

"A Perspective Of Three Eras: Force,
Power and Information."

by

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Introduction

A recent editorial in the Proceedings of the IEEE⁼ ended with the sentence, "Are we dinosaurs or birds?" If we are not interested in dying out like dinosaurs, we must first develop some perspective of where we are in the history of human civilization. We must look for things more constructive than Toynbee's analyses of the rise and fall of civilizations. Our civilization has the knowledge and the research tools to understand our problems and to propose solutions so that our civilization doesn't have to die out like the Roman Empire and other past civilizations.

To obtain a perspective of the state of our civilization, let us use a Gaussian Perspective similar to the Histomap, but extending into the future.⁺

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= J. D. Ryder, "To Define Is To Limit," (editorial), Proc. IEEE, vol. 51, No. 9, Sept. 1963, p. 1175.

+ This chart form is illustrated in Fig. 2 of SEPR No. 92-B, "A General Systems Theoretic Model for the Estimation of the Negentropy of Sociological Systems Through the Application of Two Isomorphic Electrical Communication Networks," London, First International Congress of Social Psychiatry, Aug. 19, 1964.

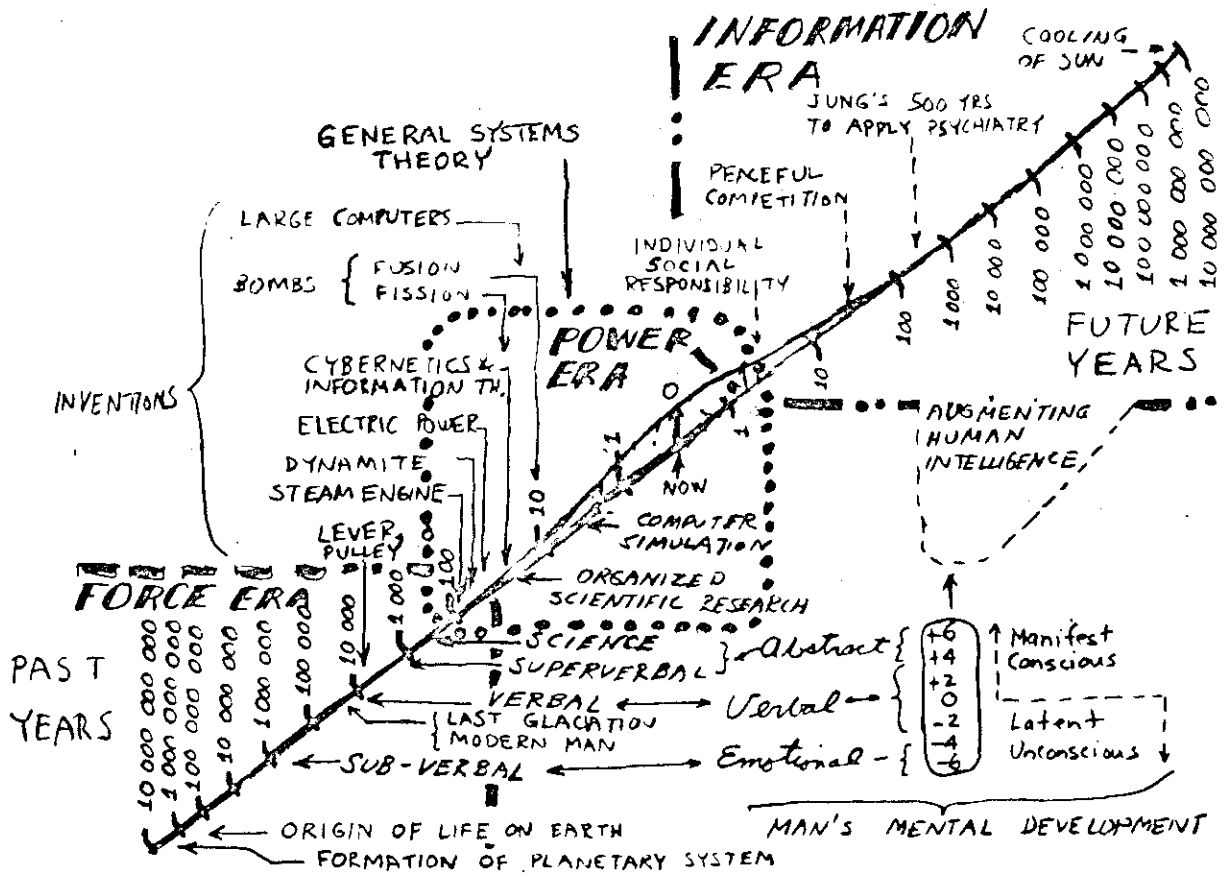


Fig. 1. Mankind's Mental and Social Development on a Gaussian Perspective Scale of the Life of the Planet Earth.

In Fig. 1 human history is divided into three eras: Force, Power and Information. The numbers on the past-future scale are years plus and minus from now. The time scale is derived from a gaussian probability distribution similar to the gaussian probability paper printed by Codex Book Co. for extreme value probability curves. Norbert Wiener uses the terms power and control, where I use the terms power and information.* I.e. the term

* Norbert Wiener, "The Mathematics of Self-Organizing Systems," in Robert E. Machol and Paul Gray, Recent Developments in Information and Decision Processes. N. Y.: Macmillan Co. (1962) pp. 1-21.

"Information Era" is possibly more conducive to democratic concepts, Albert Schweitzer's concept of "Reverence for Life", and the maximizing of information or negative entropy.* This "maximizing of negentropy" is the engineering equivalent of R. B. Lindsay's "thermodynamic imperative."# This equivalence has also been stated by Dr. William Malamud in the conclusion of his 1960 Presidential Address at the American Psychiatric Association.+

The past and future events marked in Fig. 1 are only approximately correct in location. Since future events cannot be accurately predicted, the relative order of future events should be taken as more significant than the actual times. For example it is necessary that civilization advance well into the "Information Era" before more countries reach the stage of development that could sustain manufacture of atomic bombs or hydrogen bombs. Also

* The use of the word "control" in B. F. Skinner's papers on "Behavior Control" frightens people, giving them an impression of control by a dictator. When the same concepts of feedback control circuits are used with a concept of maximizing individual creativity through some biological process similar to maximizing negative entropy, therapy oriented people like Carl Rogers see the usefulness of behavior control concepts for the benefit of mankind.

A Scientific Analogy: The Thermodynamic Imperative," by R. B. Lindsay in The Role of Science in Civilization, N. Y.: Harper & Row (1963), pp. 290-298.

R. B. Lindsay and H. Margenau have developed a principle called the "thermodynamic imperative," which is an analogy based upon increasing the negative entropy from Thermodynamics and the ethical concept of the "categorical imperative" from Immanuel Kant: "All men should fight as vigorously as possible to increase the degree of order in their environment, i.e., consume as much entropy as possible, in order to combat the natural tendency for entropy to increase and for order in the universe to be transformed into disorder, in accordance with the second law of thermodynamics."

+ William Malamud, "Psychiatric Research: Setting and Motivation," The American Journal of Psychiatry, Vol. 117, No. 1, July, 1960.

it is important that the four major steps needed to adapt to the Information Era, namely:

- Analysis of human-to-machine relationship,
- Development of Individual Social Responsibility,
- Design of Intelligence-Amplifiers,
- Organization of Peaceful Competition of Countries,

be well understood and that research plans for same be developed before man gets very far in developing more powerful weapons of destruction.

The Four Eras of Civilization in Man's Application of the Forces of Nature.

The three eras shown in Fig. 1 plus a transition era between the Power Era and the Information Era are discussed below:

(1) FORCE ERA

Man had his own strength plus the possibility of adding others to his work crews as members of his team or as slaves. Man invented the lever and pulley to permit him to exert a greater force than his own strength at the expense of moving the object through a shorter distance in a given time.

(2) POWER ERA

Man invented devices which could couple onto natural thermodynamic processes which increased entropy. In this way, man derived power orders of magnitude greater than his own power as a by-product of natural processes. The first economic system of this era, i.e., the capitalist system is designed so that economic work is done by coupling the operations to another natural process,

namely the desire of human beings for more goods or money. However this system keeps getting into conflict with philosophers due to the contradictions between maximizing profits and ethical teachings of religious leaders.

The historical ways by which these conflicts have been creatively resolved in American business is discussed in a series of articles in the Harvard Business Review.[#]

There appears to be a more fundamental change occurring in connection with the problems of our civilization shifting from power production problems to information processing problems. It is interesting to note that the founders of the consumer cooperative movement thought the contribution of their system was to introduce a time lag in parts of the economic system to allow for the inadequate information processing capabilities of the earlier forms of the capitalist system.

(3) TRANSITION ERA

This transition era has sometimes been referred to as the "Noosphere" by Soviet Scientist N. I. Vernadsky* and by the Priest Anthropologist Teilhard de Chardin.⁺

Kenneth Boulding, "Religious Foundations of Economic Progress," Harvard Business Review, 1952.

* N. I. Vernadsky, American Scientist, vol. 33, no. 1, p. 10ff., Jan., 1945 (trans. of 1943 paper)

+ Teilhard de Chardin, The Phenomenon of Man. Harper Torchbook Edition (1961), trans from French (1955). Also article in W. L. Thomas, Jr. & others, Man's Role in Changing the Face of the Earth, Univ. of Chicago Press (1956). See also Marcel Golay, "The Biomorphing Development of Electronics," Proc. I.R.E., vol. 50, no. 5, May 1962, pp. 628-631.

Hypothesis: The stability and adaptability of a social organization (country) is a function of its attainment of the ideal political idea distribution statistics based upon the variance being proportional to the per capita power production.

Some idealized curves of electric energy production are plotted in Fig. 2 to use in testing the plausibility of the above hypothesis. Ideal values of the variance are used with arbitrarily assumed political idea scales. Two selected countries are replotted in Fig. 3 to show guesses of the ideal and real distributions.

(4) INFORMATION ERA

Hypotheses: The political-economic system having the highest chance of surviving will be that operating on the principle of "maximizing negative entropy," i.e., maximizing entropy in the stochastic sense.

It may be possible to find conditions meeting the above where large sectors of the economy can be left functioning in the same capitalist, cooperative, and socialist forms of the present era. The intelligence-amplifier of Ashby is needed to find what systems come near the conditions of maximizing negative entropy. Present high-speed digital computers and programming systems provide the basic technology from which the intelligence-amplifier could be developed. However the human intelligence to

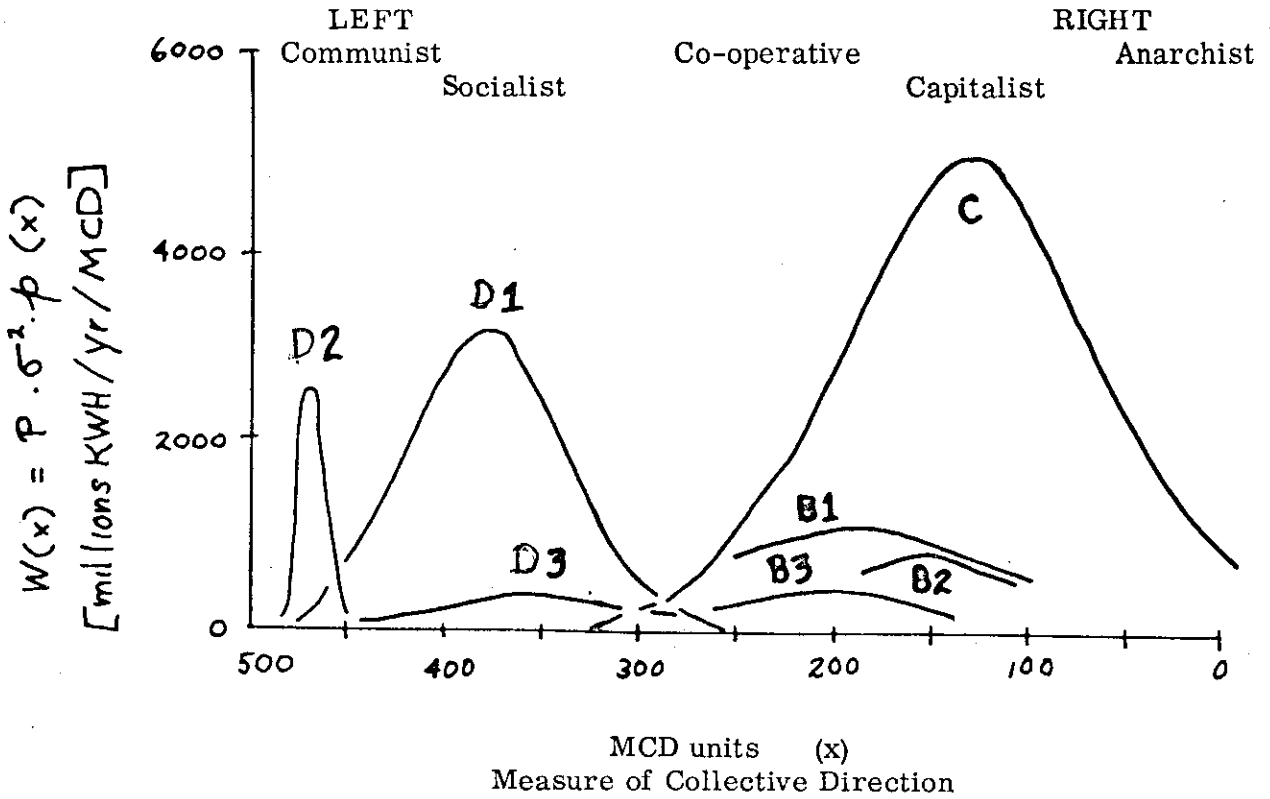


Fig. 2 Ideal Distribution Curves of Power versus Political Ideas for Some Hypothetical Countries.

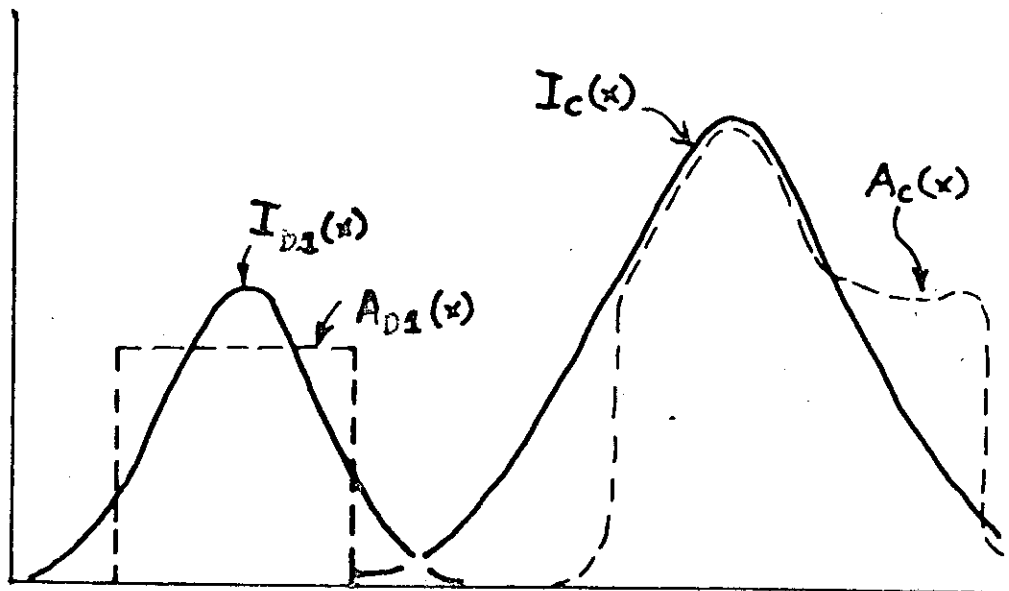


Fig. 3. Examples of Hypothetical Actual Power versus Political Ideas ($A(x)$ vs. x) Which Depart from Ideal Curves ($I(x)$ vs. x).

be amplified requires an internal biological feedback loop to provide a control based on "reverence for life" (equivalent to maximizing negative entropy). C. R. Rogers reports that human beings have such a "biological computer" within their brain that can be allowed to develop through psychotherapy or similar processes. This "biological computer" enhances the individual and leads the individual to make decisions beneficial to mankind (provided he can acquire the facts and select a reasonable number of alternatives to consider) -- equivalent to maximizing negentropy. The weakest link in the system is the human-to-machine relationship. A better "impedance match" between humans and computers is needed. (This is a task for the computer industry.)

This era changes the coupling of the economic system from a physical thermodynamic system to a biological life process.

Supplementary Note on Fig. 1, Historical Perspective

The Leipzig philosopher Eugen Rosenstock-Huessy pointed out in 1939 that a philosophy useful for one age may become destructive of human values at some future age.(4) It would be useful to have a graphical chart to help us keep track of where we are so we can better perceive when a transition is needed. The "Histomap" (5) gives us a chart of the past, but does not have space for the future. Combining some perspectives of G. Gamov (6) with the Histomap style through the use of a Gaussian probability scale and including some of Rosenstock-Huessy's techniques, we have a chart of the life span of the planet Earth in Fig. 2. The main steps in mankind's development of his

communicating of Selden Smyser presented at a General Semantics Congress (7). Lined up with these stages on the right is a representation of the development of man's mind from Foulkes and Anthony's book on group psychotherapy. (8) The classification into Force Era, Power Era (from First Industrial Revolution), and Information Era (from Second Industrial Revolution or Cybercultural Revolution) is related to Rapoport's historical introduction to Information Theory in the American Handbook of Psychiatry.(9) The augmenting of human intelligence indicated on Fig. 1 as the future stage of development in man's mental development is perceived to consist of two parts: [1] the growth of the individual's ego to keep pace with the more complex environment as discussed by Dr. William Gray (10), and [2] the development of computing and logic systems as tools to fulfill Ross Ashby's concept of an intelligence amplifier.(11)

Looking into the future, the rate of increase of complexity of society is such that mankind might destroy human life on earth before completing the 500 year period postulated by C. G. Jung (12) as the time needed for mankind to fully apply the discoveries of modern psychiatry.

Axiom: The researcher at the intersection of psychological phenomena and sociological phenomena, unlike the physical scientist, cannot separate himself from the social process, hence he needs an historical perspective against which to evaluate his own growth in respect to the main streams of civilization in time.

Supplemental References.

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2. Ludwig von Bertalanffy. "General Systems Theory," General Systems, Vol. I, 1956, pp. 1-10.
3. A. Rapoport. "Mathematics and Cybernetics," Chap. 87 in S. Arieti, editor, American Handbook of Psychiatry. New York: Basic Books (1959) pp. 1743-1759.
4. Eugen Rosenstock-Huessy. Out of Revolution: An Autobiography of Western Man. Trans. from German, New York: Morrow (1938); London: Jarrolds (1940).
5. The "Histomap" is a type of historical chart published by Rand McNally in which the history of mankind or particular classes of historical events are plotted on a chart with the time back from the present plotted on a logarithmic scale in order to compress the whole history of mankind into a six foot chart.
John B. Sparks, The Histomap of History, Chicago, Rand McNally & Co. (1952).
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7. Selden Smyser. "Logics: Subverbal, and Superverbal," Papers from First American Congress for General Semantics, March 1935. New York: Arrow Editions (1940).
8. S.H. Foulkes and E.J. Anthony. Group Psychotherapy, The Psycho-Analytical Approach. London (1957), p. 246.
9. A. Rapoport, Reference 3, p. 1747: "The engines of antiquity were hardly more than ways of transmitting force With the advent of the heat engine in the Industrial Revolution, a very fundamental change appeared in the role of technology. Machines were now no mere transmitters of force or storers of mechanical strain: machines were now transformers of energy. What Wiener has called the "Second Industrial Revolution" was initiated by the appearance of machines in which the central problem became the transfer of "information."
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