand directions, to be combined again in the larger and impersonal mosaic of nationalism. This, too, is technology: that sparkling efflorescence of technical capacity which, complementary to cultural phenomena of the eighteenth century, was the Industrial Revolution. Out of all this emerged economic man: the lonely, monetized factor of production whose inner compulsions, articulated by Calvin and Luther, fertilized the Great Transformation from mercantilism to market, from commune to capitalism.

Scarcely had the by-standers gasped their amazement as Stevenson's Rocket roared by (at the rate of 13½ miles per hour) than they were dazzled by the first flashes of the Electric Age. Yet, how could these people even have dreamed that vast metamorphosis to be wrought by electrical technology? Could they have followed the Machine Age to its terminus in mass production and scientific management and mechanized man? How much less likely it was that they and their progeny, preoccupied with segmentation and specialization, could anticipate the integrative and accelerative processes of technology which were, only a century later, again to totally transform man's environment and his relationship to it! Indeed nineteenth century man, his attitudes and thought processes attuned by Protestantism to entrepreneurial economics and linear extrapolation could never perceive the technological probabilities then being accumulated. How could it be seen that the launching pad was then being built from which technology would reach its take-off point[5] in the early twentieth century? Technology, we have said, extends and elaborates human capacities for acting upon, reacting to and interacting with environment. Thus it is that the human relationship to environment is now transformed beyond all perconception in what Buckminster Fuller[6] calls "total ecological sweep-out." All men are now everywhere, their very essences diffused by the technology into the total processes of their world.

Cybernation[7] technology extends and elaborates human cognitive functions; it removes individual man as the control loop, as a component at the operation level of process. But this is not all. Cybernation integrates components and sub-systems into even larger systems. While the integration of technology began at the "take-off point" previously mentioned,

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[4]Anne Fremantle, editor, *Age of Belief* (New York: New American Library, 1955).

[5]Here, "take-off point" means the point at which the technological development curve turns upwards reflecting incremental growth at logarithmic rate. In military technology this point is coincident with Ypres and the Somme.

[5]Buckminster Fuller, *Education Automation,* Southern Illinois University Press.

[7]Cybernation is defined by Professor Donald C. Michael of the Center for Research on the Utilization of Scientific Knowledge at the University of Michigan as "the simultaneous use of computers and automation for the organization and control of material and social processes." Michael explains that: "The theory and practice of cybernation underlies all systematic design and application of automation and computers. Cybernation, then, refers not only to automation but to society."

gaining momentum through World War II, cybernation is to this integration and systematization process what the jet engine is to the piston engine; it is a difference in *kind.*

Social Effects

Yet, have not differences in kind accompanied previous technological innovation? In his masterful way Galbraith[8] shows how economic power has successively passed from its old association with land, during feudalism to association with capital as entrepreneurial capitalism developed; then, in recent times to the knowledge and skills that are so critical for the modern corporation. (It is because, of course, large corporate enterprise is technology-related that expertise of a high order is vital to it. Indeed it is because of the very nature of modern technology that the corporation, or any other enterprise employing such technology, becomes large.) Surely it is evident that the shifts in power from land to capital and then to organized intelligence reflect "differences in kind" in the economic structure. This change in the economic structure has paralleled other structural changes in the social and institutional structure. The scale and pattern of society has altered from rural, static, occupationally- and socially-closed form during feudalism to the towns of the early market era and, in our day, to the mass-metro occupationally- and socially-open structure. Meanwhile the management of enterprise has shifted characteristically from land-owner to entrepreneur-owner to the professional manager. Not less significant is the transition of labor from serf to economic man (the monetized factor of production) and now to information man.

Walter Goldschmidt[9] describes technology as the well-spring of change. By pushing out environmental limits, by extending the possibilities within which a society operates, technology alters the parameters of that society. Yet the alteration is not "automatic"; it is an adjustive evolution. Moreover, lacking a social technology, the adjustive process has historically been, and still is, a hit-and-miss traffic largely concerned with palliating symptoms. At best it is a faltering progression from crisis to crisis. Surely this is currently clear in the economic sphere where per capita debt has more than trebled in 30 years as we vacillate spasmodically between the prospect of boom and the threat of bust, with accompanying efforts to accommodate the realities of a technological age to the Procrustean parameters of incompatible economic and social concepts. It is even clearer in the realm of international politics where, despite the application of some $140 billion worth of military technology, the prospects of peace become increasingly tenuous. In neither the economic nor the diplomatic sphere can the strategy be regarded as successful.

Education Follows Industry

Nowhere has the primitive state of our social technology been more evident than in education. As background, however, against which to

[8]J. K. Galbraith, *The New Industrial Society, op. cit.*

[9]Walter Goldschmidt, *Man's Way* (New York: Holt, 1959).

assess the current and future position of education it is appropriate at this point to try to outline its functional context. As previously noted, the cultural structure has, over the past 500 years, undergone transitions of a fundamental nature. Man's relationship to that structure has changed too. Likewise, what man had to learn to be functional slowly adjusted to cultural demand. In medieval times he learned the social and economic roles of the serf; to accept these as appropriate to what, conveniently for his masters, was his inevitable and inescapable lot. Moreover, he was not dissuaded from this acceptance by the comforting prospect of eventually attaining a more benign eternity, this being the reward of those who appropriately identified with contemporary afflictions. With the emergence of capitalism, the educated man had achieved nominal literacy, along with a keen awareness of starvation as the alternative to effectively pursuing his best interests in the market place. For most, the market was a place to sell one's toil; for others it was the arena in which to match one's wits with those of his competitors. It was an arena from which he who acquired the most money, and the power associated therewith, achieved the reluctant accolades of the populace. Education, meanwhile generally provided whatever preparation seemed essential for the process, given the individual's prospective life-role. Indeed, the nature of this preparation was relatively easy to fashion. Social and economic structures changed slowly. With electricity and the Power Age the very nature of the technology encouraged rationalization and segmentation of social and economic roles. Thus it was at the beginning of the twentieth century that the generalist was an anachronism suspiciously regarded as the 'jack of all trades and master of none.' Successfully educated was he who had acquired a specialization highly in demand, therefore highly rewarded in the market place. Education accommodated to the demand, meanwhile somewhat naively acclaiming its achievements as evidence of its own high purposes. In no sector of education has the pursuit of specialism been more evident than in the Universities and especially in the Graduate Schools.

Horse and Buggy Education Rapidly Outdated

The past 50 years, particularly the past 20 years, have brought such 'differences in kind' within such a short span of time that their nature, much less their consequences, cannot yet be fully understood. Alfred North Whitehead remarked that the greatest invention of the twentieth century is the method of invention. Whitehead referred to the succession to scientific innovation from the earlier stage of craft-invention. Out of it developed the "systems approach," starting with the result, and then organizing and integrating technology to supply the means. The concept of system begins with a Gestalt or configuration; organized intelligence then selects and integrates whatever "pieces" are necessary to produce the pattern. The "pieces" may involve information, materials, energy, people or combinations of these. The "systems," or Gestalt or configuration, predetermines the organization and the relationship of components. Behavior of the comprehensive system is synergic, it cannot be assumed

from the behavior of its individual components; this is the General Systems Theory of the biologist Ludwig Von Bertalanffy. Peter Drucker, Professor of Management at the Harvard School of Business says that: ". . . the 'systems approach' is likely to have a profound impact, where it may lead to major technological effects, and through them, to major changes in the way we live and our capacity to do things."

That major changes in the way we live is clear. The computer and the processes which it facilitates are now seen to be widely extendable and applicable. Scientific innovation as both a philosophy and a technique embraces social technology as well as engineering technology. For, in the past 30 years it has become increasingly apparent that such concepts as feedback, decision making, modelling and optimization are applicable as well to "the way we live" as to the means by which we live, to social as well as to engineering systems. Moreover, the ubiquitous computer is as willingly a handmaiden of the behavioral and the social scientist as of the natural scientist. Add the accumulating evidence that the advantages of engineering technology cannot be realized except through large and complex systems, and further, that such systems are irrevocably implicated in the whole social structure. There are thus accumulating prospects for a "systems approach" in social technology. Already, Kenneth Boulding of the University of Colorado[10] is talking about the "Sociosphere," the world as an entire social system with inputs and outputs like any other system. Reactions to this concept come from those who are sensitive about 1984 and The Brave New World. Herein, too, lie the concerns of education.

"Education and Emancipation" is the title of a chapter in Galbraith's New Industrial State.[11] He points to the monolithic, collectivist, and comprehensive character of emerging industrial organization — a character that inheres in any "systems" structure incorporating modern technology. Unaccompanied by countervailing influences, the values and beliefs of the whole society will accommodate to, if not identify with, validation of the industrial system. Just how highly vulnerable to this adjustment we are is only now being better understood[12] as the impact of communications technology, indeed of all technology upon the individual is investigated. Yet, with the imminent extension of systems technology to institutional areas of the cultural system, the impact of technological media of all kinds upon individuals becomes a matter of heightened concern. So it is that education must not only serve the needs of the industrial system (and these ought to be well and expeditiously served); education must also provide whatever is required for questioning the goals of that system, indeed of any system which manages the individual's wants, economic or social. Enlightened industrialists are not

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[10]Kenneth E. Boulding, *The Meaning of the Twentieth Century* (New York: Harper, 1964).

[11]*Ibid.*

[12]Marshall McLuhan, *Understanding Media* (New York: The New American Library, 1964).

insensitive to the aesthetic dimension of human life; yet they do not press its assertion as essential for the continuance of the industrial system.

By the very nature of systems technology the individual's life-space will tend to be adumbrated by large, impersonal forces. As a citizen of the Technostate his being is inextricably bound up with these forces. That he comprehend their nature and the fashion of his implication with them is of first-order importance. Such comprehension is the key to his personal and psychological liberation from the systems that serve him, and which he must in some measure serve. To be "in" such systems and yet not "of" them is an achievement for which contemporary education does little to prepare him. Yet such is at once the specialist and the citizen of the Technostate. He is both specialist and generalist for, in a systems-oriented industrial society he cannot gain that sense of mastery which is the essence of human dignity without having comprehensive awareness. To the preparation of such citizens education must now energetically address its resources. The plain alternative is affluent slavery.

In the present state of the world, abundance of consumer goods is imperative. By opting for abundance we *ipso facto* opt for modern technology, consequently for larger industrial agglomerations, for industrial systems technology. Whether attractive or otherwise, the Technostate is the price to be paid for opting for abundance. It need not be unattractive; it need not be inimical to individual dignity and human freedom, given now a forthright assault by education upon its dangers. It can, however, like the powerful automobile in the hands of the uninitiated, be fatal. To gird the citizen for the role of freeman in the presence of the technological juggernaut is an important role for education.

Dualisms of one sort or another have persisted through time. Since the genesis of wage-labor the polarity of dualism of work and leisure has persisted. But because technology is rapidly changing the nature of the work, it is also changing the meaning of work. Combined with a new emphasis in the aesthetic sector appropriate for maintaining human dignity, the enlightened meaning of work will eventually attenuate the work-leisure syndrome. To resynthesize what has become thesis and antithesis, to thus reinstate the unity of life to which primitive capitalism wrought such violence, is a role of education.

Replace Bits and Pieces Curriculum

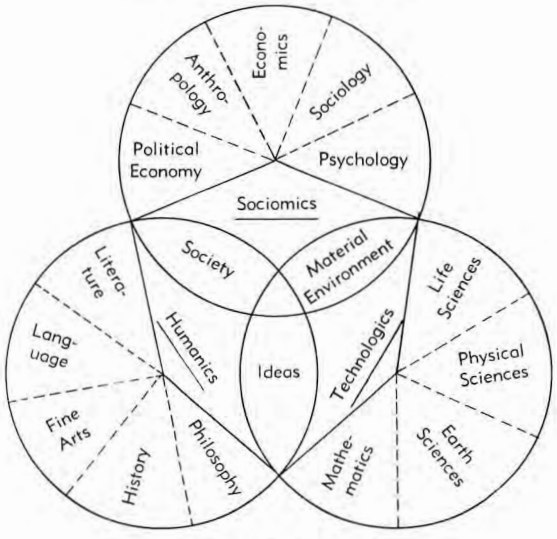
The re-design of educational machinery here implied is a gigantic undertaking. So was the realignment of industry to accommodate modern systems technology there. In both cases the irritations may be severe. But just as the cybernated industrial system is very different from the simple-addition assembly line concept, so education, to be consonant with emerging social technology, must be more than, and different from, the present simple-addition concept of segmented and compartmentalized subjects. A functioning citizen, whether in the work-place or elsewhere in the society now emerging is a generalist who understands a mosaic of relationships. In addition, his specialism relates him to pro-

ductive enterprise. But, because of the convergence of industrial and social systems now being forced by technology his general education has to serve over the entire compass of his life-space.

Three perduring entities run through the history of human existence in continuing interaction. The first of these is Ideas (philosophy) — about man and his universe. The second is man's confrontation with natural forces in maintaining his existence. The third is man's relationship to others — society. Though the specific ideas change, though the means for confronting nature are enhanced, though the form of social structures change, the three basic entities remain. They form a stable and enduring basis for the curriculum for educating citizens. There emerges a "trio-ordinate" curriculum with three subject-areas: (1) HUMANICS, or the study of the ends and the aesthetic dimension of life, being supported by a *unified* investigation of the humanities and the arts. (2) TECHNOLOGICS, providing understanding of the means by which man achieves practical tasks, being supported by a *unified* exploration of the natural sciences and mathematics. (3) SOCIOMICS, a study of society or the institutional structure, embracing and supported by a *unified* study of the human and behavioral sciences.

THE TRI-ORDINATE CURRICULUM

A "systems" approach to curriculum in Division III and IV providing general education for the citizen.



I: The Individual

In everyday life, the citizen confronts all disciplines through environment. Through the modern material environment he contacts applications of natural sciences, not as science but as technology. Through the social environment he is involved with behavior and human relationships, but as social institutions and not as social or behavioral science. Through the contemporary issues of his time the citizen confronts a welter of ideas

that, followed up, lead to the humanities. His human nature impels aesthetic expression in a galaxy of forms and through many media, provided, as now, he is not stultefied by early conditioning to the contrary. It is surely the purpose of education to lead from involvement in the insistent present to awareness and understanding of its full meaning. That little such understanding is now an outcome of the process called education is evident. The individual leaves school, not as a functioning citizen of the Technostate, but as a social and economic illiterate. It is not his fault; the process produces the wrong product. Moreover, to superimpose a guidance system tends to obscure the fundamental inadequacy of the educational process as it now exists. Does in fact such a system not tend to perpetuate prostitution of the educational system to nineteenth century concepts? Since the products (or victims) of the existing educational process appear to require the ever-increasing attention of counsellors, is it not time to investigate the process rather than to provide more elaborate ways of palliating its outcome?

How ineffective to confront the citizen head-on with science, rather than to lead him to explore it via the technology, is demonstrated by the disappointing results with P.S.S.C. physics in the United States. Just now the more appropriate approach is being fashioned by a group of technologists under the National Science Foundation.[13] And how ironic that in less than a decade after the American people (and, evidently the people of Canada) were 'sold' on the remedy for American technological obsolescence in the form of P.S.S.C. physics, the Russians take another step five years ahead of us by putting a capsule on Venus! Worse still, enrolment in science courses in the high schools of America has steadily declined! Let's stop shining up the bits and pieces of an out-moded curricular structure and rebuild a 'system' consonant with the facts of life in the Technostate. Through his relationships with others, through the social institutions that facilitate these relationships, the individual citizen contacts the human and social sciences. Why not, therefore, make these points of contact the central foci of education in the secondary school?

All the disciplines that relate to each of the three major foci then become rich explicatory resources contributing to a unity of thought — to an integrated pattern with beauty and symmetry and meaning. Yet it is not until the individual sees the harmony and interrelatedness of the three major areas themselves, of Humanics and Technologics and Sociomics, that the great drama of life and of human experience in all its exciting proportions opens before him. For it is the dynamic interplay of the three entities represented by the three subject-areas of the "triordinate" curriculum which have *generated man's story,* which are *moulding his present* world, and which will *fashion his tomorrow.* From such a curriculum the individual acquires a unity and a perspective conferring a balanced and confident mastery of his life-space by which, in turn, he is impelled to render appropriate and sensible tribute to Caesar and due

[13]The Engineering Concepts Curriculum Project.

homage to God. Anything short of this in the citizen's education today will depose him from the mainstream of life and make of him the cultural deprivate of tomorrow.

That we are a long way from realizing the kind of educational diet here depicted is evident. We are just beginning in education the steep ascent from the Machine Age to the Age of Cybernation. Present curricula reflect the piece-by-piece, building-block outlook of the assembly-line. Is there any clearer illustration of the powerful carry-over effect of pre-existing culture than the secondary school or university with their fragments or subject areas? Students go from cubicle to cubicle, at closely timed intervals, from one specialist teacher to the next 35 to 40 times per week in the secondary school. Where and when do they put the pieces together? What is the configuration? How do they relate the pieces to life? It is not a "system," it is a mass-production machine leaving a pile of bits and pieces and unrelated information from which the individual is unable to form a meaningful pattern, hence the apparent need for more and more guidance.

The essence of cultural evolution is change; it is a continuing process of selection, of maintaining congruity, of rearrangement. Pre-existing forms tend to persist too, contributing to continuity, yet often nurtured into obsolescence. These facts, well-known to anthropologists seem sometimes to be overlooked by educators who are products of compartmentalized and segmented schooling of the past and often purveyors of it today. The educator has now to be functional in the Technostate; he needs to be both specialist and generalist. Indeed, we face catastrophe if he is not. Upon the implications of these views for the curriculums of Colleges of Education and for each of us I leave you to reflect.

The gravest threat to the Western World at this very moment is not the youth revolution, it is not unemployment, it is not the constitution, it is not economic instability, it is not war, it is not race riots. These are symptoms. The gravest threat to our way of life arises from the failure of education to discharge its fundamental responsibility. That responsibility is to prepare individuals to function fully as free and dignified human beings in the circumstances of the Technostate. Time is not with us; it is fast running out. Surely that fact is now very evident as the storm clouds gather over the whole free world. The sins of omission lie heavily with education and with educators. The responsibility is clear. What is the response?