the KEY reporter

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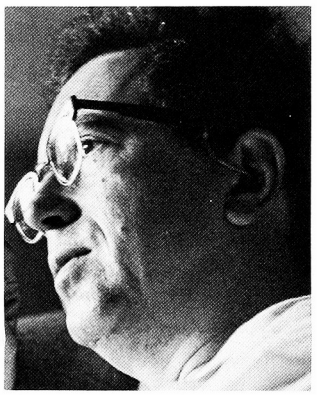
PHI BETA KAPPA PRIZE BOOKS FOR 1972

Phi Beta Kappa announced its three annual book awards of $2,500 each at the annual Senate dinner held in December.

The books chosen represent significant contributions to learning in three areas of humanistic scholarship. The Christian Gauss Award in literary scholarship and criticism was won by Hugh Kenner for *The Pound Era,* published by the University of California Press. John Rawls received the Ralph Waldo Emerson Award for *A Theory of Justice,* published by the Belknap Press of Harvard University Press. The award is made for studies of the intellectual and cultural condition of man. Winner of the Phi Beta Kappa Award in Science is Barry Commoner for *The Closing Circle,* published by Alfred A. Knopf. This award is offered for outstanding contributions by scientists to the literature of science.



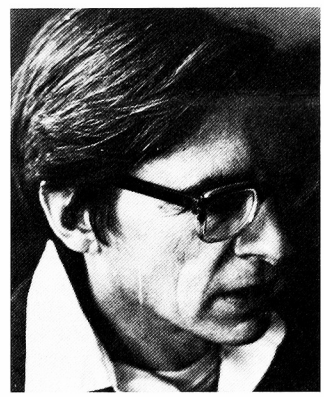
Hugh Kenner

The citation honoring Mr. Kenner's work included the following:

The burden of this study is the author's resourceful attempt to delineate the spirit animating the leading experimenters of the period, one essentially of a determination to create a language for the arts rich and immediate enough equally to express a new sensibility, to restore one lost, or fuse the two. The demands on a historian of such an era are staggering, for the artists in it — and preeminently Pound himself — were by temperament and discipline committed to plundering the world's store for their means and their matter, a sometimes discriminating and sometimes indiscriminate pillaging and reshaping that requires their historian to know not only what they knew but what they did not know or knew imperfectly. It is a special virtue of *The Pound Era* that it not only describes and narrates with attention — great feats of attention — but corrects and criticizes without superciliousness or incivility.

Hugh Kenner, a Canadian citizen, received his B.A. and M.A. from the University of Toronto and his Ph.D. from Yale. He is professor of English at the University of California at Santa Barbara and former chairman of the department. In addition to works on other modern writers including T. S. Eliot, Wyndham Lewis and Samuel Beckett, he has also written a forthcoming book on Buckminster Fuller.

In choosing John Rawls' *A Theory of Justice* as the winner of the Emerson prize, the award committee noted that it was likely to become a classic contribution to moral and political philosophy, of interest not only to philosophers but also to lawyers, economists and political scientists.



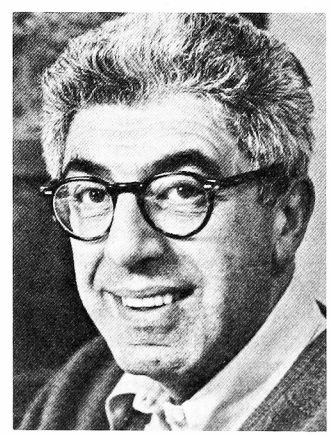
John Rawls

"In it Professor Rawls offers a profound critique of utilitarian philosophy, and argues that this philosophy cannot provide an adequate foundation for our political rights or for our notions of distributive justice. He exploits the techniques of modern analytical philosophy and of the modern theory of rational choice in order to provide a persuasive alternative to utilitarianism. His alternative is presented as an extension and consolidation of the social contract tradition, which has historically played a central role in the development of western liberal thought. In rehabilitating this tradition he makes a remarkable contribution to liberal political philosophy. This is a work of unusual importance and distinction."

Professor Rawls is chairman of the department of philosophy at Harvard University.

Barry Commoner's book, *The Closing Circle,* deals with the scientific and technological problems of the ecological crisis. As one reader noted:

"Professor Commoner is not attempting to identify a villain or even to denigrate our technological industries, but rather shows a remarkable broad understanding of how, with no wickedness at all, the natural development of human society has brought us to the crisis in which we now find ourselves. Professor Commoner is too wise to propose any easy solution, but he does indicate, in what I find a very stimulating number of broad suggestions for attack, the general line of approach which in his opinion will lead us back to a balance with the environment in which we must live."



Barry Commoner

One of the first scientists to recognize the menace of environmental pollution, Barry Commoner is the founder of the Center for the Biology of Natural Systems at Washington University in Saint Louis where he is professor of plant physiology.

THE DYNAMICS OF INFORMATION

by Frederick B. Thompson

Each of us feels somewhat informed about his individual corner of the world. At the same time, we are aware that our understanding is incomplete. Each of us in his own way seeks to make sense out of his experience. Some spend their entire lives in increasing our understanding; they are scientists and scholars, not because of what they know but because of their persistence in seeking to know more. And indeed this innate curiosity is a ubiquitous part of all of us. Since these informational activities of others are themselves part of our experience, we seek as well to understand each other. And thus, the dynamics of information.

But the results of these separate acts of knowing are not converging. Our time seems marked by a growing sense of being out of touch, of a too rapid growth in what there is to know. Creativity itself seems suspect when so much that is created is beyond our ken. Our day is fraught with informational problems. To deal effectively with these problems, we need to understand these dynamics of information.

The process of becoming informed can be factored into two parts. The first of these is experiencing. It is by interacting directly with the reality that is around us that we gain the raw materials of information. But raw experience is not enough. We must organize experience into a conceptual structure before it is meaningful to us. Nor does this structure come from the experience itself. Rather, we must impose structure on our experience. The knower must actively participate in the act of knowing. The matter was put vividly by the American philosopher-scientist William James:

> The world's contents are given to each of us in an order so foreign to our subjective interests that we can hardly by an effort of the imagination picture to ourselves what it is really like. . . . Is not the sum of your actual experience taken at this moment and impartially added together an utter chaos? The strains of my voice, the lights and shades inside the room and out, the murmur of the wind, the ticking of the clock, the various organic feelings you may happen individually to possess, do these make a whole at all? . . . We break it; we break it into histories, and we break it into arts, and we break it into sciences; and then we begin to feel at home. . . . We discover among its various parts relations that were never given to sense at all; and out of an infinite number of these we call certain ones essential and law giving, and ignore the rest.

It is our subjective habit to organize the individual elements of our experience, to cross-correlate these elements to others distant in space and time. It is only after this process of imposing organization that we feel informed.

Notice the essential role of abstraction and projection beyond what we have confirmed. Each moment of our experience is peculiar unto itself. It is only by ignoring differentiating aspects of past experience that we can see its application to current concerns. And these patterns that we exploit are not proffered by experience, which does not choose between the infinity that are there. They arise only when we back off and let the shadows of our own subjective structure cast perspective on our cluttered view. I am not questioning the objectivity of these patterns, once perceived. I am emphasizing the essential role of the subjective selection and imposition of organization that determines to as great an extent as experience itself the information that it yields.

Language is the embodiment of conceptual structure. We share our information with others. But to do so we must settle collectively on a structure into which our several experiences can be codified. It is this tacit, common structure that we exploit in communication. The essential characteristic of language is structure, as found in its word forms, its grammar, and its intrinsic logic. The study of language reveals the common conceptual structures of a community.

I should like to use the notion of language in this more precise form as synonymous with conceptual structure. In particular I am not restricting it to verbal language. Think of the language that a person is using at any instant as the embodiment of the organization that he has imposed upon his experience and as the means for framing his current information. I should like to introduce the notion of an informational community as a group of people who share a common language, whose conceptual views are based upon a common structure. An individual can be considered as a special case of such a community. When looking at the dynamics of information, it is the community and its language which is the central focus.

Now let us imagine a situation where we have a certain fixed body of observations or experience. Let us compare what would happen if we were to organize and conceptualize this experience in terms of one language or another. Each language would reveal certain information from its peculiar point of view. The concepts and means of expression in one language might be just so as to be quite inadequate for the experience at hand, while another language may be ideally suited to elicit revealing insight.

One can construct for a formal language a measure of information. Thus given a language and a body of observations, we can define the amount of information that can be elicited from the given observations in terms of the conceptual structures provided by the language. Different languages yield different amounts of information about the same observations.

Languages can be compared in the amount of information they provide. When we say that one language (L_1) is at least as powerful as another (L_2), we mean that whatever distinctions between possible states of the universe can be made in L_2, they can be made in L_1. On the other hand one can show that for any formal language (L) there is a much more powerful language (L′) which can express things not possible in L. As a consequence there is no most powerful language.

Let's examine the situation wherein we have a family of more and more powerful languages. Again we will assume that we are considering a family E consisting of a number of observations. Thus for each language L, we can determine the amount of information $I(L,E)$ that can be obtained from E in terms of language L. Let L_0 be the least powerful language in which all aspects of the observations E can be fully expressed. In L_0, the experiences E can be completely described. The question is: What happens to the amount of information as we move to either more powerful or less powerful languages than L_0? What can be shown quite convincingly is somewhat surprising.

Consider a more powerful language, L_1. The observation E can be completely described in L_1, and more. Indeed, L_1 opens many issues which cannot be decided on the basis of E; it gives rise to ambiguities and uncertainities that cannot be resolved. It is not only the case that it distinguishes between two states that were indistinguishable in L_0, but it permits states that violated the logic of L_0, that could not exist as far as L_0 is concerned. A language is essentially a means of correlation of otherwise disparate experiences; thus it per-

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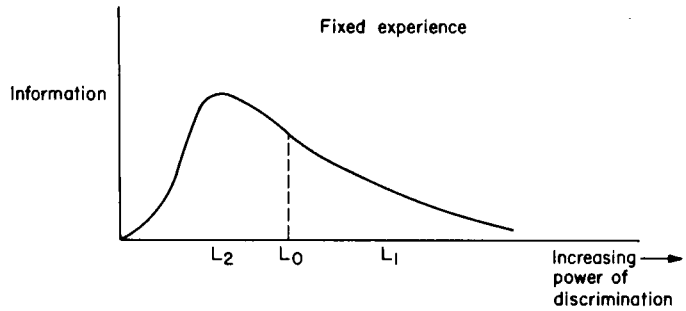
Professor Thompson, of the California Institute of Technology, gave this talk as a 1971-1972 ΦBK Visiting Scholar. It is reprinted from *Engineering and Science,* October 1972, published by the California Institute of Technology.

force must impose assumptions not inherent in the experience it explicates. It is this drastic extension of alternatives in the areas germain but unresolved by the experiences at hand that disrupts the correlations assumed in L_0, and causes information to fall.



Information as a function of the conceptual structure made available by the underlying language. Each language determines the amount of information that can be obtained from a fixed body of experience.

What happens when we move to the left? Obviously, if we move all the way to the one-word language, we lose all information. Suppose there are certain aspects of each observation that do not reoccur in any systematic way in the other observations, thus appear random; one assumes them irrelevant. Others may occur quite regularly without perturbation in all the observations; whereupon one assumes their universal regularity, thus equating differentiable characteristics. This indeed is the process of induction, moving us to higher levels of abstraction. Thus there is an intermediate position in which information is maximized.

We maximize our information at a level of conceptualization above that of our raw experience. The very essence of science has been to find those highly abstract first principles and laws which encapsulate broad stretches of our experience.

Our experience is not fixed but ever extending. In the face of changing experience, that language which maximizes our information also changes. Indeed, this is our simple model of cognitive processes, a model of the dynamics of how we are informed. We constantly change our language in such a way as to maximize the information we can elicit from our experience. We constantly modify and adjust the forms and relationships into which we encapsulate our experience in such a way as to keep us maximally informed.

Information processes, the processes by which we are informed, can thus be viewed as language change. Creativity is precisely such a process. To be creative is to impose upon experience a new structure which suddenly reveals insights which were obscured before. A poet's turn of phrase, a musician's variations on a simple melody, a painter's juxtaposition of shape and color, a dancer's mime in motion, all interpret anew things common to us all; and from these new interpretations we strangely draw a sense of knowing more.

The great moments of scientific advances are just such moments of new conceptualization. Copernicus moved the conceptual center of the universe from the earth to the sun. Kepler gave order to the confusing observations of the planets by placing them on an ethereal ellipse, tacked at a focus to the sun. Dalton observed the integral combinations of the elements in chemical compounds. Bohr gave us the basic model of the atom. Einstein grasped the absolute character of the speed of light. Each enormously expanded our information and opened highways for its further extension only by insightful shifts in conceptual structure.

But the innovative community is not an isolated thing. It exists in a wider culture. In this wider sense, the effect of creative change can be negative as well as positive. Great conceptual change calls for deep reverberating changes in the central conceptual structures that underpin whole cultures. For example, the Copernican shift shattered the image of man as central to the universe and thus opened the question the basic assumptions on which the religious institutions of the day were established. As we have already seen, this "opening to question" increases enormously the number of alternatives which have to be dealt with and thus reduces the information these expanded conceptual structures contain.

When one recalls that the previous views had themselves been constructed to be maximally informing in face of existing evidence, one can see how such a shift of view in one area can be a grave threat to the over-all conceptual accommodation of a society. As the cultural pattern of a society is built, a balance is maintained across the growing community that permits and enhances communication. If that balance is destroyed by an alien concept locally extended to account for local experience, it can drastically lower the information in the total society even while it increases sharply the local information. The global effect of a creative act must be analysed quite separately from the analysis which accounts for its local introduction.

A creative act is like an earth movement, an adjustment of local structure to the stresses built up by on-going processes of change, an accommodation to account for local experience. Like earthquakes, such creative adjustment of structure propagates throughout the conceptual structure of the society. And all along this propagating change, information falls as new alternatives are opened and uncertainty is increased. In a culture such as ours, there are continual occurrences of microquakes, thousands of quakes felt in local communities, and from time to time major conceptual quakes such as Darwin's announcement of evolution and the explosion of the first atomic weapon, which reverberate their unsettling implications throughout the society's cultural view.

A common language, a common conceptual view provides a community with a powerful tool. On such a basis, it can coordinate its activities, marshal its skills, share its experience. As a community increases its information, it thereby increases its capabilities to meet its needs and to successfully adjust to its environment. It also increases its capability to gain information. The invention of the telephone added a small item of information to human knowledge, but this small piece of information, how to design a telephone, was multiplied manyfold by its impact on the information its use made readily available in the society. The processes of becoming informed are self-accelerating.

What are the implications of this fact, the self-acceleration of information? As innovative change takes place in a community, it must be communicated throughout the community. The community's language must absorb the change, and all members of the community must recognize and adopt it. Communication takes time. The larger the community, the more time and effort are required to assimilate the result of innovative change. Thus the first conclusion we can draw is that community size must be inversely proportional to the rate of innovative change.

But information processes are self-accelerating; the rate of innovative change is increasing. As the community builds up a strong base of information, this base can be exploited on all sides. Innovation is stimulated at many places in the community. And if the community is to maintain itself, these changes must be communicated and absorbed. At some point in time, the rate of innovation becomes too great. People get out of touch. Some groups in the community are privy to information others do not have. Conflicts in view develop. The community fractionates. The seeds of its own fractioniza-

tion are sown at the very birth of a community in the self-acceleration of its information.

But the fractionation of a community need not be catastrophic. In fact one can look at the evolution of social mechanisms as the development of means of retaining high levels of information in a society even while it fractionates into a multiplicity of communities. Diversity of views and skills can be tolerated by a society if there are maintained avenues along which communication can take place. Let us review several ways society has learned to accommodate orderly fractionization.

The acceptance of a common medium of exchange is one. In the economic sphere we call it money, in the political sphere it is the vote. Social organizations also accommodate orderly fractionization. It is a common presumption that an organization has a goal and all of its members work toward its accomplishment. The myth of its goal does indeed give common coinage to the activities of its members but it is hardly more than myth. Indeed the very essence of organization is to create channels of communication which allow groups and individuals with diverse skills and goals and values to realize high levels of total information without the too costly maintenance of a single encompassing language. Think for a moment of the immense amount of information to be found in, say, the Department of Defense. The coordination of activities is worldwide and ties together in rational sequence such diverse affairs as the negotiation for the design of a new weapon system and its employment by men trained in its use years later on an unanticipated battlefield. But how few aspects of that information are to be found in any single Pentagon office, or at the fingertips of any single officer. Organization is thus a powerful means of maintaining orderly fractionization of a society.

Mechanisms such as the marketplace and social organizations are one way in which a society maintains higher levels of information in face of the self-acceleration of information. But there is another more basic one. Fractionization occurs when rates of innovation exceed the ability of the community to communicate the results of innovation. Thus if the technological means of communication can keep pace, the moment of fractionization can be postponed.

What activities of an informational community determine this fractionization? It is its data gathering and communicating that ties a community together, maintains the cohesiveness and consistency of its underlying conceptual structure. It is the activities of structuring and theorizing that are innovative activities that tend to fractionate the community.

Ever since the invention of the printing press there has been one major technological innovation after another that enhances our capabilities to communicate and to observe; the telegraph, radio, television, in fact the whole electronic revolution—the microscope, camera, linear accelerators, and bathyspheres—all support the gathering and communicating activity. As far as technological support of structuring, little has been done beyond pencils and paper.

We can record and communicate enormous amounts of data. As a consequence, the commonality of conceptual structure and the confirmation of that structure are very high. At no time in history has there been the commonality of human culture that exists today. The same popular music, the same kinds of transportation, the same values, the same technology are found almost everywhere. We virtually exist as a single informational community.

Into this situation has come the computer. So far it has been used largely to apply known theories and models to special cases in engineering and business. But the potential for technologically supporting the processes of structuring and theorizing, the innovative processes, are here.

Let me enlarge upon this somewhat. Suppose I have a large body of data or find myself in an experimental laboratory and I try to make sense out of what I find at hand. I try to construct a conceptual framework that accounts for the data or the experimental results in an insightful way. This is precisely the process we discussed earlier in the paper, the process in which one seeks to find that higher level structure that maximizes one's information. To do this I examine some small sector of the data or I conduct a limited sequence of experiments. On the basis of these, I form a hypothesis, which I proceed to test by further examination of data or further experimentation. In this way I build up an increasingly complex model or theory. But the process is not only one of accretion of structure. There comes a time when the model becomes unwieldy and unaesthetic. I try a variant on the theory, I simplify the model in a novel way that I could not have seen prior to its construction. I begin to change the model in quite creative ways, much like a sculptor takes a bit of clay off here and puts a bit on there. And at each stage I must step back and assess the implications across the entire theory, and see if the change still fits the data or the results of my experiments. This reverberating adjustment of the conceptual model is the tedious, time-consuming part of research. In the past, each research step was small, simply because checking out the implications of small changes in theory was already taxing.

In such a laboratory as I have described above, the construction of models has always played an important role. If we could make an actual physical model of what we were working on, then we could poke it, warp it, and change it here and there, and the implications of our change would be evaluated quickly and immediately by the model itself. But there has been no apparatus in which the abstract conceptual theory itself could be held and manipulated; there has been no way short of tedious calculations with pencil and paper to change the theory in one area and check the implications of these changes in other areas—capability to build complex models and then then to set them in motion and see how they work. That is, there has been no such apparatus up to now. But this is precisely what the digital computer is suited to provide.

For example, in our laboratories at Caltech we build complex conceptual models of nerve cells. We then take many of these simulated cells and build them into networks similar to those found in the nervous system, all of course in the computer. The computer is also hooked up to tiny electronic probes that are inserted into the nervous systems of living animals and that can sense their nervous activity. Both our conceptual model and the actual living nervous system feed the same analysis programs. We can thus compare them, adjusting the parameters of our model in immediate interaction with computer analysis, to fit the reality we are trying to understand. In this process the computer is handling data rates from the model and from the animal of 50,000 to 100,000 items a second.

Let me cite another example. Caltech anthropologist Thayer Scudder is studying a Tonga population of about 50,000 individuals in Zambia. Ten years ago they lived as simple farmers in an isolated valley. The Kariba Dam was built at the head of the valley, and these people had to be relocated. Recently industry has come to the area into which they were moved. Professor Scudder and his associates have extensive field notes covering this entire period, giving family relationships, vocations, education, property, etc., of hundreds of these people. We are now putting these data in the computer. In this computer system, Professor Scudder can ask questions and build conceptual models of culture change, testing these

(continued on back cover)

reading *recommended by the book committee*

humanities GUY A. CARDWELL, RICHARD HARTER FOGLE, ROBERT B. HEILMAN, FREDERICK J. CROSSON

social sciences LEONARD W. DOOB, FREDERICK B. ARTZ, LAWRENCE H. CHAMBERLAIN, EARL W. COUNT, ANDREW GYORGY, ANDREAS M. KAZAMIAS, RICHARD BEALE DAVIS

natural sciences J. T. BALDWIN, JR., KIRTLEY F. MATHER

KIRTLEY F. MATHER

The Mature Society. Dennis Gabor. Praeger. $7.50.
The 1971 Nobel Laureate in Physics continues his humanitarian avocation. Here he presents his cogent diagnosis of the contemporary crisis in human affairs and suggests some of the ways whereby a "gradual turn" may be made "from explosive, uncontrolled growth into organic development towards a mature society."

The Systems View of the World. Ervin Laszlo. Braziller. $5.95.
In this "natural philosophy of the new developments in the sciences," the author describes in concise, eminently readable terms the "systems view" which is replacing the "atomistic view" in many fields of science and discusses such far-reaching concepts as self-autonomy versus determinacy, freedom rather than slavery and the permissiveness inherent in the evolution of mankind.

To Live on Earth. Sterling Brubaker. Johns Hopkins. $6.95.
Sponsored by Resources for the Future, Inc., and appropriately subtitled "Man and his environment in perspective", this is a lucid, competent, and well-balanced survey of the several factors involved in the environmental crisis of our time and the options now discernable for the future.

The Spoils of Progress. Marshall I. Goldman. M.I.T. $7.95.
Subtitled "Environmental Pollution in the Soviet Union," this factual report effectively demolishes the "conservationist folklore" that environmental disruption will not exist in a society where the state owns the means of production and the public good rather than vested interests or private profits is the sole determinant of action.

Conserving Life on Earth. David W. Ehrenfeld. Oxford. $10.
A revised and expanded edition of a 1970 book entitled *Biological Conservation*. It presents a convincing argument for "holistic" rather than "resource" conservation; the stabilizing force of biological diversity is clearly recognized and specific actions are to be promoted with humility and caution.

Scientists in the Quest for Peace. J. Roblat. M.I.T. $12.50.
The Politics of American Science: 1939 to the Present. Edited by Penick, Pursell, Sherwood, and Swain. M.I.T. p. $4.95.
An authoritative history of the Pugwash Conferences, the constructive effects of which have been world-wide, and a collection of appropriate selections from official documents and other publications.

Man-Machine System Experiments. Henry McIlvaine Parsons. Johns Hopkins. $17.50.
This encyclopedic review of more than 200 recent or current experimental studies, many of them little known even among connoisseurs, is intended primarily for scientists and engineers specializing in this rapidly-growing field of research, but it will also prove of interest and value to anyone seriously concerned with the role of man and machine in the technologic culture of today and tomorrow.

The Private Nuclear Strategists. Roy E. Licklider. Ohio State. $11.
A scholarly study of the characteristics and motives of civilians outside of government who have been notably articulate in recent years concerning nuclear strategy and disarmament. One happy conclusion is that their role in policy-making seems unlikely to threaten American democracy.

The Nuclear Apple: Recent Discoveries in Fundamental Physics. P. T. Matthews. St. Martins. $6.95.
Modern Physics. Edited by David Webber. Penguin. p. $3.95.
Two lucid, minimally technical, introductions to the startling discoveries concerning the nature and structure of matter that have resulted from research in nuclear physics during the last few years. Each contains much fascinating information about such entities and concepts as quarks and leptons, relativity and quantum theory, parity and time. Dr. Matthews' book has the advantage of closer integration of ideas and uniformity of style. David Webber not only selected the 15 articles reprinted in the Penguin Book, but added valuable introductory paragraphs and helpful notations.

Faraday as a Natural Philosopher. Joseph Agassi. Chicago. $12.50.
Fossils and Flies: The Life of a Compleat Scientist, Samuel Wendell Williston. Elizabeth Noble Shor. Oklahoma. $8.95.
Charles Sumner Slichter: The Golden Vector. Mark H. Ingraham. Wisconsin. $10.
Worth-while biographies of remarkable and remarkably different men of science, appropriately published by three university presses.

ANDREAS M. KAZAMIAS

Inequality: A Reassessment of the Effect of Family and Schooling in America. Christopher Jencks, et al. Basic. $12.50.
On Equality of Educational Opportunity. Edited by Frederick Mosteller, and Daniel P. Moynihan. Vintage Books. $3.95.
Two complementary volumes on perhaps the most crucial and controversial issue in American education. Both were supported by the Carnegie Corporation and grew out of a special seminar held in 1966-67 at the Harvard Graduate School of Education; and both were inspired by the government-sponsored survey *Equality of Educational Opportunity* (1966), now commonly known as the Coleman Report.
The Mosteller and Moynihan volume presents illuminating reassessments of what have been called the "anti-education" findings of that document, such as, "family background differences account for much more variation in achievement than do school differences," or "characteristics of facilities and curriculum are much less highly related to achievement than are the attributes of a child's fellow students in school." Like its prototype it is mainly concerned with the relationship between equal educational opportunity and educational *achievement* (interpreted in terms of cognitive skills). Jencks and his seven collaborators go beyond the effects of school characteristics on achievement, and re-examine the role of schooling on *social* and *economic* equality. Their conclusion, in rather simplified terms, is that schools in and of themselves do not help "make adults more equal," nor do they contribute to "economic success."
Along with the Coleman Report, these studies will contribute to a more balanced appraisal of school reform and the part schools play in bringing about social change.

Education and Change in a Village Community: Mazières-en-Gâtine. 1848-1914. Roger Thabault, Translated by Peter Tregear. Schocken. $11.
A fascinating study, based on painstaking documentary research and personal experience, of the economic, social, and cultural modernization of a French rural commune with particular emphasis on the role of education. The story spans most of the last century and shows how the school in Mazières-en-Gâtine sustained and helped promote socio-economic changes (new communications, an exchange economy, a co-operative dairy, land clearance) as well as the "new faith" (belief in Progress, Republic and Fatherland). An important footnote to 19th century French social and educational history.

The Real World of the Public Schools. Harry S. Broudy, Harcourt Brace Jovanovich. $8.95.
A sober commentary on contemporary issues in American education. Well-written, full of common sense and the wisdom of an urbane educational thinker.

Modernization and Diversity in Soviet Education, With Special Reference to Nationality Groups. Jaan Pennar, Ivan I. Bakalo, and George Z. F. Bereday. Praeger. $20.

Education and Modernization in the U.S.S.R., Seymour M. Rosen. Addison-Wesley. p. $2.95.
Two informative additions to the literature on Soviet education. Both studies treat education within the framework of modernization and thus examine the complex relationships between schools and aspects of society (economic, social, and political). The Pennar, Bakalo, and Bereday volume includes the most detailed information available in English on the education of the various nationalities in the U.S.S.R. (Russians, Ukrainians, Balts, Georgians, Armenians, Turkic groups, and Jews).

LAWRENCE H. CHAMBERLAIN

The Last of the Big Time Bosses. Warren Moscow. Stein & Day. $7.95.
This straightforward, sensitive treatment of recent New York City politics deserves high marks. No one is more knowledgeable about his subject than Warren Moscow. His dispassionate report on the political career of Carmine De Sapio will take its place among the indispensable reference sources on this period.

Uncommon Sense. James MacGregor Burns. Harper & Row. $6.95.
In this searching critique of American political and governmental institutions, Burns is pursuing a theme that he has been expounding for more than twenty years: the inadequacy of existing mechanisms — the "disjunction of means and ends." For this essay he draws not only upon his own observation and experience but also upon a careful examination of most of the relevant literature. The result is a trenchant, at times eloquent, appeal to reason.

The Party's Over. David S. Broder. Harper & Row. $7.95.
The thesis of this book is that our governmental institutions at all levels are failing, that we are faced with under-financing, defective performance and a resulting disillusionment with the democratic process. According to Mr. Broder, the only corrective is a realignment of our political parties so as to make them parties of principle, in order that voters, given a clear basis for choice, will once again participate directly and continuously in determining governmental policy.

A Populist Manifesto. Jack Newfield and Jeff Greenfield. Praeger. $5.95.
The authors propose a political program and an election strategy designed to appeal to a new majority composed of the disadvantaged, the little people, the "non-elite." They argue that a Democratic candidate who would run on a program calculated to redress existing imbalances of wealth and power could win in 1972. This pre-election book, like Frederick Dutton's *Changing Sources of Power* presents a point of view that seems to have been repudiated in November. It remains to be seen whether the miscalculation lay in unsound doctrine or in faulty timing.

A Dictionary of Politics. Edited by Walter Laqueur. Free Press. $14.
A reference work of six hundred pages must be selective. The emphasis here is political and biographical rather than conceptual. One might question some allocations of space. For example, both Germany and Vietnam receive nine pages; Sherman Adams receives fourteen lines while Dean Acheson is given seven, Eleanor Roosevelt, five. There are strange omissions: no mention of the fifty states, no entries for urban or metropolitan problems, mass media, money in elections, etc.

Conflict of Interest. Sanford Waltzman. Cowles. $6.95.
The concept "conflict of interest" though frequently employed is not always clearly defined; its meaning is far from precise. This well-written book makes a substantial contribution toward a better understanding of the term. After discussing a number of recent instances of conflict of interest, distributed among all three divisions of the federal government, Mr. Waltzman proposes some interesting reforms. His reporting and his constructive proposals bear the stamp of careful investigation and serious reflection.

Blowing the Whistle. Written and edited by Charles Peters and Taylor Branch. Praeger. $8.95.
"Blowing the Whistle" means the exposure by a member or former member of an organization of malfeasance within that organization. This book presents a superficial treatment of a subject that deserves more thorough examination. Much of the material here reported previously appeared in the *Washington Monthly.*

EARL W. COUNT

A Trayload of Aboriginal-America

The Aztec Image in Western Thought. Benjamin Keen. Rutgers. $20.
The image, from Cortes to us, always has bespoken our world-view; it has lurched toward fidelity only as Zeitgeist has allowed. The earliest image shaped up from on-the-spot witnesses—Spanish clerics and lay administrators; later judges appraised these, were themselves reappraised in turn. A XVI century Spain passed theological judgments upon a presumed aristocratic theocracy, upon the anomalies of a magnificent crudity, bizarre with its cannibalism and poetry. It deserved conquest and destruction, the rescue of a populace from abomination. Contemporary Protestantism was unenthusiastic about the "rescue," readily generalized the "poor savage" from its encounters with non-Aztecs.
The Baroque image—classicism with fantasy —had Moctezuma speaking like a Montaigne or a Descartes. Then the Enlightenment supplanted the religious touchstone with secular reason. All "savages" reflected the "childhood of the human race." Indians were "degenerate" by virtue of climate and geography. At least, here was a seedling evolution and anthropology. In Spain, however, anti-Indianism triumphed. But the dilemma of Cortes therewith became that of a heroic conqueror of hapless savages. The early XIX century had a romantic sympathy for any ethnic *risorgimentos;* which refurbished the Aztec image; it now bore comparison with the Hellenic and the Roman. There appeared a "comparative civilization," drawing from a burgeoning archaeology, philology-linguistics. Mid-century positivism, law-and-order valuations, evolution, generated a scaling that placed European culture as culminative, while an oncoming ethnology arranged the rest, Aztec included, properly below it. Hypotheses were ethnocentrically deductive; yet the rediscoveries of codices, myths, prayers, sculptures compelled inductions that ate away hypotheses. The XX century saw Mexican civilization fully fleshed out as history. A creole-mestizo-indigene people has come to terms with its pre-Columbian past as the rest of the Occident has not had to do. Archaeology-as-history has proven a well-spring for further art-thoughts in sculpture, painting, architecture, literature.

The Ancient American Civilizations. Friedrich Katz. Translated by K. M. Lois Simpson from the German. Praeger. $15.
A masterly comparative overview of Mesoamerican and Andean cultures: their incipience, formative, classical, historical stadia, elicited from their ecology, archaeology, linguistics, narratives. They were practically contemporaneous; analogous but grossly and markedly unlike under a close eye. The Andeans outmatched the Mesoamericans, on the whole: in irrigation, extra-human transport (though feebly), communication, colonizing, administrative effectiveness (non-exploitive give-and-take, where the Aztecs only took). The Mexicans were the heavier traders, and, paradoxically, much the better mathematicians, though but for astrological purposes. Both *imperia* were theocratic, but their supporting aristocracies were very different. The Andeans, in their cold-high aridity, not the Mexicans, resolved the threat of famine. Art—in both worlds, it climaxed *before* imperialism closed down upon it. Götterdämmerung overtook both almost simultaneously; since the conquests, it is the Andean tradition that has proved to have been the hardier.

The Omaha Tribe. Alice C. Fletcher and Francis La Flesche. Nebraska. 2 vols. $3.50 each.
A reduced, offset facsimile of one of the very great classics of American ethnography, from the 27th Annual Report of the Bureau of American Ethnology (1911).

Cheyenne Memories. John Stands In Timber and Margot Liberty. Nebraska. p. $2.25.
Lame Deer, Seeker of Visions: The Life of a Sioux Medicine Man. John Fire/Lame Deer and Richard Erdoes. Simon & Schuster. $7.95.
John Stands In Timber was his people's self-appointed archivist-by-memory. His own, modest autobiography serves as epilogue to the archive; for one can live the history of a scanty nation. A Catholic turned Mennonite; and indeed a "great and simple" man. Lame Deer has spoken the more self-revelatory autobiography. He quested for Power, after the eternal manner of his people; he has remained faithful.
We who have ever been amanuenses to such as these, realize our privilege. We have experienced, vicariously, their strength to bend without breaking, as confronted with an imperceptive life-mode that would break. And both of the collaborators have transmitted their tellers' artless puissance. In Lame Deer's tale, particularly, there are chapters singly worth the book. The signature to it, the epilogue, is the spare autobiography of the recorder — who, in his native and hostile Europe, learned also to bend and not break; though the outcome has been the happier.

Out of the Silence. Photographs by Adelaide de Menil. Text by William Reid. Harper & Row. p. $4.95.
The mists and the silence. And the forested mountains spoke to men, men spoke to the trees; and there came forth a virile and sensitive carven art. Photographer and speaker (himself a worthy Haida sculptor) talk, not in duet, but in gently harmonious solos. Look, listen.

GUY A. CARDWELL

Critical Essays. Roland Barthes. Translated by Richard Howard. Northwestern. $10.
Mythologies. Roland Barthes. Translated by Annette Lavers. Hill and Wang. $5.95.
Theory (semiology) and critiques based in theory on such wide-ranging topics as striptease, Dutch painting, Tacitus, Brecht, and structuralism. The two books together make an easier approach to Barthes than did earlier, more technical volumes. Brilliant, dense, important.

The Visconti Hours. Edited by Millard Meiss and Edith W. Kirsch. Braziller. $40.
A reproduction of one of the most beautiful manuscripts of the late Middle Ages. Not just for the coffee table; the erudite editorial matter actually instructs.

Ulysses on the Liffey. Richard Ellmann. Oxford. $8.95.
A learned and at times amusing exploration of the ways in which Joyce created his Ulyssean myth.

Virginia Woolf: A Biography. Quentin Bell. Harcourt Brace Jovanovich. $12.50.
Virginia Woolf's nephew abstains from critizing her works but writes a compelling, inclusive account of her ultimately tragic life. Two volumes in one. Illustrated.

Black English: Its History and Usage in the United States. J. L. Dillard. Random House. $10.
Grounded in recent anti-racist scholarship. Important to educators; interesting to general readers. Includes sharp attacks on "Establishment" linguists and their theories.

The Occult Sciences in the Renaissance: A Study in Intellectual Patterns. Wayne Shumaker. California. $15.
A rationalist treatment of the meanings and uses of astrology, white magic, witchcraft, alchemy, and the "philosophy" of Hermes Trismegistus.

August 1914. Alexander Solzhenitsyn. Translated by Michael Glenny. Farrar, Straus & Giroux. $10.
The first fascicle of what promises to become many volumes by the Russian Nobel Prize winner. The book will be valued especially by readers who like monumental realistic novels. (The translation has been severely criticized.)

Folklore and Folklife: An Introduction. Edited by Richard M. Dorson. Chicago. $12.50.
Articles by many hands make a solidly structured, encyclopedic introduction to theories and practices of "scientific" folklorists.

Indian Life on the Northwest Coast of North America. Erna Gunther. Chicago. $15.
Extracts from later-eighteenth-century diaries and journals supplement comments on existing artifacts. An interestingly illustrated ethnohistorical study.

The Politics of Literature: Dissenting Essays on the Teaching of English. Edited by Louis Kampf and Paul Lauter. Pantheon. $10.
A mixed bag of doctrinaire papers by militant reformers, several of them prominent in the take-over of the Modern Language Association in 1968. Partisans of the right may see the volume as shallow and megalomaniacal; partisans of the left may consider it the work of heroes, saints, and martyrs. Uninformed and uncommitted readers will get some idea of what the shooting has been about.

An Anthology of Twentieth-Century Brazilian Poetry. Edited by Elizabeth Bishop and Emanuel Brasil. Wesleyan. $11, p. $3.45.
Bilingual; the translations are for the most part by distinguished poets.

Mark Twain's Fables of Man. Edited by John S. Tuckey. California. $16.50.
Roughing It. Mark Twain. Edited by Franklin R. Rogers. Published for Iowa Center for Textual Studies. California. $14.95.
The Booker T. Washington Papers. Volume 1, edited by Louis R. Harlan and John W. Blasingame. Illinois. $15.
The Diary of Edmund Ruffin. Edited by William Kauffman Scarborough. Vol. 1. Louisiana. $20.
The New Oxford Book of English Verse, 1250-1950. Edited by Helen Gardner. Oxford. $10.
Literary History of the United States: Bibliography Supplement II. Edited by Richard M. Ludwig. Macmillan. $14.95.
Each of the above titles (or items in a series) is in its own way indispensable.

FREDERICK B. ARTZ

Rome from its Foundation to the Present. Stewart Perowne. Coward, McCann & Geoghegan. $17.95.
Superb illustrations and excellent text.

Culture and Society in Venice, 1470-1790. O. M. Logan. Scribner's. $12.50.
An excellent social and intellectual history of the Golden Age of Venice.

Imperial Cities and the Reformation. Bernard Moeller. Fortress Press. p. $3.25.
A new approach to the history of the Reformation.

Women of the Reformation in Germany and Italy. Roland H. Bainton, Augsburg, Minneapolis. $7.95.
Many new facts about the Reformation.

Captain Cook. Alistair MacLean. Doubleday. $9.95.
A good popular life of one of world's greatest navigators.

Diderot. Arthur M. Wilson. Oxford. $25.
A masterpiece based on years of research.

That Greece Might Still be Free. William St. Clair. Oxford. $14.95.
The first scholarly treatment of the whole Philhellenic Movement.

Victoria's Heyday. J. B. Priestley. Harper & Row. $15.
A fascinating description of England in the 1850's. Elaborately illustrated.

Before the Deluge: Berlin in the 1920's. Otto Frederick. Harper & Row. $10.
A brilliant portrait of Berlin from World War I to Hitler.

Gamal Abdel Nasser. Shirley G. Dubois. Third Press. $8.95.
An excellent introductory account.

Fascism in France: The Case of Maurice Barres. Robert Soucy. California. $15.75.
A valuable study of the early development of French fascism.

 (continued from page four)

models against the data, all in natural English and in direct conversation with the computer. This capability accelerates the processes of understanding and theory building manyfold.

The introduction of the computer is for the first time giving major technological support to structuring and theorizing. What is its effect? There will be a large return in information for this movement. Thus the economic coercions for this change can be expected to be great. And indeed they are, as evidenced by the extremely rapid growth of the computer market and the application of computers in all aspects of our life. We should not underestimate the ubiquitous effect computers have already had. Our highway program, as well as our space program, could not exist without them. The effect on industrial inventories is a major factor in our economic stability. But it will be in expansion of our information frontiers that they will have their greatest effects.

As greater use is made of computers, the balance between conceptualizing and communicating changes. And this change will be such as to reduce drastically the size of the viable informational community. The rate of fractionization will be greatly increased. We should expect a time of rapid divergence in points of view and values. Because innovative change in conceptualization of our environment will be accelerated, we will feel more and more out of touch with others; and their effectiveness in dealing with affairs in ways we neither understand nor value will threaten even more our sense of being informed.

I have mentioned methods a society may use in attaining orderly fractionization. In this regard we discussed the marketplace and the use of social organization. These social mechanisms can be drawn upon and strengthened under current conditions too. However, what are the roads open to a society when faced with catastrophic fractionization of context? There are two, and we stand at the crossroads of these two paths today.

The first is to slow down the rates of conceptual change. Cut the national research budget. Reduce the support of public education relative to the general economy. Repress divergent groups. Enforce conformity to established codes of behavior. But the explosive forces of change cannot be controlled by half measures. This road leads to dictatorship.

The second road is characterized by the tolerance for diversity. It seeks a new, more enlightened conceptual base for our culture—one that recognizes that divergence of views can be enriching to a culture. What a challenge there is to society when innovation runs high! Are there deeper wellsprings of humanity on which we can base a new communication, one that revels in the richness of human diversity and welcomes the kaleidoscopic patterns of a creative culture? It is this choice between the challenge of the innovative society and the grim maintenance of a single conforming world that we face today.

But let us turn away from this crucial issue. Let's suppose we take the challenge. And indeed there is no question in my mind that we ultimately will, even if that ultimate follows a difficult period for free men. What is in store for creativity in an automated society?

It has taken the best brains and a prolonged and intense effort to forge our single science. Today science stands as a single edifice of astonishing complexity, yet yielding stunning simplicities of view. With the limited tools for conceptual structuring we have had in the past, the belief in science's uniqueness of objective view has been a necessary discipline. Science is the result of those forces that maximize the information that we can obtain from our experience. The intolerance of science of its own history is evidence that it dared not recognize its many changes. The belief that there can be only a single science, that truth lies in only one package, has been necessary when the effort to uncover that truth has taxed our ablest minds.

Yet even now the humanistic aspects of science are well recognized, at least by our scientific leaders. Conant referred to science as policy, not truth, policy to guide further experimentation. Schrödinger, while acknowledging the objectivity of science, called attention to its highly subjective aspects as well. The great expanses of unexplored reality leave open to the subjective curiosity of the individual scientist what corner he will examine, what experiments he will perform. Whatever our philosophical views on reductionism, as a practical matter the scientific landscape is sparsely settled. There are no bridges today between political science and psychology, individual psychology and psychobiology, psychobiology and molecular biology.

But what of the future? As we augment radically the technological support of the processes of conceptual structuring, each community can build its own science. From its accumulated experience it can distill that conceptual view that best expresses its own inner feelings, its values, its aesthetic taste. Science itself will become our greatest art form. With the material affluence of our automated society, we can turn our full attention to that which is most peculiarly human, the building and communicating of conceptual structure. The humanities—philosophy, the arts, literature, and science too—these will be the proper province of creative man in the automated society.

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