FUTUROLOGY
1970s

INTRODUCTION

During the past decade the practices of assessing, forecasting and long range planning have become increasingly central in our conduct of public and private business. These practices are now recognized as belonging to a more comprehensive discipline whose subject matter is "the shaping of the future". This discipline which has been variously titled futuristics, futurology or futures research has developed in response to the requirement among decision makers ~~--executives and planners~~ --in business, ~~and~~ government, and in service and research institutions for a better understanding of the processes of change--economic, technological and social--and for earlier warning signals of the threats and opportunities that come with today's rapid rates of change. But researching the future is not limited to the construction of an early warning net to tell us what is coming over the ecomomic, technological and social horizons. It is more basically concerned with what we would like to see come over those horizons and how we go about selecting and implementing what comes over. For what comes over the horizon of the future is not absolutely determined. It is shaped in part by what we have done in the past, by the continuing inertias of our past decisions. But it is in part open-ended depending on choices we now make and on the goals we now select. What limits the alternatives for the future that are available to us are the constraints imposed by the laws of nature and systems and the constraints imposed by the imaging capacities of our minds. In brief, the discipline we shall call <u>futures research</u> is concerned with the conceivable and possible futures, with their assessment and selection, with forecasting the most probable destinations of our present and selected courses, and with modifying these courses through plans that promise to take us toward the future we prefer.

CHAPTER 1. FUTURISM, FUTURISTICS, AND FUTUROLOGY

1.1 Introduction

Long range planning and forecasting are now recognized as parts of a larger discipline whose subject is shaping the future. This discipline variously titled futuristics, futurology, or futures research has developed in response to the requirement among decision makers, executives, planners, managers, and engineers in business, and government, for a better understanding of the processes of technological and social change and for earlier warning signals of the opportunities and threats that accompany today's rapid rates of change. But researching the future is not limited to the construction of an early warning net to tell us what is coming over the technological, social, and economic horizons; it is also concerned with how we may affect what comes over these horizons. For what comes over the horizon of time is not fully formed; it depends in part on what we have done, on the inertias of decisions made in the past; and it depends in part on choices we now anticipate, on the goals we now select, on what we assess to be useful or salutary for the future. Delimiting the alternative futures that are avialable to us are, on the one hand, the constraints imposed by the laws of nature and systems and, on the other hand, the constraints imposed by the limits of our minds to imagine other than what is. In brief, the discipline we shall call, futurology, is concerned with the conceivable and possible futures, with their assessment and selection, with forecasting the most probable destinations of our present courses, and with changing that course through planning and implementing those plans which promise to take us toward the future we prefer.

It is well to recognize at the outset that the concepts and even the language of futurology which utilizes terms such as forecasting, planning, scenarios, trends, or extrapolations, carry loaded emotional affects for many.

There are those for whom any kind of forecasting or prognostication carries the distrustful flavor of prophecy, the supernatural, and crystal balls. Forecasting is repugnant or non-sensical for them because the idea of foreknowledge of events implies a strictly pre-destined world, lacking freedom, open-endedness, freedom of will and choice. There are others for whom the concept of long range planning or just planning anything beyond a week-end camping trip carries the odious flavor of Marxism, state socialism, and structuralism. These concepts are repugnant or threatening because again they represent invasions of freedom of will and choice of action. There are still others who are suspicious of futurists, forecasters, and long range planners because they fear their usurpation of undue social influence for their own ends, seeing in them a threat to democratic institutions. Finally, there are those who, though recognizing the importance of entrepreneural planning, feel that forecasting and futurism are impractical since any forecast specific enough to be useful is in all probability wrong and any forecast general enough to be right is too vague to be useful. These criticisms and antipathies are based in part on justifiable and pragmatic concerns, but they also derive in part from prejudices of unwarranted associations or from misconceptions, making much of this aversion toward only straw men.

It accordingly becomes important to understand what futurology is and what it is not; what it can do and what it cannot do; to understand the proper purpose of a long range plan, and the function of a forecast. It is not only important to see the contributions and opportunities of futures research but also to see its limitations and threats. It is important to understand its assumptions and models as well as its methodologies and techniques; to know its philosophical approach as well as how to evaluate its results; and to be able to distinguish good practice

from bad. In order to meet these requirements and to gain a preliminary orientation into the theory and practice of futurology, the present chapter gives a brief survey of the discipline, its sources, its vocabulary and literature, its people and institutions, and its contextual meaning in today's world.

1.2 The Sources of Futurism

Whatever the objections and criticisms, the facts are that the past decades has seen a ubiquitous mounting interest in and concern with the future. Evidence lies in a burgeoning literature on futures including new journals such as The Futurist, Futures, and Technological Forecasting and Social Change, the formation of societies such as The World Future Society now having over 6500 members and frequent conferences and symposia on the subject of the future such as the First General Assembly of the World Future Society, an international conference held in Washington, D.C. in May 1971 (14). Evidence lies in the creation of long-range planning departments in corporations, special planning and assessment commissions in government agencies, and institutes whose full time function is the study of the futures. (15) This rather sudden development of a widespread orientation toward the future is a social phenomenon of major significance that has itself attracted considerable notice and evoked many explanations for its occurence at this time in history.

Daniel Bell, the chairman of the American Academy of Arts and Sciences' Commission on the Year 2000, proposes two causes for the present onset of futurism (15). First, it may be ascribed to the approach of a new millenium. For many, the same magic hovers over the year 2000 that gripped Christendom as the year 1000 approached. There is the same expectancy of some chiliastic change about to take place -- the "Age of Aquarius," or the "Omega" point of Teilhard de Chardin. When superimposed

on the fatigue and shock of today's unprecedented rapid rate of technological and social change, the hopeful expectancy of an even more profound change soon to come seems contradictory. But the anticipated millennial change will somehow deliver us from our present crises including our burden of saturated change. Bell's second reason for the onset of futurism is our present bewitchment with technology. The cult of novelty ~~has found~~ finds technology to be the principal contributor of gifts for its altar. The stream of new products from technology ~~seems to~~ fires our imaginations to seek further and further innovations going beyond need, convenience, or even good sense -- the prospect of plastic dishes expressly stamped and molded for each meal and then remelted rather than washed intrigues us to imagine even more fully automated kitchens of the future.

But in addition to the "magic of the year 2000" and our "bewitchment with technology", three other factors effect ~~facing~~ us futurewards. Foremost among these perhaps is the very rapidity with which change is taking place about us. What 19th Century man ~~had the~~ first tasted of -- in history — a steady diet visible change affecting his personal life style -- has become for 20th Century man ~~a steady diet~~. For example, the personal patterns of travel have changed several times for all over age forty. In the cities, trams, trolley buses, and buses have been exchanged for the private automobile. Between cities, steam locomotives, diesel locomotives, and propellor planes have been exchanged for jet planes, and no one expects present dominant modes of intra or inter-urban transport to be those of ten years from now. The visible ~~disolving~~ dissolution of all permanence creates a focus on change and an orientation toward the future.

Another factor influential in effecting futures orientation lies in the magnitude of our technological activities. There are two aspects to this magnitude: first, the fiscal requirements of today's high-budget programs in both public and private sectors. The trend toward budgetary

bigness began with the public works programs of the 30's, followed by the defense programs of the 40's with the major budgetary jump for an individual program being the two billion dollar Manhattan project. Defense and space programs of the 50's continued the trend to ever higher budget programs with the culmination in the 25 billion dollar Man-on-the-Moon program in the 60's. At the same time, private industry innovated new products such as jet planes involving unprecedented high budget development programs. These programs crossed a budgetary "watershed" in which the costs of comprehensive planning became less than the costs of the mistakes that invariably occurred in the absence of such planning. The decision makers on such programs saw the importance of the ability to predict and react quickly and became among the first to be future oriented.

The second aspect of the magnitude of our technological activity effecting futures orientation is the cumulative effects of all technological operations large and small. For example, the effects of widespread pollution on our environment ~~have brought~~ forces the realization that piecemeal focus on individual enterprises ~~will~~ fails to ~~detect~~ provide sufficient feedback signals that while locally small, effects become globally large. Our present environmental crises is attributable to such a reductionist perspective, a world view that cannot provide an adequate framework for operations involving the large amounts of energy that we now control. The scope of our enterprises ~~and their side effects~~ have outgrown the traditional economic and political coordinate frames in which ~~we reared them~~ they were reared. The fiscal year, for example, is a poor temporal unit for taxing many of our rapidly evolving activities. Space age activities require release from the provincialism of both place and time.

In addition to the dissolution of permanence and the magnitude of technology, there is a philosophical factor contributing to the growth of futurism. Today there is a general feeling -- one which no previous generation shared -- that we have or soon will have the power to control

our destiny. The Greek sense of tragedy reflecting the insignificance of human aspirations and struggles in the face of overpowering forces of nature or whims of fate, has almost completely disappeared in today's developed world. The degree of our mastery over nature exemplified by voyages to the moon, the subduing of disease and famine, and the availability of a personal share of humanity's accumulated wealth of knowledge and power in the form of automobiles and electrical conveniences, has eroded the philosophy of fatalism. But confidence in mastery over our destiny is not a new American feeling. Robert Pollack (p. 78 in ref 16) reminds us that "In America ... men have felt free to envision ends, even seemingly utopian ends, that can even now determine action. That is, men feel free to live in a way that endows even distant goals with reality in the present...In American, where belief in futurity became firmly rooted... determinism, which for so long weighed down the human spirit, was finally got rid of." (16) It is our tradition that we are free to shape tomorrow. This idea is so ingrained that to revive any spectre of determinism is to invite rebuke and disdain. The present futurism in America is but a more intent focus on tomorrow resulting from the reinforcement of our traditional beliefs by recent developments of better tools for predicting and shaping the futre. These tools are the predictive methodologies coming from operations research, systems analysis, and futures research itself that allow us to trace alternative paths to the future and plan for those of our choice.

The growth of futurism can also be ascribed to the activities of futurists themselves whose sales campaigns sometimes oversell their capabilities. Those who are suspicious of the influence of certain types of futurists have here grounds for their concern. There is no question that in a non-deterministic world, those who do our thinking about the

future have a large influence in shaping our future. Though we may choose as we wish from a smorgesboard ~~table~~, the chefs who prepare the menu have the ultimate control over our choices. Control over choice is power and the recognition that through the practice of futuristics lies an alternative path to power has no doubt attracted some to the profession of futuristics. The power of the futurists is to the power of the ephemeralist as the control exercized by a navigator is to that exercised by a pilot. In fact, the role of the decision makers of the future will be increasingly navigation-like and less pilot-like. The automatic pilots provided by computers and the decision sciences will eliminate much of present managerial activity. This situation will tend to make the real decision makers largely invisible, and in turn, mandatory the monitoring of those who practice futures research. They must be held accountable to the public as are shoe who exercise the power of the present. The challenge to a participatory democracy is to organize futures research so that all who are to live in the future may participate in its choice.

Summarizing, we find that futurism has been stimulated by the possibilities inherenet in technology, and by the visible rapidity of change. It is a response to the budgetary bigness of projects, and to the requirement for earlier and more discernable feedback signals to head off treats and reveal opportunities. It is an outgrowth of our philosophical belief that we are masters of our destiny and not puppets dangling on the spun, measured, and cut threads of fate. Futures research has been promoted by those who recognize new paths to power in its practice, and finally, futurism is in resonance with the chiliastic Zeistgeist of a new millenium. With all of these roots supplying nourishment, the future of futurism looks fat indeed.

from Chap I

22 June 1971

Introduction

~~PREFACE~~

The rapidity of change intody's world is impressing all who are invovled in decision making processes with the fallacy of taking current configurations of markets, state of the art, social values, or pollitical allignments as the inputs for their decisions relative to condtions 10 years, 5 years, or even 2 years hence. No business, government, or individual plan can any longer be based on the assumption that it represents a unique element of change imbedded in a quasi-static context. The high rise, tract, freeway, educational curriculum, or weapon system conceived for needs and preferences as projected today, without taking into account the gestalt change effected by all the other planned innovations, projected growths, and attitudnal switches may not only be obsolete upon completion but actually counter productive. In addition, with a rapidity of change that renders obsolete even our methods of planning for the future, it is not surprising that obsolescence is overtaking or threatening long established institutions and businesses and certainly is sweeping over the educations, professional trainings and careers of many individuals. This situation poses an unprecedented challenge to almost everyone ~~either~~ both personally or institutionally. How do we meaningfully plan our businesses, our communities, our investments, and our careers in a world in which the very coordinate frames of state-of-art, value and relationship from which we obtain our orientation and within which we locate our lives alter even as we view them. How may we know before it is too late whether we are still sitting trustingly behind Maginot Lines of education, investment, policy, or defense upon which we have spent out lives and fortunes but which will ineffectually vanish ~~in~~ with the very next test of time.

One response to this challenge has resulted in the emergence during the past few years of a discipline, variously called futurology, futuristics, or futures research, whose current state is that of a preleminary formalizing of a "science of the future." Forecasting, assessing, and long range

planning are the three major constituent operations of futurology. But futurists also recognize that before goals can be set, priorities assigned, strategies adoped, or plans laid, one must possess a set of alternative images of the future. If we are without images of alternative futures, then we are without choice, and forecasting, assessing, and planning become either frustrating or meaningless. Thus the generation of alternatives through the exercise of creative imagination becomes the fourth and perhaps the most important branch of futurology. Already futurology has ammassed a tool box of useful methodologies for its various operations. Many of these have been taken over from operations research, systems analysis, or decision science, but some, such as iterated feedback polls)Delphi techniques) have been expressly designed for futures research.

Whether a successful systematic and critical approach to all of the problems posed by rapid change can be developed reamins to be seen, but altready futurology has shown it can help in pointing out future threats and opportunities and in making us aware of some of the delayed feedbacks of our present plans and policies.

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SOCIETAL SCHIZOPHRENIA: OUR PERCEPTIONS DO NOT MAP REALITY

Several times in recent years the mayors of certain large cities have stated that their municipalities are becoming ungovernable. They are not only referring to the impossibility of balancing the city budget, but to the difficulties of keeping the flow of services--waste disposal, citizen protection from crime, social and health services, energy and transportation--above an acceptable minimum. While but a few of our cities have been overwhelmed by these problems, hardly a city of any size exists that has not begun to feel the pressures of these problems, especially in the downtown urban core.

But other large systems besides cities are also becoming ungovernable. The economy in-toto frequently takes turns opposite to the intent of those who control the ailerons of taxation and interest rates.

Our theories and models no longer seem to accurately map the systems they are supposed to represent. We cannot expect to navigate safely, if our maps are wrong or if our position on the map has been incorrectly determined, nor can we expect to guide a ship which does not respond to the rudder in the expected manner.

Governability, basic cybernetics tells us, depends on accurate knowledge of the error signal or vector between where you are and where you want to be. If either, or both of these positions are not known the system becomes uncorrectable and the best that can be hoped for is some sort of muddle through.

As we enter the 80's it is becoming evident to many that we, in fact, not only do not know where we are going, we don't know where we are. We not only have no positive image of the future, our notions of the present state of our stability, vulnerability, viability and governability have all become illusory. Our perceptions of our situation do not map our actual situation. Our images are anisomorphic with reality, and in an individual this condition is called schizophrenia and can prove to be serious. But collective schizophrenia is also possible and can likewise prove to be serious. Let me give an example:

A few years ago I had a job one of whose duties was from time to time to sit in for my boss on the meetings of the executive committee of a large corporation. This was so I could report the proceedings to him when he could not attend.

I was quite surprised by the subject matter discussed in these meetings. I had the image of the top executives of the company being concerned with such items as the level of sales, new government regulations, future models, what the competition was doing etc. Instead, the topics usually discussed were on a very nuts and bolts level, with an obsession with company status symbols. Should the company bus schedule be shifted 15 minutes so as to be more convenient for those going to the South Plant after lunch. Should assistant department heads have reserved parking spaces. Should the executive dining room pass on discounts in wholesale liquor purchases. At first I thought my boss skipped these particular meetings because of the trivia on the agenda and had me waste my afternoons instead of wasting his. But he assured me this was not the case. All the meetings were of this nature.

I recall the last meeting I attended. The subject was the paneling and carpeting for the executive offices in the new corporate office high rise for which the ground was to be broken the next spring. That ground was never broken. Less than two weeks following this meeting, it was disclosed that through gross mismanagement one of the divisions of the company was on the skids and a major cash flow crisis was upon the company. The resulting panic reached to every level of the corporation--I suppose even intruding on the meetings of the executive committee. The company survived only under the terms of a humiliating merger.

I report this as an example of an anisomorphism--the relation between reality and the perception of reality being distorted or even totally disconnected.

But not all anisomorphisms arise from the absence of a perception. Some derive from the deliberate creation of a misperception. One species of anisomorphism began when the Hollywood idea of image began to diffuse beyond the bounds of the film industry. The makers of motion pictures are in the business of creating illusions, of making us believe we are viewing battles between Roman galleys or starships from another galaxy, or that certain actors and actresses are phenomenally beautiful and charming people, having all the looks and talents that anyone could wish for. The art of projecting images quite different from reality had been successfully developed by Hollywood. But this was O.K. Everyone understood it was an illusion and it was fun. The only question was sometimes, how was it done.

The Hollywood experience led to the realization that everything existed on two levels: The chaotic and flawed realities of the production lot with its rather ordinary, but exclusive, people in front of the cameras--the real level; and the magnificient palaces displayed on the screen inhabited by cosmetically transformed gods and goddesses--the perceived level. It was as old as Plato, the two levels, the real and the perceived, the object and the shadow. Having been trained by Hollywood to perceive the images which they projected as real--and we liked to think of them as real--the road was paved for creating a world of projected images as a surrogate reality. Not only did movie stars have images, politicians had images. Corporations had images, products had images. We began to transfer our perceptions and our psyches to the image world and forget about the world actually in front of the cameras.

But it took another few steps before we began to accept the idea of general anisomorphism, the idea that it was O.K. outside of Hollywood for the image not to faithfully map reality.

I remember the disturbance over "payola". At first people were upset when they learned that a favorite 'genius' who had been able to answer all of the questions on the "$64,000 Quiz Show" had been given the answers in advance and was a phoney. But the flap soon subsided, "Who cares--after all it was a good show".

But today anisomorphism is the rule. I went into a restaurant the other day that had for years been noted for its excellent split pea soup. I remember the soup well, it was truly delicious. But the other day the soup was very inferior, bland, nothing at all like the old soup.

On the table in front of me, however, was a card describing how wonderful this soup was--how widely renowned, vouched for through glowing testimonials by gourmets and gourmands. But personally unable to substitute the flavorful description for the insipid reality of the soup, I could not finish it. Today when quality or performance goes down, we do not spend money on making the soup good again, we spend money on giving the soup a good image, creating a brand or product anisomorphism. Though I often suspect it would be cheaper to improve the soup than its image, it would not be so cost effective since people come to the restaurant for the image, not the soup.

I see in the papers these days where certain politicians are having their images changed for the presidential election year, acquiring images to which the public will be more responsive. The inference is that neither the old image nor the new image tells us anything about the person ~~man~~ himself, but who really cares since we no longer vote for ~~men~~ persons, we vote for images. (an image can be put on and taken off like a hat)

Experience with schizophrenic patients has shown that these sorts of charades can go on with impunity for years. If sooner or later there were not the inevitable traumatic encounter with the real reality, there would probably be little reason to seek to cure schizophrenics, what harm in letting them continue to live in their surrogate reality in cloud coo-coo land?

Realities are nested and each of our surrogate realities--our symbols, institutions and laws must exist within and in conformity with the contextual structures, processes and laws of nature. The cultural plays that we write to take place on our planetary stage--this globe theater--are produced by permission of the management, the natural order. (The contextual reality is not subject to our manipulations.) It is insane to pretend that the natural order may be considered a character in our play and write a part for it in the script having it do the things we would want it to do. And yet that is what we do when we equate our economic imperatives and the global ecology to two adversary characters in our play. That is what we do when we write such scripts as the one entitled, "Nuclear Deterrence". Nature is not part of our act, we are part of nature's act. To forget this is HUBRIS, the sin the gods invariably punished with extinction. Four centuries in search of the Baconian Grail--control over nature--have brought us to a place where we can no longer perceive this illusion.

The key, perhaps, is to understand the difference between controling nature and shaping the future. The former is the ideology of the cancer cell, the part seeking to grow beyond its functional bounds to become the whole. The sub-system breaking with its allotted role in the total system, seeking to divert the processes of the system to its own ends and replace the system goals with its own goal. It is no mere coincidence that the world's greatest literature repeatedly warns of the fatuity and futility of this obsession. But in spite of the caveats, we have become a "cancer society" on every level from the internal organs of the individual to the east-west political blocs.

Shaping the future, on the other hand, takes as its point of departure the truism that there are both shapable and unshapable components in the universe and the first rung on the ladder of futures wisdom is to appreciate the difference.

The second rung on this futures ladder probably has to do with what I have been trying to articulate today. We must recognize that there are two kinds of error signals: The first is the cybernetic error signal, the vector difference between the actual present state of the system and the selected normative state or the goal. The second error signal is the perception error signal, the vector difference between the actual present state and the perception or image of the present state. Whenever the first error signal is zero, the social dynamic vanishes and the society becomes becalmed; whenever the second error signal is not zero, i.e. when there are anisomorphisms, social correctability vanishes and the society becomes schizophrenic.

The first error signal may vanish when there exist no energizing images of the future, or when the second vector error is equal and opposite to the first. This is the case when we misperceive our present state as being our ideal state already fulfilled--especially as permanently fulfilled. If having reached the rank of number one, effort relaxes, resting on laurels, a positive feedback situation increasing the size of the second error signal may develop. The belief that the U.S. has the best medical care in the world, the highest standard of living, the greatest per capita income, the most civil liberties, the greatest per capita production, etc., facilitates our slippage into lower ranks.

This is confusing a vision of the future to work towards with the false image that you are there.

What are the causes of the anisomorphisms--the second error signals--that are guiding us to the wrong runway?

1) The first is: No perception of reality, Herman Kahn's "Reality has outstripped experience". Examples of this are:
   - o The bio and social destructive power of nuclear weapons.
   - o Accounting systems that do not take into account all of the costs, especially the non-renewable and irreversible impacts on our planet.
   - o All systems in which the feedback signals are delayed or not sensed. Radioactive components in a system, for example.

2) The second is anachronistic thinking and refusal to change--assuming configurations that are no longer valid to still be true. Some examples:
   - o All strategic thinking about nuclear war based on obsolete symbols of national power and security.
   - o The more money we spend on defense the more secure we are.
   - o We are so affluent that we can have both guns and butter.
   - o Americans want large and powerful cars. They have bought them in the past and they will buy them in the future. (This is an example of 'the future is to be more of the past' . It is one of the most widespread and deceptive anisomorphisms.)
   - o Economic practices which tend to freeze capital where it is (e.g. capital gains taxes) and make it difficult for capital to flow where it is needed are supportive of anachronistic anisomorphisms.

3) The deliberate fabrication of misperceptions. (requiring truth in advertising legislation). Examples:
   - o The beautiful billboard people with their cigarettes.
   - o The images of most politicians.
   - o 'Bad Guys' on whom to project the blame, currently the multinational oil companies.
   - o The abuse and misuse of language.

4) Self-deception in any of its fashionable forms: Escapism, denialism, refusal to look at unpleasant facts. Examples:
   - o Executives, business and government, who insulate themselves with cadres of 'yes men'.
   - o Mutual admiration societies.
   - o Philosophical schools such as logical positivism which hold that facts which contradict theory must be ignored, defused with ad-hoc hypotheses or rhetorically nudged out of the picture.

5) Hubris, arrogance, chauvinism, particularly those brands that assume they wield more power and control than they do.
   - o The whales, the redwoods, the lakes will be here forever, and when they aren't we'll find a substitute.
   - o There is a technological solution to every problem. We may not have it in our pocket at the moment but that is no excuse to postpone or delay.
   - o The Titanic is unsinkable and we therefore need supply it with only a few token lifeboats.

6) Ontological confusion or the inability to perceive the nested nature of realities and which nest one is in.
   - o The important thing on the Titanic is the seating arrangement at the Captain's Table.
   - o The lady, Kitty Genovese, being stabbed in the yard is part of a TV performance.
   - o And perhaps this is where best to place that all-embracing inflationary anisomorphism--that between value and price.

One is inclined to conclude that social anisomorphisms will inevitably arise--especially the anachronistic variety in a world in the throws of rapid change. But anisomorphisms are not all bad. Sometimes reality can be paralyzing and we actually need a certain amount of deception to avoid being overwhelmed. But when anisomorphisms begin to interfere with the correctability, the governability of the system, we had best ask for a position redetermination.

There are those who feel that the decision makers should not be allowed to be above their mistakes. When a man is too high up to be fired after his decisions have proven disasterous for his company or its customers, then a system needing of correction does not get corrected. There are those who feel that when we are called to bail out a company, it should only be done with the proviso that the entire upper echelon of management be replaced. During Watergate it was decided that no one, no matter how high up, was above the law. Now it is felt that the other shoe should drop, and no one, no matter how high up, shall be above the consequences of his mistakes. When we got rid of kings, did we not also discard the idea that 'the king can do no wrong'?

Certainly, deliberately immunizing the decision making component of a system from correct~~ability~~ion may lead to the entire system becoming uncorrectable, but not necessarily so. However, our policies of limited liability, and by inference limited responsibility, definitely violate the basic corrective processes of long-lived natural systems as evidenced in the principles of bio-evolution. This immunization of the decision maker from correction may be the most important anisomorphism of all in that it is a meta-anisomorphism, one that breeds other anisomorphisms.

As America enters the 80's, the situation is much like a pre-earth quake condition with intense stresses built up along , not only the economic and social fault lines, but along the San Andreas Fault of Western Culture itself. Our anisomorphisms must soon correct themselves out of their own stress, even if we refuse to act.

The test of the 80's, to paraphrase words uttered at another time of great tension for Americans, will be again to test whether this nation or any nation so conceived and so dedicated can continue to endure.

1.3 Types of Futurists

While the turn toward the future is a general phenomenon, the specific approaches to the future are varied and the worldviews underlying the approaches are oftimes contradictory and conflicting. In order to place in perspective the approach and worldview toward the future adopted in this book, we shall briefly look at some of the principal types of futurists, their backgrounds and emphases.

Many types of futurists have intermittently been important throughout history. Those who have the longest record of unbroken professional continuity as futurists from ancient times ~~down to the present~~ are architectural and military planners. This is perhaps due to the fact that until recent ~~times~~ only architectural and military projects had sufficient size to require thorough planning in advance. It is therefore not surprising that the futurism of our time developed largely from the activities of military planners during World War II and the following period of the Cold War. The escalation in the size and cost of weapons systems concomitant with the increase of time span from a system's inception to its becoming operational required long range planning that changed the basic approach from that of a sequence of isolated weapon projects to that of a dynamic weapon configuration-in-time. The viewpoints and methodologies developed to solve the problems of dynamic weapon systems proved appropriate to other large industrial enterprizes operating in the competitive milleu of technological change with rapid obsolescence. Hence the military futurism was widely adopted by both private industry and other departments of government during the 50's and 60's. It has today become the paradigm for a large sector of futuristic thinking. (17)

The tradition of architectural futurism, on the other hand, followed a different path. In mid-century, architectural planning like military planning escalated to larger projects and systems -- multiunit complexes, communities, and entire cities becoming the proper subjects of design. But architectural systems were different from military-industial systems in three important respects. First, architectural systems operated on a different time constant of obsolescence principally due to the fact that the high competitive pressure that existed in the form of military force vis-a-vis military force in industrail markets was lacking. Secondly, architectural systems are of a more purely 'hardware' nature than modern military-industrail systems which tend to have sizeable 'software', network, and organizational components. And thirdly, architectural systems have a more intimate interface with people and their diversity of reactions and opinions and are therefore more subject to democratic processes of acceptance than military systems which may be centralistically designed and implemented. Both military-industrial futuristics and archetectural futuristics seek to incorporate as rapidly as possible all useful technological innovations, but in other respects their emphases are different. Competitively conditioned futuristics such as those of the military-industrail variety must obey the rubric of being continuously operational, and whenever investments become very large, they must also cintinuously adapt existing systems through modification wherever possible. These factors give military-industrail futuristics a largely determinative flavor, their evolution being primarily 'past' propelled. Archetectural futuristics, on the other hand, operating in a less competitive milleu and inheriting the tradition of the arts in searching for the ideal, requires its primary direction from its images of the future, its evolution being primarily 'future' propelled. Architectural futuristics has until recently ignored

the gestalt systems methodologies of military-industrial futuristics, while military-industrail futuristics has until recently lacked the imaginative normative inputs of architectural futuristics, making the one naive and the other pedestrian. Military-industrial futurists are mostly found in 'think tanks' such as the RAND Corporation or the Hudson Institute and are primarily concerned with perpetuating existing corporate and political organizations through pointing out the opportunities contained in the changing technological state of the art amid the threats posed by competition or resource scarcities. Architectural futurists are found in the various schools of architecture and design about the country and in some of the major architectural and planning firms. They are primarily concerned with improving man and the world through changes in the design environment, introducing not only more smoothly functioning cities, buildings, and artifacts, but more esthetic surrounding to which men's characters will hopefully respond. (18)

Another group of futurists having a historical record are the economic futurists, those concerned with predicting economic trends and opportunities. Until the 18th century, their role lacked the historical continuity of the military or architectural futurists. In fact until the 19th century, their activities were largely associated with military requirements. But following the industrial revolution, economic theorists appeared and an extensive literature relevant to futuristics derived from their work. Since the 1930's the economic futurists have contributed much to the development of forecasting methodologies, particularly trend extrapolation techniques and growth function analysis. Today, market analysis and various economic prognostications constitute an important branch of futuristics. (6)

Fundamental to both military and economic futurism, but only recently developed, is technological futurism usually called technological forecasting. Technological forecasting is now recognized and because of its role in shaping the boundary conditions for industry, the military, and for society itself, the potentials inherent in technology and its forecasting have become perhaps the most important subject area of futuristics. Technological forecasting not only has taken over many of the methodologies developed by economic forecasters, but has more than any other subject area stimulated the development of new futurological techniques. At the present time, technological forecasting is the central thrust for most futurists.

The 1960's saw the addition of another important subject area to futurism -- ecological and environmental futuristics. This is global futuristics that combines the fields of the ecologist, geographer, and demographer with a gestalt view of technolgoical and industrail processes. The future has always been a central theme of ecologists and environmentalists and it is largely through their efforts of relating local practices within larger contexts that we are made aware of the condition of the very biosphere which supports life on this planet. Unfortunately the full recognigition of our finite and isolated condition only came with the advent of space flights when astronauts photographed our planet earth in depth. And this perhaps accounts for the tendancy to emphasize finitness through using the metaphor 'space ship earth', first coined by both Barbara Ward (19) and Kenneth Boulding (20) and promulgated by Buckminister Fuller. (21) This metaphor, however, is unfortuante. In giving a mechanistic image of the earth complete with control deck rather than the more accurate image of a living organism, man is imporperly related to the planet. Our isolation requires an image which acknowledges "service to growing life" (22) and motivations for healing the soil which supports us rather than vehicles of escape.

Other futurists should be mentioned in classification of futurists by subject area. The most recent newcomers are the cultural futuristics innagurated with an anthropological conference in the fall of 1970.(23) Anthropologists also take a global view but study cultural and social change as well as the phenomenon of futurism itself. They here thus become futurologists joing those who design methodologies, model change, compare value systems, and who study ways of studying the future. Social planners operating mostly east of the Iron Curtain (24) constitute another subject area as do religious futurists such as Teilhard de Chardin. But futurists are not to be classified only according to subject area in a one dimensional categorization. A more complete classification involves at least five parameters (Table 1) to which the subject area may be added as a sixth. These are:

1) the scope of the vision ranging from the cosmic to the individual;

2) the perception of change ranging from a causal natural laws to cosmic intervention;

3) the underlying motivation (either consciously expressed or unconsciously assumed) in formulating a prediction or image of the future;

4) the operation the futurist perfoms on images of the future ranging from image concretization of the science fictionist, poet or artist to the implementation of change of developers and social activists; and

5) the explicit view of the present and expectation of influence on the future ranging from the world is good and man can make it better to the world is terrible and there is nothing man can do about it.

Taking each of these parameters in turn, the fi st describing the characteristic temporal and spatial view of any one futurist is sually easy to identify in the various approaches. For example, Teilhard de Chardin (8) typifies the cosmic view; Buckminister Full (25) displays the global view in his formulation of the World Game; military-industrial futurists are

most often concerned with national levels; citizen groups concerned with freeways destroying trees and natural waterways typify a local view; and psychotherapy or fundamental religion whose major concern is the 'saving of souls' would exemplify an individual view.

The perception of change parameter designates the model of change implicit in every image of the future. The subject of change will be discussed in detail in the next chapter under the title of "Dynamics of Change", but briefly put, change can be considered to be the acceptance of any innovative thought, thing, or practice. To change is to move away from or beyond what exists here and now, and thus, images of the future necessarily specify spatial and temporal elements which direct attention to the conditions in some other place and time. Some futurists assume that the dominant features of change are the causal forces of natural law such as entropy or growth; others emphasize random, mutative events. More recently, futurists such as Gabor (9), Ozbekhan(26) and McHale(4) discuss 'normative' forecasting by which they imply that purposeful goals of man are the chief factors of change. Finally, futurists such as Chardin(8) or Cayce(27) clearly imply that change is a teleological interventive occurance from an outside source.

The motivation parameter is a description of the underlying reasons for focusing attention on images of the future. A futuristic motivation may vary from keeping control of some desired configuration such as the planning activities of military-industrial futurists discussed earlier to gaining control or effecting a transfer of control as seen in the testements of radical militants whose avowed purpose is to gain access to power. Other futurists such as Fred Polak (28) look to images of the future to reform present conditions without specifying who holds power. The prophets of the Old Testament are another example of futurists motivated by reform. Artists, poets, and other creative individuals who express images of the future in

various media may be said to be motivated by the necessity to concretize images that possess them with little or no concern for the effect their creation has on society or the future. Finally, there is the motivation which can best be described as intoxication with novelty. Examples are seen in the increasing number of films, books, and sunday supplements describing novel new possibilities in technology, new sexual mores or fascination with a pressumed millenial event about to occur.

The various operations futurists perform in the birth of tomorrows would include first, image concretization and the generation of 'conceivables'. These tasks are performed by those who grasp the images of the depth consciousness by handles of word, symbol or substance. These are the writers of science fiction, the fashioners of utopias, the artists who work with sound, light, or matter. These are the intuitive seers and prophets who hear the voices of the Other and translate them for men. These are the researchers who pursue the images toward new theories and new knowledge. Second is the operation of image exploitation. This may be the modification and structuring of images for utility -- the operation performed by inventors, applied scientists and designers; or it may be the projection of images with the assistance of assumed cannons of change -- the operations performed by forecasters, prognasticators and analysts; or it may be the synthesis of image bridging from the 'is' to the 'ideal' -- the operations performed by planners and strategists. Third is the assessment of images, the operations of weighting the images with values, measuring them against preferences, and sequencing them by priorities. Those who shape attitudes, make policies, and set styles -- the educators, executives, and journalists. These are those who evaluate new images and assess the feedback signals from present images, the significators such as Ralph Nader. (2) Fourth are the allocators who decide which images of the future are to receive

what resources to bring them into being. These are the funders, the bankers, the publishers, the grantors, the appropriators, and the creditators. They may act in accord with the views of the assessors or may make their decisions quite independently according to their own values, preferences, and priorities. (Thier special position adjacent to the main valve of resources permits this independence.) This group makes the go/nogo decision but it may be bypassed or replaced if it becomes insensitive to the pressures of change. Finally, there are the implementors of the images of the future -- the activists. These are the entrepreneurs, the change agents, the organizers, the revolutionists, and the experimenters with community and social codes. These are those who take an image and seek to build it in the world, or is some cases, those who possess no image of the future and seek merely to remove what exists from the world.

The fifth parameter that distinguishes the types of futurists is that of their view of the present and their expectation of influence on the future. The four basic combinations are (28):

++ the world is good and man can make it even better

+- the world is good but man is powerless to do anything about it

-+ the world is bad but man can improve it

-- the world is bad and there is nothing man can do about it.

In addition to these four, there are the existential 'now' people who focus on the present and feel the whole idea of 'futures' is a put on. The present is sufficiently full of anxiety that there is no need to worry about the future. These are signified by 00 but they do not appear in Table 1 since they constitute the null set and no futurist would fall into this category. There are in addition to the above five parameters other diescriptors such as whether the futurist is elistist or democratic in his view of himself and society, whether is is oriented toward 'holding

actions' or toward innovation, etc. But most of these views can be correlated with combinations already existing in Table 1.

We may illustrate how Table 1 characterizes futurists by selecting one entry from each row and each column (later we discuss in detail the representation of Table 1 as an example of Morphological Construction). If descriptions of futurists map onto the combinations given by Table 1, we may assume we have found the required parameters. For example, Arthur Waskow describes an important group of futurists he calls techno-planners. (29) From his description we find that the scope parameter is predominantly national, that is, P_a would have the superscript, 3, or P_a^3. Perception of change is given by P_b^4 since techno-planners believe it is human purpose and action that play the dominant role in change. Their motivation is to keep control which is P_c^1. Their operations on images of the future are predominantly forecasting and planning (omitting evaluation and seeking to influence allocators and implementors to their views) giving, P_d^2; and their expectation is either P_e^1 (+ +) or P_e^3 (- +), but usually (+ +). We therefore characterize techno-planners by:

$$(P_a^3, P_b^4, P_c^1, P_d^2, P_e^1),$$

or simply as (3, 4, 1, 2, 1). It should be noted here that the main reason for introducing the parameterization methods of morphological construction is the economy of description in large inventories rather than the suggestion of matrix operations. In order to verify completness of parameterization, many specifics must be tested and for that purpose matrix notation may be utilized.

Elise Boulding describes several types of futurists among which are the social planners who made their appearance in the early 1920's as the world's first socialist state launched its initial state planning activities and five year plans. (30) The goal of the social planner is to modify society, not man, despite the fact that it is usually individuals who bear the thrust

of social planning. Social planners may be parameterized by

(2, 4, 3, 2, 4).

P_d is taken as 2 since images have already been concretized and evaluated by political and economic dogma, and (east of the Iron Curtain) allocative and implementative functions generally reside in the same hands as the exploitive operations. Another Boulding group is the newly arrived ecological futurists who would be parameterized as:

(1, 2, 1, X, 4),

that is, their thinking is global, they favor natural organic processes as the dominant force of change (called 'growth' in Table 1), they hope to restore ecological balance and stasis. The 'X' in the fourth place signifies multiple operations ranging from exploitation through implementation, and finally, they believe the present situation is bad but man can do something about it, (+ -).

Edgar Cayce, a modern mystic who has become the serious prophet of tomorrow for a large portion of people throught the United States (31), may be parameterized as:

(1, 5, 4, 1, 2).

Cayce's scope is cosmic, the dominant force of change in his view is superhuman, he was motivated by the need to express the visions he received, his task was the concretization of images, and he felt the world is good but not in human hands. Another important futurist is Arthur Clark, the science fiction writer. (32) He would be described as:

(1, X, 4, 1, 2),

where X stands for 1 + 2 + 3 + 4. Other classifications are Herman Kahn as (2, 4, 1, 2, 1); Buckminister Fuller as (2, 4, 3, X, 1) where X = 2 + 5; Robert Theobald (33) as (2,X, 3, 2, 4) where X = 3 + 4; and finally it is only fair that the authors of this book be parameterized. Although we are primarily futurologists, not futurists, when thinking as futurists, we are (1, X, 4, Y, 4) where X = 1 + 2 + 3 + 4 + 5 and Y = 1+2+3.

1.4 The Engineer and Futures

Everyone is a consumer of futuristics whether planning future global environments or merely a personal life style. But we not only consume professional futuristics, we generate our own. We continually project into the future our own mental images and models of the systems with which we are primarily concerned -- our family, our business, our city, or our planet itself. With the rapid changes taking place today, it is becoming simultaneously more important and more difficult to assess professional futuristics and generate meaningful futuristics of our own. While we need not become professional futurists to meet our own decision making, we do need a better understanding of the processes of change governing the systems with which we are involved. We need to know the location of the sensitive points in which to inject normative inputs. Above all, we need a "futures-oriented" viewpoint in order to cope successfully with change.

There are three fundamental aspects to the problem of change: its dynamics, its assimilation, and its integration. In this text, we discuss only the first aspect, the dynamics of change including the modeling of change which is the subject of Chapter 2. Assimilation of change is the subject of Alvin Toffler's book, Future Shock. (34) Toffler defines future shock as the "dizzying disorientation brought on by the premature arrival of the future." He asserts that even though future shock is never listed in Index Medicus or any other inventory of disease, "it may well be the most important disease of tomorrow." According to one reviewer, Toffler's five years of research on coping with change concluded that although "earnest intellectuals talk bravely about 'education for change' or 'preparing people for the future', ...we know virtually nothing about how to do it."(35) What Toffler calls a disease may be what other commentators call the breakdown in imagination.

Whether in terms of Matson's "broken image"(36), or Langer's "collapse of the world image"(37), or Sykes' "misuse of symbols" (38), many share Toffler's concern that something is grossly wrong with us. But if remedies are based on erroneous diagnosis, our condition will only get worse. We must understand change in order to escape our present condition. In the language of the above triad, assimilation of change may be considered to be the correct interpretation of feedback signals from the environment and integration of change, the contextual positioning of novelty within the environment. In other words, in order to assimilate change we must recognize what is novel, and in order to integrate novelty, we must place it in context. To do otherwise leads to meaninglessness or chaos.

Today's engineer is no longer concerned exclusively with purely physical systems invovlving mechanical, electronic, or electro-magnetic radiation components. In industrial, urban, and environmental problems, the engineer is often concerned with complex multilevel feedback systemts involving random and volitional components. Problems of prediction and behavioral guidance of such systems will increasingly be the concern of tomorrow's engineers. Such systems require not only new methods for their analysis and modeling but require several attitudinal changes on the part of those who design them. First, the design engineer can no longer afford to consider such systems in isolation from their societal and ecological contexts. A holistic viewpoint that regards every system as a sub-system of a larger system must become the basic approach. Secondly, typical large non-linear multi-loop feedback systems frequently behave counter-intuitively. "Seat of the pants" flying no longer works. There is yet inadequate 'dash-board" knowledge for many of these systems much less good "under-the-hood" knowledge. Consequently new modeling and simulation techniques become important where traditional intuitive solutions frequently result in amplifying the difficulties.

The rapidity of permutative changes makes much that is called futuristics no more than an up to date description of the present. However, this is one important use of futuristics. Many people view the future as nothing more than that which is already present but unknown or unrecognized. We all have a cognitive phase lag due to the time it takes to communicate and assimilate information. This lag frequently makes us confuse what is past for the present and what is present for the future. The magnitude of the phase lag tends to increase with the rate of permutative change although the milieu of rapid change requires a smaller lag if optimum use is to be made of forecasting and planning. To cope with tomorrow we must therefore discover ways of reducing this phase lag. Our problem is that the vehicle is moving so fast that the view of the road ahead is the past in the sense it is the road we shall travel before any alternative is available. In Heidegger's words, "the past is already beyond us."

To these attitudinal up-datings of imaginative and holistic thinking, expectance of 'counter-intuitive' patterns and recognition that it will be too little and too late (or even disfunctional) to design for today's needs instead of tomorrow's needs, the engineer will have to become sensitive to feedbacks with long loop times. Much of out of phase correction and counter intuitive performance is related to identifications of inadequate or delayed feedback signals -- a trouble we rearely encounter with instan= taneous feedback. In social systems the long loop feedbacks may not show up for a generation or more. In addition to delayed feedbacks, another phenomenon being increasingly encountered and contributing to counter intuitive behavior is the "watershed phenomenon" in which the basic laws of the system changes. The sonic barrier is an example of a watershed with different forms of aerodynamic relations obtaining above and below mach one. A type of watershed

frequently occuring today is the transition from exponential to equilibrium growth, the watershed being the inflection point in the "S-Curve" marking transition from a positive to a negative second derivative.

Demands for changes from traditional viewpoints may be repeatedly expected in engineering practice of the future and a good part of any engineering career will be spent in educational updating which will consist not only of learning techniques and new developments, but also in unlearning many old attitudes. Futuristics on many levels will become highly relevant for the engineer. It is is the purpose of this book to introduce the concepts, viewpoints, and methodologies of futurology to the practicing engineer. In becoming futures-oriented, the engineer will not only be better attuned to oncoming opportunities and threats -- many caused by his or her own work -- but will broaden the base for generating an open-ended future, as important for freedom as a broadened base of participation in democratic practices.

Option Space — The Future Measure of Progress

Accounting System

THE FUTURE ~~OF WEALTH~~

One of the spinoffs of Future Shock is an addition to the already ~~too~~ long list of phobias affecting twentieth century man. This is "palaiophobia", the fear of obsoleteness. Whatever your profession, your business, or your tastes, there is growing anxiety over the difficulties to keep up with and on top of new developments. The fear of obsolescence--of products, ~~of concepts~~, of processes and of our own selves --has become an overiding obsession , especially among managers and professionals. In fact one of the principal reasons given why the study of 'Futures' is important is that it is a nostrum to head off or hold off obsolescence. (This assumes that futurists are never obsolete, but let me emphasize that nothing is as obsolete as an obsolete futurist.) For as W.C. Fields said "The Future ain't what it used to be"

But it is not only products, people and institutions that are falling under the mortality of obsoleteness, but many of the basic concepts and yardsticks by which we measure how well ,alive and vital we are--even our yardstick for measuring obsolescence is ~~becoming~~ obsolete. GNP, profits, even quality of life, wealth are no longer satisfactory measures of progress. Nor can we any longer conveniently reduce measures of such things to the single, simple unit of the dollar. Every few years our culture passes a new watershed, when the usual way of doing or measuring things no longer works, in fact in many cases becomes counter-productive. It was felt that size was security against demise. The larger the organization, the more powerful, it was the more economies that were available and the more flexibility to generate and take advantage of new opportunities. This idea of the goodness of bigness has become a myth. At some point we passed a watershed, upt to which point growth gave more advantages, but beyond, it began to limit. It is like the situation faced by aeronautical engineers who learned that all of the well known concept of aircraft design and all of the tried and true practices no longer worked after the sonic barier was reached. An entirely new aerodynamics and princilpes of design had do be adopted after this water shed was passed.

bigness watershed

Tusks of the Mastadon

Several of our ~~One of the~~ measures ~~that has~~ passed through a watershed, is ~~that~~ of our economic wealth. In fact several basic measures have become recently obsolete. And continued attempts to utilize them are resulting in increased confusion and lack of predictability.

Among the measures that have become obsolete are our measures of ~~wealth and~~ of progress. Progress is a generic word and is meaningless unless accompanied by some explicit goal toward which progress is being made. And since today no one is certain of goals, no one is certain of progress. No longer can growth in size, or profits or even increase in experience be considered necessarily positive. GNP is seen to be an inadequate measure of a better world or a better society. Attempts have been made, in recognition of this, to add new measures to ascertain a better assessment of the quality of life, but no single parameter genuinely useful has emerged.

Bucky Fuller has recognized this obsolescence of our compasses, ~~and~~ odometers speedometers in his distress over our present accounting system. In his "Operating Manual for Spaceship Earth", Fuller (p96) says, "It is utterly clear to me that the highest priority need of world society at the present moment is a realistic economic accounting system ~~which will rectify~~ An accounting system not locked into the world's gold reserves (40 billion in a 4000 billion GWP), an accounting system that takes into its columns the value of increased knowledge and even increased consciousness. Such an accounting system requires a revised definition of wealth, in fact it requires a completely revised economic theory. The one we have is foundering in paradoxes of decreased employment and increased inflation, it is perhaps a less useful guide to the future than a good horoscope.

In connection with a revised accounting system and economic parameterization, it is interesting that Kenneth Boulding ~~has~~ recently pointed ~~out~~ to the accident of history that economic theories were developed just prior to the discovery of the great principles of physical science that could have provided useful paradigms.

used to, here was a close-mouthed head of a tight-lipped private organization, who wanted no publicity whatsoever until the photographs had been examined by reputable scientists. The Academy felt no need to go public; they used no public funds, and their findings were their own business. So, since the Academy did not welcome them with open arms, many reporters, perhaps not as assiduous as they should have been in searching out the facts, concluded it was a fraud.

The journalists were also faced with the crushing responsibility to write *something, anything,* about the findings. The story was a big one and had to be reported somehow, even if it meant using uninformed opinion, hearsay or rumor. Hence, the wide circulation of the anagram story, and the issuance and publication of various opinions about the pictures even before they had been viewed and analyzed.

And finally, there is the basic gulf that always exists between scientists and laymen. The photographs themselves are not good, certainly not as clear as those the public is used to seeing in its daily press. But as scientific evidence they are powerful when combined with the kinds of measurement and correlation with sonar evidence possible. This correlation was often not considered in press stories, even by reputable science writers reporting on the subject. One said the "body-head" photograph "could still be taken for a sad-eyed mole with a long tail," perhaps an unfair simile considering that reputable experts' analyses had revealed the object to be at least around 20 feet long.

The moral to the whole affair seems clear: when it comes time to re-examine old beliefs, the examination should be done with a healthy skepticism toward those reporting the evidence as well as toward those proclaiming it.

Dennis Meredith is Managing Editor of Technology Review.

Norman

Continued from p. 7

priorities and to suggest how the federal effort might be improved.

Coming just as the budget debates in Congress begin, the report is likely to have far-reaching impact.

Colin Norman is Washington Correspondent for Nature *and a regular contributor to* Technology Review.

Boulding

Continued from p. 3

those institutions.

The most delicate question is whether either the United States or Adam Smith really believed in anarchistic capitalism. Certainly they shared a belief in natural liberty, and neither believed in laissez faire. Both asserted the limits to natural liberty, and the necessity of government, since no sensible person can be an anarchist. But the proposition that government is a *regrettable* necessity is one which Adam Smith would probably favor, and is enshrined in the American Constitution. Although I have never seen a treatise on the extent of Smith's influence on the men of 1789, there had been time for at least some of Smith's ideas to gain currency.

Marx, Mao, and Milton Friedman

Sumner Slichter once described the United States after the antitrust legislation of the 1880s as a laborist rather than a capitalist society. One can argue that while United States government has always thought business useful, and capitalists tolerable, or even to be encouraged, it has had no special fondness for either businessmen or capitalists.

Oddly enough, the same thing is true of Adam Smith. The roots of Marx as well as of Milton Friedman are deep in *The Wealth of Nations.* In fact, the idea that employers have unfair advantage in the labor market comes straight from Smith, to be embraced with a will later on by Karl Marx: "As soon as the land of any country has all become private property, the landlords, like all other men, love to reap where they never sowed and demand a rent even for its natural produce." This is hardly the talk of a good republican, but it is talk we have heard since from Stalin and Mao.

The greatness of Adam Smith is rooted in fruitful inconsistencies. In the very first chapter of *The Wealth of Nations,* Smith comes within an inch of seeing that the crucial factor in production is not labor but knowledge. If only he had gone that extra inch and seen that the factors of production were not labor, land and capital, but know-how, energy and materials, how much grief the world might have been saved. But this is a lover's quarrel; I have had a long love affair with *The Wealth of Nations.* On its 200th birthday it is still a young book, with a great future.

Kenneth E. Boulding is Professor of Economics and Director of the Institute of Behavioral Science at the University of Colorado.

Option space is 4 dimensional

1) tools, capital (frozen knowledge)
2) know-how
3) vision - images
4) energy

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also The freedom and ability to decide and to act.

Factors decreasing O ↓ | increasing O ↑ option space

population ~~growth~~ declining | Technology
shortage | know how, research
Double bind | Imagination
The 2nd Law | Education
Scale ← war, competition? → Scale

Zero option space ≡ deterministic future.

Metaphor of Book

Rapoport: • If I report I am going to do something and then do it - I say I am free

• If I report something else (you) is going to do something and it does it - then I say it is determined.

Polluting the future decreasing our option space.

Illiteracy increases in option space through sub-dividing,

War: to destroy your enemies option space at minimum cost to your own

We have needed a new definition of war

Modern war decreases both side option space. Vietnam

- The temporal factor in option space: O.S. has temporal patterns

The Archetypal Theory of Change.

Not profit v loss
measures of in flow & out flow
But future opportunity
- option space

Sick people
eat more
than they
discharge or expend.
They can show loss
a profit

Close:
How can we effectively make use of our O.S,
Howard Hughes

We see that ultimately the challenge
to shaping the future is changing
ourselves. — increasing our consciousness
awareness, perception.
knowledge not enough

The place to begin to change the world
— as great philosophers & teachers have said.
first change ourselves.

SURVEY OF CRITICAL SITUATIONS AND NEEDS

One of the most valuable products of technological and social forescasts is the anticipation of critical stituations toward which present trends are leading. Advanced knowledge of shortages and surpluses can be used cybernetically to relieve excessive fluctuations. Advanced knowledge of a shortage of medically trained personnel or a surplus of physicists can guide students in the selection of courses of study. Proper forecasting of needs obviously provides opportunities, but most "need" situations are cybernetically more complex than just oiling the squeaky wheels. The response to an anticipated shortage of medically trained people, for example, may involve implementations on many levels requiring different accomodation times. It is not just a matter of enrolling more students in medical courses to assure an increased supply of doctors in four to six years. New medical colleges that cannot begin to receive students before four or six years may be required. And the correction of the shortage may require a new educational orientation such as multi-level training for different health care tasks. The acceptance and implementation of such new approaches may require even more years before the tide can be turned. Hence, in addition to forecasts per se, a most useful feature of FSOU yearbooks would be forecasts giving the restorative effects of remedial measures taken to counter undesirable trends -- PERT charts describing corrective responses and their probable effects. In general by a critical problem is meant a situation that is tending to a "crisis point" or a point at which some irreversible development occurs that radically alters the subsequent available spectrum of choice. Examples are an arms race moving to the crisis point of outbreak of nuclear war, increased pollutional alteration of the atmosphere leading to the triggering of major climatic change, spread of the use of drugs so wide as to lead to social collapse.

Measures of criticality are given by the size of the area or num ber of persons affected, the temporal duration of the physical, social, or psychological dislocations, the degree of ultimate irrepairability, and the rate of approach to the crisis point. Since critical situations, as defined, arise out of the activities both of society as a whole and various of its sub-components, it is important to identify the major activities contributing to the criticality and their distribution among sub-groups. It is also important to trace the contributing activities to more basic activities and attitudes, disclosing both direct and indirect factors. For example, it is not sufficient to look at the problem of atmospheric pollution only in terms of the automobile and industrial smog. The total role of combustion in human activity and in the natural environment must be analyzed. It is alwo useful to examine the "characteristic times" in the growth of crises such as the time from recognition of a critical situation to the beginning of implementation of corrective action. Many critical situations have to do with approaching a limit in some natural or man-made resource. The values of known limits, estimates of the remaining distance to these limits, and rates of change in the use are important inputs for identifying characteristic times of such critical problems.

In many developing critical situations no solutions exist and research must be undertaken with no precisely predictable time table for the availability of results. In other cases solutions are available but years of education are required before political processes can respond to the needs. The advanced warnings of crises together with information

regarding the availability or non-availability of solutions is the first step in the educational effort.

Today there is public awareness of many critical problem areas: pollution, education, health care, transportation, etc. The primarily because the public directly experiences the effects of these problems. But the trends toward criticality in these areas have been known to specialists for years -- valuable years in which corrective steps could have been initiated at relatively smaller costs. A way is needed to make forecasts of critical situations available to the public and to train ourselves to respond before the consequences and costs of undesirable trends overwhelm us. To respond in advance is a sine-qua-non factor for man's survival in the future. Reprogramming ourselves to before-crises responses is one of the most critical long range corrective measures to be made. ~~This task must be begun now.~~

FOUR FACES OF THE FUTURE

Albert Wilson and Donna Wilson

3 June 1973

Abstract

The essay begins with the current scene -- the death of a world view. We find ourselves in a de-energized state. From the moment Niel Armstrong stepped on the moon, we've been running out of fuel. Its as if the moon drained us all of a will to do anything. As a result, we become more and more cynical. So What! is the response of both young and old while the prophets of doom increase the intensity of their warnings that the World is surely going to End. True, the world we know is coming to an end, but its not the world that's dying -- its the World View we've inherited from three hundred years of rational and scientific enlightenment that's dying. What characterizes this world view? It is the view that holds individual autonomy as it's highest value and the processes of reason as it's total commitment. Englightened reason fosters no more Mediterrain myths of Light and Darkness. It subscribes to Progress: no more living guided by mere symbols. Cocktail parties: no more communal celebrations and empty rituals. The rationalization of industry, commerce and community: no more awkward, inefficient heterogenity. The limits of Reason alone: no more imagination, sensousness, mystery, incantation. This is the world that is falling from the sky. But contrary to what the profits of doom would have us believe, there is MORE THAN ONE FACE TO THE FUTURE.

Ehrlich's extrapolations of overwhelming population densities, Kahn's surprise free scenarios of bigger and faster versions of today and Toffler's shocks of what has already come to pass represent the predictive - determinative face of the future. There are at least three others: the active - implementive face which is intentionally and ritualistically practied by many modern day futurists. It performs such exercises as World Game, Syncon, or Delphi in the attempt to channel resources and energies along new paths. It proposes goals and projects to destructure rather than destroy. In a hundred different modes, it retells the expected awe-full discontinuity in order to effect change. The normative - evaluative face focuses on the future through assessment and critique, through weighing what is with what should or could be. It significates through funding and encourages the future along alternative paths rather than pushing it from behind. The receptive - imaginative face acknowledges images of the future as the most vital source of change and prepares to receive new images rather than organize to attack what we or others think will be. The receptive face is at odds with Mr. Newton's linear time and recognizes sources outside ourselves in its attempt to escape the determinism of the present.

The main body of the essay is an amplification of these four approaches illustrated with examples of the Rituals of Futurism -- Predictions, Evaluations, and Energizations. It concludes there is gloom and doom for those who cling to the deterministic path of the present world view. For those who can recognize the other three faces of the future, it asserts that the world is not dying -- but that it is going through the birth pangs of delivery and its child will be a new World View.

Length: 3000-5000 words.

Introduction

The growing occupation with the future as exemplified by the number of mushrooming commissions, institutes, journals, books, and college courses given to its study has been ascribed to the approach of the beginning of a new millenium; or to our fascination with technology and the changes it is effecting in our life styles each decade. (ref:Bell) It has also been attributed to the increasing visibility of the consequences of our past lack of concern for the future. Pollution, blight, and waste are not just common words, they are common experiences. The rapidity of change - whether for good or bad - from our own activities has given us a sense of power to control our destiny that no previous generation of men experiences. The Greek sense of tragedy that reflected the insignificance of man's aspirations and struggles in the face of the overpowering forces of nature has almost completlely been eroded in today's developed world. The mastery of nature illustrated through voages to the moon, subduing disease and famine, and the availability of a personal share of mans accumulated wealth of knowledge and power in the form of automibiles and electrical conveniences has all but driven philosophies of fatalism from our world view. Although some fatalism may still lurk in the dark corners of our consciouness in the form of uncertianty over possible consequences of hubris, we believe that if we are to be derailed, it will only be done by ourselves through our own choices.

Concomitant with the feeling that we are free to select and shape our tomorrows is the development of a "science of the future", variously called futurology, futuristics, or futures research. Stemming from the roots of operations research and systems analysis in Wrold War II, futurology already possesses an array of methodologies for forecasting, planning, and assessing that afford a systematic approach to its central task of attaing guiding control over the patterns of change. The enthusiasm in many sectors for this new science has not only resulted in broad claims for its capabilities, but

has also created a reaction of caution and conern in other sectors. (ref:Jungkt, etc) and a demand not only for the assessment of the various futuribles generated by the futurists but an assessment of futurology itself. The increasing call on the energies of management for evalutions and decisions regarding forecasting, long range planning, and the applications of futurology make it appropriate to analyze the basic assumptions underlying current futurology and develop some manegerial yard sticks for measuring its bounds and limitations.

THE FUTURES BUSINESS OPENING REMARKS Friday, February 1, 1974

The Artists view of Futurists

The placard carriers. Paul Ehrlich, Barry Commoner, Sierra Club

The rivalry frequently is over being doomier than thou.

THE END IS HERE, ALL IS LOST, EVERYTHING IS FALLING APART

NOTHING NO LONGER WORKS

The placard carriers are beginning to become entangled in their own web. The condition that Toffler calls future shock is beginning to grip the professional as well as the laymen. Not only is business as usual becoming a thing of the past, but Futures as usual is becoming a thing of the past. And there is nothing ~~so~~ as obsolete as an obsolete futurist. The placard carriers themselves are loosing their cool. to (1b), (1c)

It is not that futurism is failing on the level of its forecasts and prognostications, (1) It is failing to communicate.) communication relevance

Twenty years ago the Pauley commision spotted the energy shortage. What futurists are discovering is that "classical futuristics" forecasts, delphis, s-curves, etc are not enough. (2) It is not ~~very good~~ good enough to be correct in the prediction that photochromic glass will be used in houses by 1975, and fail to predict that the number of people throwing non-photochromic stones at each other by 1975 will make living in ~~the~~ such glass house impossible. Even at recent meetings of the World Future Society, communication between different types of futurists broke down. The very people who predicted that would never happen. within the group.

It is really not so important in futures research to be correct as to be relevant. The successful futuristics pinpoints the important issues and trends. Whether the percent increases are correct is of little importance provided people are led to focus on the critical issues.

The failures of classical futuristics in communicating and in relevance have led to a more wholistic futuristics in which the successful forecasting methodologies are placed in balance with techniques for signification of the important, assessment of the side and cross impacts, and systematic searches for alternatives to the curves leading to doom.

It is a more balanced approach to the future and the problems of change that we hope to develop here in the next three days. And before we begin our program , let us talk about this a bit.

WHAT WE PLAN TO DO IN THE NEXT THREE DAYS (coordinate with the printed program)

The pattern of the three days is reflected in the three books selected as texts.

The motif of the first day is set by the approach of Thompson.

- The centers of change. Watts, Ireland, Esalon, M.I.T. How various types of futurists think about the future
- The dynamics of change, the structure of change, the the forces and components that shape the future
- The causes of change, plans and ~~other rituals~~ intentional change

The flavor of the second day is that of the book by Meadows. Are the pathways to doom inescapable.

- The representation of change, displaying it making changes visible
- The implementation of change, methodologies and techniques
- The evaluation of change

The sense of the third day is a reflection of Toffler's book.

The assimilation of change, the perception of what is happening and what has already happened

The response to change including obsolescence and the resistance to change.

The internalization of change. adjusting to the new developments. How do we get on top of it?

On Sunday we also want to look at jointly with all of you, what specific things various futurists are saying about the future.

- We want you to have some participative experiences in some of the rituals of change--for that is what they are. So there are workshops for you to be the futurist.

- We want you to have an understanding of the psychological types. How you can be more effective in dealing with your problems and decisions. How you can have better relations with your associates--your managers, your planners, with what you read in the papers.

There are a couple of things that should be mentioned.

First, we cannot go into your own field in detail. We are not experts in your subject and there is not time. What we hope to do is provide you with a smorgasbord of methodologies, techniques, concept, facts, ideas, approaches and perspectives some of which you will find useful for your own specific requirements.

Second, some of the things we plan to discuss will be repeated in slightly differnt language by other speakers This is because these topics are important and we hope to afford you some kind of stereo vision on them. On other matters the staff will sometimes appear to contradict one another. This is partly only a variance in emphasis, and partly a healthy open ended approach to issues that no one will claim settled.

TO SUMMARIZE: WE HOPE THAT IN THE NEXT THREE DAYS YOU WILL FIND:

- A FRAMEWORK FOR PUTTING THE SUBJECTS OF CHANGE IN PERSPECTIVE
- SOME TOOLS FOR SETTING UP YOUR OWN FUTURES SHOP
- EXPERIENCES CONTACTS, RELATIONSHIPS, AND A CHANCE TO SHARE YOUR OWN EXPERIENCE
- [illegible]

September 28, 1977

CHANGING CHANGE

There are three subject areas in our scientific/ technological culture--dedicated as we are to objectivity--which consistently defy a scientific and and objective approach. These three are:

SEX, DEATH and the FUTURE.

When everything that can be said about sex on the anatomical and physiological levels, on the psychological and sociological levels, and when all of the case studies in their wild variety have been interpreted and their statistics evaluated, we still feel that only the most superficial things have been said, and that the deeper truths about sex remain unuttered. The same with death. When the meter readings and the definitions, clinical and legal, the statistics have all been assembled, we feel essentially nothing of the real nature of death has been learned.

And a similar reaction is felt by most people about the future. When the trends hve been displayed, the forecasts published, the new plans and goals agreed upon, most people still feel that the real future is essentially unknown and has very little to do with the trends, forecasts and plans.

But not only do these three subjects defy an objective and scientific approach, just the discussion of these subjects makes many people uncomfortable. They blush, they pale, they squirm, they smirk. As planners you have probably encountered executives who react to forecasts and long range plans with an amused tolerance and a let's hurry up and get this over with so we can get back to work attitude.

Another aspect of these subjects is their difficulty of discussion in so-called mixed company. Perhaps this is because there exists certain basic differences of approach that cannot be resolved by mere objectivity. We are pretty clear what we mean by mixed company when talking about sex. Mixed company when talking about death usually means those of different religious persuasions or lack of persuasion. But what does mixed company mean when speaking of the future?

Nov. 30, 1977

The discipline that we call futures research, futures studies, futuristics etc is now about a quarter of a century old.

after sci fi, utopias, gee whiz. doom+doom

It has become of age: it is studying itself. It is encountering some basic questions that now require a hard critical look:

We begin to find out what F.R. is about what we are really trying to do.

- Why the widespread resistance to futures thinking?
  Planners and their "practical" bosses.
  Energy crisis--moral equivalent of ants at a picnic.
  Jungs explanation. if so a democracy can never be future oriented.

- Can (or should) futures research be scientific? predictability = scientific
  The role of causality
  Gordon: Cause and effect relationships exist most of the time, but occassionally spontaneous events emerge. = archetypes.

The species of discontinuity

Harmon's two types of futurists: Those who see the future as more of same.

1) The shoe no longer fits--Kuhnian crises
   Phlogiston, the ether, inflation and unemployment
   parapsychology, quasars.
   Double Binds:
   ⇒ new worldview Necessity for growth and limits to growth
   Guideance to technology vv centralized control DNA
   Complexity vv Liberty
   Need for self esteem per workvv no work

2) Mutations True innovations from outside the system
   inventions, discoveries, Becquerel's key

3) Normative forces: The power of the human imagination and will to shape the future, to break causal chains.
   What ought to happen? L 5 , population limits, new energy approach

4) Synchronicities: Two causal sequences--un related
   In evolution, moths, parasites, transistors and missiles

5) Extensions of consciousness
   by instruments, radio telescopes, quasars
   by drugs
   by breaking down mind sets. quasars.
   In economics, Land, capital, labor
   Resources, know-how, energy
   New concepts of wealth: Option space.

March 2, 1977
May 2, 1977

ST 39 1

CHANGING THE CHANGER

A prominent anthropoligist, between field trips to the South Seas, became interested in the strange things happening at home. He took a professional look at the Western World and observed that, like among the tribes he had been studying, ~~that~~ there were three groupings of people. But instead of shamans, warriors and craftsmen, he found that here the significant groupings were:

- Those who make things happen
- Those who are aware of what is happening
- And a vast majority who don't know that anything is happening.

He also observed what these three groups have in common: There is--like among the tribes who have not yet perceived the connection between sexual intercourse and pregnacy--a profound ignorance of how and why certain things happen. Having injected these observations, the anthropoligist quickly went back to the simpler societies of the South Seas before he could be called on for diagnoses.

Hoffmann's class distinctions

Tokenism

But we have plenty of diagnoses without those of this particular anthropologist. There are plenty of diagnosticians hard at work on the causes of the diseases of the West. These are especially vocal right before presidential elections, so we have available a recent harvest of their fruits. I have been collecting some of these diagnoses concerning the viral and functional causes underlying our social, psychological and economic ailments. Let me pass on ~~three or four~~ a few of these. - just a few The complete list is ~~quite confusing to say nothing of being~~ that has been proposed somewhat overwhelming.

It was not only a recent Chief Executive of our country who was obsessed with crises, our entire society has become crises oriented. Only crises can evoke any sort of response from us. It is thus not surprising that most diagnosticians formulate their etiologies in terms of crises.

The first crisis is a communication crisis. When formulated in terms of the South Sea anthropologist's categories, the crisis centers in that, category one--the people who are making things happen--and category two--the people who are aware of what is happening--are not communicating with each other. Those engaged in making things happen do not have the time to keep up with the state of the culture. Their focus is on the particular changes they wish to effect. (Planners and decision makers are largely in this class.) Those, on the other hand, who have access to the vast amounts of information needed to construct an up-to-the-minute picture of the world, have fallen behind in their task, because of the magnitude of the acceleration of change.

The situation is akin to that of an aircraft whose pilot and navigator have both become too busy with their tasks to be able to talk to each other. The pilot, making numerous course changes to avoid storms, thunderheads, and other aircraft; the navigator overloaded with the dead-reckoning problems created by all of the course changes, unable to keep his position up to date.

This goes beyond Toffler's too much change too fast resulting in Futures Shock. That was back in 1970. Today we are not only experiencing an orientation crisis, we are in the midst of a reality crisis. The economist, F. Schumacher, of Small is Beautiful fame, claims that our basic problem since 1975 has become to decide what is real. Herman Kahn says that "Reality has left experience far behind".

That TV is playing a significant role in the reality crisis is beyond question. There were already dire indications that something was acutely amiss back in the days of Kitty Genovese. But the basic malfunction seems to lie in the delay of our feedback signals, or rather that the accelerated pace of change renders our usual response times obsolete. From the point of view of a self-regulating system, such as our metaphorical aircraft or our economy, the delay in the feedback signal gives erroneous inputs and the negative feedback correcting signals intended to keep the ship on course, through delay, become even deviation amplifying signals, causing not only wild fluctuations, but complete ungovernability. Governing officials are remarking on the ungovernability of their organizations.

A second crisis frequently referred to by the diagnosticians is called "the collapse of images". At the present time no one possesses a believable image of the future. Surely each of us has some truncated personal view of what we would like to see happen, but there is no generally shared energizing vision of the future. There are no longer any utopias, the American Dream today exists only in history, no new City of God has appeared to inspire our hours with all-out exertion and achievement. The real energy crisis seems to be depletion of our spiritual or psychic energy. The scenarists who used to do Walt Disney's tommorow movies long since gave up. They said that the frontier of what has already happened caught up with and overtook the frontiers of our imagination. Only in the totally unbelievable are there any images of how it could be different. Equating this to such aphorisms as, "Where there is no vision the people perish", "Those who have no vision of the future, have no future", we sense a crisis indeed.

• First There are those who hold that the Western Crisis is attributable to the fact that class 1) and class 2) don't talk to each other.

Communication Crisis — Inadequate Communic. Pilot-Navigator — A feedback malfunction

Future Shock 1970 — This is an extension of Toffler's diagnosis
Too much change, too fast - resulting in future shock
We are experiencing not only an orientation crisis
but even a reality crisis - TV has helped in this
Herman Kahn: "Reality has left experience far behind"

• Second Our crisis is one of the collapse of images.
We have no viable image of the future
Our utopias are obsolete. The American Dream
passed in material aspects, remains unfulfilled in other
but has lost its ability to energize
Image Collapse and Energy — Ward Kimball & Disney's Tomorrowland
results from goal rather than process orientation
This is the true energy crisis - psychic energy
for images energize

• Third Our crisis is a crisis of Bigness and complexity, + Monopoly
Our institutions like our airplanes can no longer
be flown by the seat of the pants
Bigness & Monopoly — Lindsay said NYC was ungovernable
Frederick Schumacher has touched off a serious
worldwide movement with "Small is Beautiful"

• Fourth We are passing through a watershed in human history
Watershed — subsonic - supersonic
Jonas Salk - the Inflexion Point changes
The Cultural ~~Social~~ Menopause
Harmon's Paper — The history of worldview changes
600 B.C., 1500 A.D., 1920, 1963 ...
A limit point.
The counter-culture's term We are entering the Age of Aquarius

1) Speed, 2) Loss of direction, 3) Bigness 4) Watershed

Of course these perspectives are too abstract for many
They still prefer the bad-guy models for our problems.
There are many favorite targets
OPEC and the Arab Sheiks
The Military Industrial Complex
The CIA and the Mafia
The old perennial, the Commies
Science & Technology
Fuzzy-headed Professors — and Men
Diet.

If I have left out your favorite please fill it in.

Another way of perceiving today's crises is in terms of Double Binds:

THE FOUR DOUBLE BINDS:

1) GROWTH

The environmental and social costs of continued exponential growth in energy and materials usage, and economic growth in the forms forms we have known, appear to be unacceptably high. But the costs of stopping that growth also appear to be unacceptably high. (through economic decline, increasing unemployment, and further alienation of those with low income.

2) PLANNING

We now demand 'technological assessment' i.e. anticipatory control of new technology. e.g. recombinant DNA, On the one hand, interference with the free enterprise system seems imperative, on the other, it jeopardizes the private market system and democratic processes.

3) DISTRIBUTION

It is costly and unlikely that we will reduce our standard of living to aid the underdeveloped nations. Yet they cannot consume and pollute at the US level--the planet is finite. We have in our present market system no mechanism for equitable distribution nor for protecting the interests of the future.

4) Jobs and Employment

Industrial society is increasingly unable to supply an adequate number of meaningful social roles. Legitimate social roles today are: a) holding a job, b) being married to someone who holds a job, and c) being a student preparing for a job. Estimates of real unemployment are 25% to 35% of the potential work force. Unemployment as an economic problem can be handled by income maintenance, but unemployment is a psych-cultural problem. The individual without an organization is defined as worthless since a feeling of productiveness comes only from holding a position in an economic organization.

In essence

THE WORLD MACRO-PROBLEM

BASED IN THE FUNDAMENTAL PARADOX OF FUTURES STUDY

Perfectly reasonable microdecisions are currently adding up to largely unsatisfactory macro-decisions.

The basis of this is a schizophrenic perception cf. Rapaport "If I report..."

micro-decisions	macro-consequences
produce certain things	5% growth rate
buy certain products	deteriorating cities
hire certain people	crime
fund certain research	polluted air
Make specific plans	scarcities

THE FUNDAMENTAL DILEMMA

The basic system goals that have dominated the industrial era

material progress, individualism, free enterprise, few restraints on capital accumulation, social responsibility delegated to government

and that have been approached through a set of fundamental sub-goals

division of labor, specialization, cybernation, stimulated consumption, planned obsolescence, private exploitation of resources held in common , ~~various efficiencies~~

have resulted in processes and states

efficiency, productivity, continued growth of production, consumption, and technological and manipulative power

which end up counteracting human ends

enriching work roles, resource conservation, environmental enhancement, equitable sharing of the world's resources

The result is a massive and growing challenge to the legitimacy of the basic goals and institutions of the present industrial system.

After this survey of the viruses, what cures have been proposed? 2 7

1) Stop all change: → continuous change
King Canute, Heracleidos & Boulding
From Mountain

Harman sees the crucial division among classes of people in our society, not as division according to generation or to race, to sex or between liberals and conservatives, or left and right. but between "those who anticipate a continuation of present trends and those who insist that a drastic change must occur." In other words between the continuists and the dis-continuists.

2) Change our way of change

Change as Usual

The traditional mode of change may be characterized by three steps:

- o building a form
- o experiencing the form
- o destructuring the form

1st Commandment (It is O K to build idols if you smash them instead of worshiping them) and then repeating the process with alterations in the form based on what was learned in the experiencing. This general three step archetypal process proclaims its universality by having been immortalized in dieties--Brahma, Vishnu and Shiva; symbolized in myth--Dionysius ever escaping the forms in which Apollo captures him; observed in bio-evolution in the origin, development and extinction of species; studied in social history in the birth, growth and death of civilizations; and formalized in philosophy in various dialectical triads and of course each of us experiences this archetype individually. The obsolescence of this type of change arises not only from our having built forms that we dare not experience, for in experiencing them we would terminate the sequence, defeating the entire process, (for the forms are built to be experienced and the experience must be had in order to learn from it.) But also from our increasing refusal to experience or digest what we have done. We have somehow been seeking to eliminate the second step.

Marx(1845) said that "Philosophers have only interpreted the world in various ways, but the real task is to change it." To update Marx, "Activists have been busy changing the world, but the real task is to change change."

We are going to have to change our way of change itself.

~~Our present~~ The classical way of change is predicated on the premise that if what we have been doing isn't working if we do more of it, then it will work. A change in the scale of effort. We must decide that we are going to have to go at it harder, make more effort, get more data, spend more time, appropriate more money. If what we have been doing isn't effective, it doesn't occur to us that we are probably doing the wrong thing, using the wrong tools, and we ought to explore something different.

The classic example of this type of bone-headedness is of course World War I. The frontal infantry attacks against machine guns and across barbed wire didn't work. Tens, hundreds of thousands of men were expended to advance the front a hundred meters or so. But the generals knew they could effect a breakthrough next time, if they could just employ more men and mount a bigger attack.--result 200 meters or so. It was 3½ years and millions of men expended before it was decided to seriously try something different--and the war was over in a few months.

Today we are sometimes winning, sometimes losing a few meters in the push against pollution, infaltion, shortages, imbalances, weapon proliferation, crime and terrorism, moral decay. Because we have not seriously undertaken the exploration of alternative approaches to solving these problems.

Harman's Solutions

1) Continue the trend toward collectivism

The New Socialism

coercive controls, wage and price restraints,centralization

2) Revitalize the Private Sector

BUT the micro-decisions based on self-interest are giving the wrong macro-configuration, we must work backwards to see what patterns of micro-decisions would be necessary to achieve the desired macro-configuration.

This infers the CHANGING OF THE MICRO_DECISION MAKER, THE PLANNER

But we may not, according to our rules use coercion nor may we employ the techniques of B.F.Skinner.

The only means compatable with our goals are the re-education of people to enable them to appreciate the desired goals and to understand the micro-decisions necessary for reaching them.

After this survey of the Viruses
What cures have been proposed?

- Stop all Change (i.e. cont.) King Canute proved the futility of that
  Heraclitus & Building
  Iron Mountain
  dinosaur
- Change our way of Changing

Harmonic to dichotomy

The well adapted vs The readily adaptable

Traditional Change
- o Build a model, a society, a form
- o Experience the form
- o Destructure the form

see p. 8 Tc

How ∴ Change the Changer i.e. Change Ourselves

Three things

1) The (Tools) with which we work
   New methods & techniques
   for planning and assessing
   the impacts of our plans

It does not suffice to have better tools for decision making. We must also learn how to generate new options among which to select. We must broaden our option space.

This is what you will be doing here this week. But if each of us is supplied with an automatic rifle to replace our old squirrel gun this will not assure us of moving more intelligently into the future.

3) New (Perspectives.)

First disbelieve some things:
History shows us that disbelief is the portal to higher plateaus. • Disbelieve that Science and Technology have all the answers
• That being first is the only success
• Disbelieve that trend is destiny
But believe somethings: Believe that there is within man the resources to solve and overcome our problems
Believe there is work to be done by man beyond satisfying his own needs.

We must find that optimum combination of belief and disbelief that both energizes us and liberates us.

Believe the planet is your home and it needs you as much as you need it.

2) New (Commitments)

optimize knowledge vs ignorance diversity

I did not say goals — because goals may not be to what we commit — rather we may commit to process.

old economics: land, labor capital
resources, energy, knowledge

Not so much what but how

New Values

Today: Time efficiency & labor saving

Tomorrow. Energy efficiency & resource conserving

I.P.

Today Energy + resource ~~Labor~~ intensive

Tomorrow Labor + Knowledge intensive

Man must ~~also~~ cover the proper role for his hands & his head

then he will find his heart.

COOP { Our relation to the world will change from
Manipulation to Participate

I.I.

- Internalize — not just intellectualize
- Digest experience — not already repeat then
- Find Solutions — not just holding actions
- Participate — not just react

and we will see evidence of the
change in our selves

January 27, 1976

PROPHETS, PLANNERS AND FUTURISTS

Albert Wilson

Preceeding the key year in history whose bicentennial we are celebrating, there was a decade of extensive and intensive debate. The taverns and coffee houses were filled with men questioning and arguing the rights of citizens and the limits of governments. The creative events that we associate with the Founding Fathers were not the results of lobbying, plea bargaining or back room deals. They resulted from constructive dialogue and searching debate concerning not only the pragmatic but the philosophical issues that underlie [redacted] political order. When it finally became evident that the alternatives open to the colonies under the Crown were not acceptable, a long search began for a different set of alternatives--alternatives without the Crown. It was an intellectual tour de force to come up with new solutions to the problems of colonialism, federalism and the legitimization of revolution. It was an even greater tour de force to devise the concept of a constitutional convention and to derive from it the framework in which the new alternatives could viably operate. This came about only from the exploration of the foundations on which human social orders are built.

Today, two hundred years later we are faced with a parallel situation. It is becoming increasingly evident that the alternatives open to us within the constraints imposed by our present institutions, present procedures and present world view are not viable and that we too must seek a broader set of alternatives -- those afforded by some new worldview. It will again require an intellectual tour de force to find a worldview that will supply both the needed alternatives and the framework

for their realization. We shall have to explore not only the structure and purposes of our institutions and procedures, but the values and images on which they rest.

But already our own decade of dialogue has begun: Zero growth, Small is Beautiful, Environmental accounting,... are being debated. We read about the dialogue in books such as Erich Jantsch's Design for Evolution, Ervin Laszlo's Strategy for the Future; we hear the dialogue at meetings of the World Future Society where a prominent senator reminds us, "Only those who actively engage the future are empowered to shape it"; and we participate in the dialogue in meetings such as this one. I feel it quite reasonable to say that the searching dialogue of our time has grown up with, and is centered around, what is variously called the futures movement, futures research, futuristics--whatever name you prefer.

While the new worldview has not yet emerged--and we cannot expect it to appear overnight-- already our level of consciousness has risen and we are effecting important modifications to our approaches to problem formulation and problem solving. We are discovering what is more basically important and are re-ordering our priorities. We are rediscovering the role of values and learning the importance of assessments made in advance. We are even achieving the maturity to forego doing something just because we can do it. But perhaps the most uncomfortable suspicion emerging from the dialogue is that, in our times the Scientific Worldview is playing the role ~~in our times~~ of the Crown. (At this point, I expect to hear cries of "TREASON" from the back of the room, but on this issue, I confess, I am no tory.)

Time does not permit us on this occasion a detailed demonstration of this identification of the present dominant worldview with the Crown. We have all heard the superficial attacks made on science and technology by the hippies and the neoluddites, and the more responsible charges leveled

by scholars such as Roszak, but from a futures research point of view the difficulties are deeper. There is more than an important watershed delineated in Boulding's statement that all scientific knowledge is about the past while all decisions are about the future. Scientific knowledge strives above all to be objective--free of the prejudices and biases of the researchers. It seeks to describe an order of the world that is independent of the subjective dimension. But in taking such depersonalized knowledge as the guide for the very subjective processes of designing, planning and decision making we introduce a curious schizophrenia into our culture. We obliterate from our images of the future the spectrum of possibilities that exist in a worldview cognizant of the full powers of human participation and interaction with the natural order of science. Through its pursuit of objectification, "Science has", in the words of Nobel Prize Winner, Alexis Carrel, "built a world in which man has no place". The present worldview has delivered us from the illusion that we live on a flat earth and inculcated us with the illusion that we ~~are creatures~~ live with flat potentialities.

It is our usual assumption that the past is the best guide to the future, but this imposes on us McLuhan's "driving into the future guided by the rear view mirror". We consequently never escape from the past and must keep reliving it. Today's futurist holds that the past is a rather poor guide to the future. This in no way is meant to imply that the futurist feels that scientific knowledge is not valid nor useful, but it does mean that the assumptions of determinism, basic to so much of scientific modeling and the root of scientific prediction, are improperly projected onto the human being and have the effect of emasculating man as creator and participator in shaping the future. This despite the world of Future Shock brought to us by science and technology.

Knowledge is based on facts and what is important about facts is whether or not they are true or valid. Science has been very successful in developing methodologies for validifying the factual components of knowledge. But decisions, while based on facts, are also based on other inputs such as values and goals, and these are not true or false, they are desirable, useful, workable, meaningful or other things that lie beyond the canons of scientific testability.

These remarks will for this time have to suffice as indicating that futures research will have to move beyond the methods and worldview of Science and develop a new epistemology adequate for the exploration of the world in which human participation is a very meaningful component.

There is a subject that science and futures research share and must each consider in their respective epistemologies. This subject is the nature of change. Change is basic to phenomena that are repeatable, ubiquitous, and value free--those phenomena lying in the purview of Science. And change is basic to those experiences having to do with images, goals, values and plans --all subjective and value ridden--the area treated by futures research. The futurist requires a different model of time and the nature of change than that which has successfully served classical science. In the exploration of the nature of change from the futurist's requirements we encounter candidate concepts for the new worldview.

Historically, there have been two polarized views concerning the essential nature of change. The first of these views has its scientific expression in the words of Laplace:

> "Given for one instant an intelligence which could comprehend all the forces by which nature is animated and the respective situation of the beings who compose it--an intelligence sufficiently vast to submit these data to analysis--it would embrace in the same formula the movements of the greatest bodies of the universe and those of the lightest atom; for it nothing would be uncertain and the future as the past would be present to its eyes."

This same view of change was formulated more comprehensively by Omar the Tent Maker:

"What the first Morning of Creation wrote,
the Last Dawn of Reckoning shall read."

This view of change based on causal determinism or one of its modifications is the philosophical base of scientific prediction and of any brand of prophecy that is able to foretell the future. (Note that here the term 'future' is always singular.) We may designate this tradition--and it is an ancient one, the tradition of fatalism, predestination, etc.--the tradition of the prophet.

At this point I would like to introduce a metaphor--one that is illustrative but not to be over extended:

Let us think of all human experience as pre-written in a book and that in living we are the readers of the book. Right now we are ~~beginning to~~ reading on page 1976 of the latest volume. Pages already read and turned we call history, upcoming pages we call the future. The place where we are reading is called the present. From time to time there appears an individual with rare gifts who is able to read what is written on the yet unturned pages. We call this person a prophet. But a prophet is not to be confused with the maker of scientific predictions who deduces what will be on the next page from what he is reading in the present. His deductions usually are based on analogy with similar sequences that have repeatedly occurred on previous pages. It is essential to scientist's function however that the book be pre-written and that we be readers, otherwise there would not be scientific law.

But there is a second equally important classical theory of change. In the terminology of our metaphor of the book, again human

experience is written in the book, but is not pre-written. It is written while it happens and it is we who are the authors. The pages already turned are those on which we have written the record of history. The place where we are writing is the present; and the future consists of all of the unturned pages, which are blank, and upon which we are free to write as we please.

This tradition is also an ancient one. It built the pyramids, laid out the streets of Persopolis, constructed all the roads that led to Rome. This tradition is very much alive in the world today. It is the view of those who made it possible for man to place his footprint on the moon. It is the view of the existentialist who believes we are free to reshape the world completely at every instant of time.* This is the tradition of the Planner.

* or as Emerson said "I give you the universe new and unhandled every hour."

These two views of the nature of change are polar extremes but in recent years only occasionally does someone present a case for the exclusive validity of one view and the falsity of the other. Scientists, such as B. Rensch in his recent book, Biophilosophy, still frequently hold for a totally deterministic universe. Humanists such as Sartre hold for the total freedom view. Futurists must subsume both views. Science to form its predictive models must employ causalism: the past shaping the future; society to plan and build its structures must operate with finalism: Images of the future shaping the present.

This paradox on the nature of change is somewhat like the dilemma which confronted physicists concerning the nature of light. Light behaved in certain experiments like a wave and in other experiments like a particle. Neither view by itself could explain all of the observed properties of light. It was necessary to employ both. Only in the

integrative synthesis of the quantum mechanics in the 1920's was this century old dilemma resolved.

The futures research workers in designing their methodologies and systematizing ways of studying the future have done with determinism/finalism what scientists did with the particle/wave dilemma. For purposes of forecasting, the world system is viewed as determinative, for purposes of planning the world is viewed as finalistic. But all the while the search is going on for the "quantum mechanics: that will enable the contradictions to be integrated.

Returning to our metaphor, the futurist has come to believe something like the following: First, we are in agreement with the planner that we are primarily the writers of the book, not just the readers. We write in the book at the moment of the present, but as we do so we simultaneously write on the ensuing pages, so the prophet is correct too. There is indeed much already written on the pages of the future, but we have written it there ourselves. In today's world as we turn each page we are finding that there is increasingly less blank space per page. Since the primary thrust of futures research is to generate sets of alternative passages from which we may select that we prefer to write in the book, futuristics becomes a meaningless endeavor unless there is sufficient blank space for the inscription. The futurist recognizes this problem by stating that, while it is true that the next five or so pages are pretty well filled, there is ample blank space on the pages beyond. (But after 20 or so pages there is little or nothing for a prophet to read.) This rough statement is barely more than an admission of the existence of this central problem of the interface between determinism and freedom--where the book is inscribed and where it is blank.

These are times characterized by rapid change. We are writing more and more on each page as we go and we are also simultaneously writing more and more on the pages of the future. Whether the amount written on the future pages depends in some necessary way on the amount we write on the present page--i.e. on our rate of change--is not clear. But if this is the case then the planner will find himself increasingly uncertain and frustrated and with less and less freedom in planning. And soon only the role of the prophet will remain. He will stay in business to tell us what we have already filled in on the pages of the future.

What we are talking about, of course, is the phenomenon of slow or delayed feedback. The pollution that we have been writing on future pages for decades before it reached our perception; the theft of our cities from us by the automobile; the increasing shortage of meaningful social roles and the developing crises in meaning. All the unplanned consequences of our many plans.

We have come to recognize the necessity of comprehensive planning yet we fear such planning because we see in it a threat to freedom and a challenge to the survival of democratic institutions. The dilemma has been posed: We shall face chaos and eventually collapse if we do not begin to plan comprehensively, but in order to do total planning we must coordinate and centralize all planning as is done in Communist Bloc countries. But this is not the only choice open to us. Our society moves in the direction statistically determined by the interactions and cross impacts of all of the many microplans developed by each center of enterprise. Soviet society moves in the direction dictated by a central planning bureau. While it is easier to study the dynamics of a single particle than that of a statistical ensemble,

this is not the issue, for the mathematics and the programs for the study of predicting the behavior of statistical systems exist. The problem resides in the nature of the microplans. We can get the macrosystem to go where we want it to without a dictatorial politbureau if we can orient the myriad microplans correctly. And the key to the microplan is the planner himself.

With the emerging new consciousness that the futurist has catalyzed, we are beginning to consider not only the alternate passages that we may write in the book, but to study the process of writing itself and how it may be changed so as to better control the inscriptions that we are making on the pages of the future. This is indeed a new approach to change and it is sufficiently different from the historic approaches of the prophet and the planner to warrant a separate designation: The approach of the futurist.

But self-reference has entered our metaphor. We are now thinking about how we write as well as what we write. Your conference here this week is a study of how we write. But basically to change how we write we must change the writer. We now reinsert the planner himself back into his plans. He is the most important part of the process. The dynamic of change must henceforth take into account the changing changer.

The planner of the future will not only be a planner who can take into account the changing context in which he does his planning, who can plan holistically, tracing the impacts of his plans to fifth cousins, but a planner who in seeing himself as part of the process ~~can~~ continually redesigns himself.

The striving for objectivity was an important compass during the centuries of unconsciousness. But in an age of increasing consciousness

we must no longer artificially keep the subject and the object, the planner and the plan, the knower and the known in separate boxes.

We are moving toward the level in which the guidance of change will become primarily the guidance of change in the changer--of change in the author of the book which will in turn change how and what he writes. We thus take on the responsibility for our own evolution. And sometime after we do this we shall make the final discovery: The writer and the book in which he writes have become one. But then they have always been one. But it was a necessary part of our journey to separate and objectify them both before we could see the whole.

DRAFT

WILSON

VALUES CLARIFICATION

The polarizing issues around which many current ecological discussions turn, point to the fact that values, unlike theories or ideas, cannot be proved or disproved by rational thought. Values exist as social facts as does the physical fact of the atmosphere we breath but cannot see. Like the atmosphere that's always there but never noticed until it suddenly changes, values come into view only when they conflict with other values or are forced into view by a discontinuous experience. The conflicting ecological values ~~that~~ polarize us between such extreems as unlimted grouwth or ~~limited~~ zero growth, self-sufficiency or interdependance, control or chaos, centralization or fragmentation, do not arise from our organized ideas and thoughts about the nature of reality but stem from convictions that are contradictory, unstable, and operate on different levels( )

The polarizing ecological issues currently being discussed make values visible as smog colors the atmosphere at sunset. Environmental education will succeed or fail in its goal to increase environmental awareness depending on whether it recognizes polarizations as opportunities to guide the process of values clarification or as necessities to resolve the conflicts by taking a stand on one side or the other of each dichotomy. The difference is the difference between teaching processes for intentionally examining hidden values and tracing their effect on shaping behavior; or inculcating a particular value system by conditioning behavior. Indeed these two approaches polarize around deep convictions about the nature of man. Values are inherent in the process of education itself but if the choice is to educate for values clarification rather than values inculcation then the choice of what value system to adopt is made by the educated individual, not by the conditioner. ( )

Values Clarification Process

Values clarification is a process addressing itself to the levels of awareness in human consciousness. Environmental awareness like any other awareness is achieved in a series of steps in self-reference.( ) In the early stages of childhood, the "I" is not differentiated from the "Not-I" -- a small baby is completely immersed in its environment but one would not attribute environmental awareness to this level since there is not yet any knower or known. Behavior at this level is completly determined by instinct or satisfaction of urges arising from the physical body. Values systems at this level may be described as acts without choice because all behavior springs from 'love of the deed.'

The second step of consciousness is the differentiation between an "I" and a "Not-I." The child begins to separate itself from mommie, from dog, from tree, etc. Language is used to name persons, place, and thing and the differentiation is made in taxonomies of animal, plant or mineral. Behavior at this level is still instinctual but with the newly acquired ability to name, behavior can be guided by reference to differences between mommies, trees or dogs. Once the I exists, interaction with the Not-I begins to separate my space from other space. The child does things to its environment and his language requires verbs. The ability to act on the environment is possible because the "I" can separate itself from an "IT". Language is now used to transfer information about nature (the level of objective science) -- an I discovering it, probing it, attacking it, controlling it, changing it, etc. Value systems at this level of awareness are in the form of external codes -- thou shall not kill, steal, rape -- or in the form of internal authority -- a conscience that tells the I how to act in situations relating I and It.

The next step of awareness occurs if the knower begins to differentiate what "is" from what "is ideal." Here the "I" addresses the other as "Thou" and waits for the response before acting. The use of language on this

level is the language of myth and metaphor. The consciousness asks not "what is" but "what would be ideal." The differentiation between I-Thou ~~now~~ forms a picture of some desired condition -- the highest good for the greatest number; the good life; the survival of the fittest, or a picture of some desired process -- act in ways that you would all men act, ~~etc.~~ do unto others as you would have them do unto you, etc. Values have moved from the level of authority - either external or internal - to the level of moral insight. In systems language, values are described as choices, and processes for increasing option spaces are formulated in terms of decision-making algorithms. ( )

A fourth differentiation can be made in ~~terms of~~ which I equals I and action is ~~now~~ based on "love of the deed" with no intervention of mental pictures of the ideal or criteria for measuring options. But ~~here it is not~~ the absence of value found on this level is not ~~in~~ the egoless consciousness of the baby or the animal but rather the egoless condition ~~xxxxxxxxxx~~ of the consciuousness that has transcended ego ~~xxx~~ as well as values. We call this behavior the realization of saint/or hood the state of samadhi.( ) Whether there are higher states of consciousness is ~~xxx xxxxxxxxxxxxxxxx~~ beyond our present concern; ~~that is~~ our need here is to recognize the existence of ~~level's structure~~ of awareness.

This brief description of the level structure of human awarness in steps of I-Not I, I-It, I-Thou, and I=I provides a framework for specifying the requirements of methods used for value clarification. The method ~~used~~ must first of all differentiate the level of consciousness of the knower. Remember ~~what it is we are trying to do in~~ our aim in environmental education is to guide the learner in discovering how behavior derives from deeply hidden convictions about reality. To describe an ideal realtion between man and environment, for example, in terms of the greatest good for the greatest number to a consciousness that has not yet differentiated the I from the Not-I in himself is to speak of the ocean to a well frog. ~~The well frong does not know oceans exist.~~ The polarizing conflicts now seen in environmental

debates illustrate these very dichotomies in human consciousness. The first task in values clarification is to provide educational arrangements for the discovery of what level of consciousness is dictating the value systems that are in conflict.

A second requirement of the values clarification process is that it be made available to the learner without the necessity of the intervention of an expert or specialist. This requirement derives from the basic difference between conditioning behavior and guiding the process of consciousness-raising. Throughout history there have always existed methods for raising the consciousness of select individuals above the level of consciousness of society as a whole, but in todays world where man is linked together by global systems of communication and weaponry and humans on all levels of consciousness have access to information, skills, and processess that can disrupt the balance of the very biosphere itself, consciousness-raising methods that guide individuals one by one are inadequate. The world is now too small to depend on methods that were devised in days before the horse was harnessed or the oceans were discovered. In an age where men send rockets to the moon, we need methods for internalizing developmental guidance, not methods for institutionalizing authority and certifying experts.

A transformation in the level of awarness of what defines educational arrangements coexists with the awareness of the need for environmental awarness. Here we refer to such organizing themes as transdisciplinary, holistic, or integrative that are visible within the new holistic intellectual movements. ( ) The educational objectives of these movements include such themes as 1) to guide students to acquire ability for organizing fields of information rather than to acquire information about the nature of the world, of man, or of their interaction or 2) to acquire the ability to make evaluations of significance rather than to collect and store information deemed significant

by the teacher. Educaitonal awareness itself has shifted from the level of "I-It" to the level of "I-Thou" and as a result, certain methods developed during the level of consciousness of the previous stage can be adapted to the needs of the next stage.

For example, many techniques for acquiring information about individual value differences exist in the disciplines of psychology, sociology and cultural anthropology. Their primary use in the stage of I-It consciousness was for the objective measurement of differences in human values and social behavior. ( ) Their use required specialists trained in both measurement techniques and in knowledge of psychological development. If these inventorying procedures are transformed to the next level of consciousness and the use seen primarily in terms of developmental guidance rather than as a means for collecting statistical data on behaviorial differences, educational arrangements may be re-oriented toward the internalization of developmental guidance rather than the certification of experts and the protection of expertice. The transformation requires the dissemination of the coded keys that relate answers to the interpretation of behavior as well as the distribution of answers and a score classifying the subject. The object of disseminating psychological indicators is to expand the awarenss that alternative states exist, not to objectively measure awarness in isolation under controlled conditions.

The Meyers-Briggs inventory has been adapted and used in just this way. ( ) Other possibilities suggest themselves. The following examples show how questions used to differentiate personality type for the purposes of career counceling can be adapted to raising the consciousness of the person taking the test.

Psychological Type Indicators

The Meyers-Briggs Inventory is a self-reporting scale developed to measure Jung's psychological types. ( ) Jung introduced the constructs of introversion and extroversion in order to characterize differences in human behavior. Following Will James' work on temperament, Jung's scheme further divides extroverts and introverts according to four typical functions: sensation, intuition, thinking, and feeling. The notion of four characteristic functions stems from the observation that humans utilize two cognitive processes in developing consciousness: we make discriminations which is to say we perceive differences among things and we form equivalences which is to say we judge things to be similiar. Making discriminations is what Jung calls 'perception.' Gestalt perception is the intuitive function -- it grasps the whole in a flash. Step-wise perception is the sensation function -- it operates with five sense of hearing, seeing, touching, tasting, and smelling. Forming equivalences is called 'judgment.' Fast judgment is the feeling function -- it is emotionally toned and full of value. Slow judgment is the thinking function -- it is directed by logic and is systematic.

In other words, we perceive differences in two characteristic ways. In using sensation we utilize one or more of the 'five' senses; in using intuition we utilize some 'sixth' sense. A basic tenate of epistemology is that all perception, whether obtained through human sense organs or from laboratory instruments, is subject to verification through judgment or assessment. Our intuitive 'gestalt' may fool us just as easily as our eye or ear.

Judgments of similarities consist of thinking which is to make comparisons of fact with the situation or subject at hand in systematic and logically directed steps. Feeling compares situations or subjects with what is humanely agreeable or acceptable. Thinking assessments result in statements

of fact and take the form of 'is' statements -- "This x is animal, vegtable, or mineral," or "X is a function of time," or "The result of performing x is to increase y." Feeling assessments result in statements of value-judgments and take the for of "ought" or "like/dislike" -- "I like x," or "X should be prevented," or "We ought to do x."

Scientific disciplines have primarily emphasized and perfected the functions of sensation and thinking. The more recent recognition of the importance of intuition is a step toward wholeness. The cognitive function of feeling judgment lags behind, but hopefully its inclusion into our ways of knowing is beginning to catch up and balance the one-sided development of the scientific approach.

The Myers-Briggs type indicators differentiate four sets of opposites:

Extroversion-Introversion

Sensation-Intuition

Thinking-Feeling

Judgment-Perception.

The judgment-perception axis differentiates the 'superior' function and it is this key insight of Briggs and Myers that transforms Jung's typology from a theoretical construct into a practical working tool. These indicators have been used for many years by councelors advising young people on apptitude and career choice. The extension of these indicators into methods for internalizing developmental guidance and raising levels of consciousness is seen in the experience many people have when they complete the inventory.( ) On first looking at the questions used in the inventory one is likely to doubt their ability to differentiate characteristic human behavior. The questions ~~themselves~~ which force a choice between dualities appear simplistic and somewhat arbitary, yet their ability to differentiate the four functions is well documented.( ) What interests us here however, is the report of those who take the inventory in its effect to extend their awarness of

of their own bias in communicating with others and their own hidden assumptions in world views. That similiar self-activating questions can be designed to trigger environmental awarness on the part of the person taking the inventory is suggested by the descriptions of the five World Views given in the Arizona Report. For example,

World View 1. "takes the form of learning the basic life processes, getting the feet wet and getting the organism back into its environment...it utilizes metaphors of getting back, returning to basics and flight to the wilderness."

World View 2. "almost all ecological or environmental issues boil down to direct dualities between the individual and the larger group...this dualistic model relies on a a highly differentiated, objective, and analytic emphasis...environmental issues and solutions are seen in terms of conflict and/or control."

World View 3. "environmental education is viewed as crisis-oriented behavior focused on immediate events and short-term solutions."

World View 4. "this type of perception leads to the ultimate extrapolation of technology and tools far removed from the natural systems from which they emanate, e.g., nuclear weapons, electronic simulations, and the visions of advanced medical technology."

World View 5. "this world view sometimes called the second naivete, has its basis in the underlying positive primary conception of integrated one-ness or nondecomposable systems."

These descriptions map on the Jungian types as follows:

WV 1 -- feeling type
WV 2 -- thinking type
WV 3 -- sensation type
WV 4 -- intuitive type.

World View 5 "the one in which the core themes and integrative mandates of environmental education" are manifest would be the individual who has become aware of his own type and learned to develop his underdeveloped functions so that he is able to utilize each function whenever the situation calls for it. The object of becoming conscious of type is not to value one type over the other but to understand oneself's and other's type so that we can develop wholeness.( ) The four types of personality revealed by Jung's

pioneering effort to understand opposite responses and perceived realities are a step toward values clarification of the individual polarized between the extreems of current ecological issues.

World View Profiles

World View Charts displaying the development of consciousness from the time of the early Greek philosophers up through the present time have been utilized in interdisciplinary courses at high school through graduate levels and in adult education. ( ) These charts have an effect on students similair to the type indicator experience described above. Although primarily used to organize and display the historical development of thought in subjects such as astronomy, mathematics, philosophy, biology, economics and technology, they inevitably reveal attitudes and values by activating one to examine his own beliefs of reality. Parameters such as

origin of the universe
destiny of the universe
origin and destiny of man
methods for acquiring knowledge
ways of verifying knowledge
image of man
image of world
level of technology
means of subsistance
metaphors of the body
attitude of time
source of authority, etc.

specified for each age: 600bc-100ad; 100-1500, 1500-1750, 1750-1900, 1900-1960, and 1960 to 1976 reveal both the acceleration of change and a corresponding discontinuity in the root metaphors of each age. Many students discover their own attitudes and beliefs are a complex and inconsistant set -- some derive from the time of Pythagoras, others since the Copernican Revolution while some coexist with the present. Both the exercise of studying and constructing world view charts have the effect of discovering unexamined values and beliefs. Indeed a world view chart itself is a tool for raising consciousness in the same sense the type inventory is because it displays alternative values. Further extensions of this methodoly in the form of questionairs and choices of words opposites are being developed.

DRAFT

WORKING PAPER ON INTEGRATIVE MODELS

Introduction

WILSON

Both the Environmental Education Act and the primary recommendation of the Arizona report stress the necessity for the construction of an integrative model for environmental education. In the wording of the Arizona Report, the primary recommendation is "To develop core themes and a conceptual structure in environmental education that synthesizes and integrates pertinent subject matter across and between a variety of traditional disciplines". (1.18) The report does not characterize an integrative model specifically but does give examples of what it regards as the primary core themes or unifying threads with which such a model is to be built. Five core themes or key concepts are suggested: Environmental unity; General Systems Approach; Energy Flow; Economics; and Human Settlements or Ekistics. (1.8) The report suggests further that these primary themes may be divided into secondary or sub-themes such as, pollution, land use, population patterns, etc.

From these recommendations and suggestions, a sequence of questions emerges. First, what is an integrative model? Before one can sculpt an elephant, one must know what an elephant looks like. The views reported by three (or five) blind men who describe different parts of the elephant's anatomy, by themselves will not allow us to sculpt an elephant. And if we validate our model by having the blind men check it, thay can only verify the particular portions whose input they supplied, which means we could satisfy each of them and still not have an elephant. How, then to proceed? The sculptor knows the elephant is an animal, so it must have certain anatomical parts to enable it to perform requisite life functions and these parts are known to be located with respect to each other in standard ways. Hence with

the fundamentals of animal anatomy and physiology the sculptor can derive the general guidelines of the design. The dimensions of the legs, the size of the ears, the shape of the trunk, etc, inputs supplied by the blind men, can then serve as the boundary conditions which constitute the specifics to which the general anatomical principles are to be molded. Redundancies in the inputs are no problem, they are actually helpful in checking the fit; but inconsistencies in the inputs pose problems for the sculptor and he must make decisions to favor certain inputs over others. Extricating ourselves now from the metaphor, what are the fundamental processes and techniques for synthesis and integration and where have these methodologies been developed?

A visit to the science section of a typical university library reveals that about 95% of the books limit their subject matter to a single branch of science or to some specialized topic within one branch. The bulk of the remaining books are general science textbooks that cover several fields and are written primarily for use in introductory science courses, or are survey books touching on several fields of science written for laymen. But few of either the general science or survey books have anything integrative to say about the various branches they describe. In fact books of an integrative nature inter-relating the principles in the various fields of science are almost non-existent. This lack of books on integrative aspects of science is not only a comment on the nature of present day science, but on the concerns and capabilities of scientific epistemologies in general. While there exist unifying schemata like the periodic table of chemical elements or the electromagnetic spectrum which inter-relate restricted domains of scientific phenomena, there are no general unifying

schemata or integrative processes in science. Only a few books in the philosophy of science have anything integrative to say and these only on the so-called scientific method. (Which is largely what unifies what is presently called science.)

Looking next at the various system disciplines, cybernetics, General systems theory, information theory etc, we find that their epistemologies allow the subsuming of diverse phenomena much more than do those of science. Although a discipline like general systems theory is based on the recognition that everything is related to everything else and that there is no such thing as a isolated system and that you can never do just one thing (Hardin's Law), at the present time GST possesses no systematic methodologies for synthesis or integration or techniques for discovering unifying schemata even though it emphasizes the importance of these pursuits. It thus appears that the sculptor must himself develop the fundamentals of 'anatomy' and 'physiology'.

Historically, scientific and technical disciplines grew out of the analysis of specific problems--planetary motions, plant fertilization, ore reduction, etc-- It is therefor not surprising that the present condition of scientific knowledge is fragmented and that there are but the most primitive tools for synthesis and integration, while powerful analytic methodologies exist in abundance. When the new problem is ~~to integrate~~ synthesis, we naturally expect it to yield to the old approaches because it is a problem. But the best that has come from the analytic approach to the problem of synthesis consists of a few "hybrid" analytical/synthetic techniques such as Zwicky's morphological method and some of the methods developed in management sciences--relevance trees, graph theory, etc. But this is a beginning and where we had best start.

Types of Integrative Systems

Morphologically, integrative constructs may be considered as static or developmental, outer or inner, leading to four general classes:

Static integrative constructs are schemes for organizing information having the property that additional informational inputs are anticipated and suitable 'boxes' exist for the incorporation of new material. Examples are libraries, expandable files and unifying schemata such as the preiodic table of chemical elements mentioned before. General morphology is a useful technique for constructing this type of system.

Developmental integrative constructs, on the other hand, may be anticipative with respect to much new information* but also include in their structure a reorganizing process for restructuring the file so that it logically incorporates the new material. Only developmental files are integrative in the full meaning of this term. Restructuring of the file each time a bit of new information is added is a process which provides for the continuity of the file and at the same time optimizes retrievability. Such a developmental integrative construct is homologous to an evolving bio-organism in its manner of information adoption and optimization of performance. Successful bureaucracies are developmental integrative organizations, (some, however, appear to fallinto the static category). In general, the adaptive processes in evolution and succession are those of developmental integrative or self organizing systems.

Outer or external integrative constructs are those that organize information of a tangible and practical sort: facts, data, processes, plans, and activities. These systems may be either static or developmental in the above senses.

* In the rigorous definition of information it cannot be anticipated.

Inner integrative constructs organize and process information of a psychological nature. Typical materials include beliefs, values, worldviews (core beliefs), and personal psychological materials such as images, fantasies and dreams. Inner integrative systems are necessarily developmental since the processing of this sort of information, whether cultural or personal, invariably restructures or alters the system. This fact is at the root of psycho-therapy and non-conditioning processes that result in value, attitudinal and behavioral changes, such as consciousness raising group techniques and various self-referential devices for value clarification (Ages of Man, Jungian types, worldview charts, value profiles...).

	STATIC	DEVELOPMENTAL
OUTER	Unifying Schemata	Self Organizing Systems
INNER	Empty	Psycho-Therapy Value Clarification

TYPES OF INTEGRATIVE SYSTEMS

An additional property of developmental integrative systems must be taken into account. A general principle of systems theory reminds us that in self-organizing systems, any change that leads to a state more resistant to further alteration is immediately assimilated ( ), or in informational terms, acquired information is subsequently used to close the door to further incorporation of information. This principle assures that within a stationary environment, every purely self-organizing system will be converted from a developmental to a static system. This is consistent with the maximumization of stability of the system. However, in a fluctuating environment, due to the demands of fluctuating equilibrium, developmental integrative systems defer their transition to static integrative systems and maintain longer developmental lifetimes. This principle accounts for the termination of evolutional modification and the extinction of some species and for the necessity for revolution in human political and social affairs. But there is no a priori reason why a developmental integrative system could not be designed to artificially alter its environment so that the demands of fluctuating equilibrium be maintained and the crystalization into a static system indefinitely postponed. Man, indeed, appears to be such a system.

Design of Integrative Models

Several organizational forms have been used in the design of static integrative systems. These all have in common the satisfying in one way or another, of the specification requiring the provision of a relational network of addresses in which information may be stored.

This relational net is so structured that a few simple 'navigational' rules permit it to be easily traversed to any point and thus allow, usually through some coding procedure, for the informational elements to be readily stored and retrieved. The structure of the relational net together with the coding format adopted should display all of the connectiona and interactions that exist between the stored informational elements.

Static relational nets include simple node-link diagrams which display systems and/or concepts as nodes and connections and/or flows as links. Such node-link nets may take the form of trees or latices. A special type of tree that displays levels of organization or complexity is called a hierarchy. The levels must involve either sequential inclusions or sequential self-references, an example is Bouldings System Scala. Whereas the nodes in a node-link net may be decomposable into sub-systems containing 'micro' nodes and links, the links are generally not divisible. Nodes typically represent locations in the net where there is relatively high entropy production, high density, low extension and long persistence; links are relatively low entropy producers, have large extension and are of brief or intermittent persistence.

A second static format is the matrix which employs rows and columns (or may even be higher dimensioned) to give a simple (x,y,z,...) address net for stored information. Examples are again the periodic table of elements, morphological boxes and in a one dimensional case, the electromagnetic spectrum coded with wave length. Characterizing properties of the stored informational elements are mapped onto the positions in the matrix, thms displaying the informational relations through the geometric relations.

The simplest forms of developmental nets are static nets that are periodically restructured to fit new informational inputs. But a more sophisticated developmental schema not only contains self corrective circuits but contains prescriptions governing the manner of network growth. The most common developmental integrative nets are axiomatic languages such as logica or algebras. An axiomatic language is constructed from a set of elemental propositions (nouns, postulates, system core themes) joined through prescribed operations (verbs, pperators, combinatorial core themes) subject to certain rules (syntax, algebraic laws, general systems principles). Axiomatic languages, like common languages, involve semantics, syntax and grammar,i.e. involve the characterization and definition of the elemental propositions, their relational properties, and the rules governing the manner in which they are to be combined. The construction of such a language involves the identification of a self-consistent set of generating axioms and the allowable rules of combination. The linkages in a network of such linguistic statements are not mere connections or flows, but possess inferential or predictive powers. Thus the network has the capability to grow through epitactic extensions derived from its generating base and additional informational inputs. In this sense an axiomatic language is integrative and developmental. Examples of axiomatic languages include Euclid's geometry, Aristotle's logic and their descendents, modern abstract logics and meta-logics. A systems language developed from a set of core themes (system, stability, information,...) according to certain combinatorial or relational rules (analogy, homology, isomorphism, micro/macro,...) would constitute a developmental integrative model.

A Construction Strategy for an Environmental Education Integrative Model.

1) Select a candidate integrative net, such as axiomatic language.

2) Collect system core themes and classify them according to whether they belong in propositional or combinatorial categories.

3) Select an initial set of systems propositions for the generating set.

4) Collect ecological, economic, energetics, nutrition, ekistics,... core themes. designated here as theorems

5) Translate all theorems into a common systems terminology. [This translation is in itself a major integrative process]

6) Trace between the systems generating set (3) and the theorems (5) as is possible.

7) When tracing is not possible, heuristically add new propositions to the generating set. Again attempt the trace.

8) Iterate step (7) until each of the theorems in (5) can be traced to the restructured generating base.

9) Translate the final systems language into the various user languages.

10) Trace from specific case studies to key theorems or to the generating set as required by the situation.

The term 'trace' is used instead of the more formal derive or prove, until formal inferential steps can be developed in systems language.

For 'Correction' read 'Change'

①

April 28, 1981

A Few years ago at an international meeting of astronomers, seated among a group at the same table during a luncheon were an American astronomer and a German astronomer previously unknown to each other. As the table conversation developed it turned out that both had served in the intelligence sectors of their respective armies during World War II. They began to compare personal notes of the times. They found that they had both been across the lines from one another in Belgium in the Autumn of 1944 and that they both had been responsible for the decoding of enemy messages. The American said that they had succeeded in cracking the code the Germans were using and, "We were aware of every move you Germans were going to make." The German said that they had also cracked the American code and, "We knew every order that your side had issued." Both men were bemused. The American said, "You had superior fire power and simpler logistics, if you also had the knowledge of our code, as you claim, then how come you lost?" The German thought a minute and then said, "We each had the other's codes and we each knew the other's plans. But there was this difference. We Germans always followed orders, you Americans never did. and that is why we lost."

This story illustrates, perhaps as well as any, an important characteristic of ~~Americans~~, a characteristic that Perhaps has accounted for much of our success, not only in war but in many other areas and one of which we are quite proud. ~~of achievement. This is: Initiative, innovation, and creativity are~~ Everyone Doing his own thing or Doing the Thing in his own way ~~have generally~~ been not only but encouraged ~~permitted and expected~~ at every level. The person at the site ~~may~~ is felt to ~~be the best one to assess the situation and make the decisions,~~ is the key to success - and the greatest good for the greatest number

This story illustrates an important characteristics of Americans, a characteristic that has, as in this example proven quite successful, and a characteristic of which we are inordinately prowd EVERYONE DOING HIS OWN THING OR DOING THE THING IN HIS OWN WAY is the optimal path to the greatest good for the greatest number and the key to success. This is one of our most cherrished myths. And whether or not it is true, we go to great extemes to make it seem true and to avoid facing the possibility that it isnt true.

But there is strong evidence that this particular idea of what freedom is all about is on collision course with some very fundamental facts of life and the world. And we are face to face with a day of correction, a day that the greatest degree of Yankee ingenuity has succeeded in long postponing.

Our philosophy is not being challenged by scholars, by dissidents, not even by the Soviets, We are being challenged by the environment, by the context within which our institutions are imbedded, challenged by such principles as the second law of thermodynamics.

The american love of freedom makes us naturally averse to hierarchies of any sort and we subscribe to a one level view of the world. We are not under any physical or metaphysical control system , all competitors are on our own level and our success or failure will be determined in competition with them.

A few decades ago, shortly after World War II, a group of scientists form many different disciplines met in Mexico City and evolved one of the most remarkable generalizations ever to have been derived from human experience. Electrical network experts from MIT, doctors and surgeons from leading medical centers, world renowned anthropologists, mathematicians etc. met and demonstrated that certain systems principles arethe same in the human nervous systems, all kind of mechanical devices, social organizations, electrical circuits, etc. Using the newly formulated concepts of information science, a general system theory of broad applicability was derived and tested and proven in many experiments and demonstrations. This discipline is variously called by several names but most commonly by the name CYBERNETICS. It is about control systems of all sorts and applies to the brain, to governors of engines, to thermoststs, to managerial groups, to parliaments to ecological complexes and every sort of system where explicit functions are to be performed and goals attained.

The first thing cybernetics tells us is that systems cannot be considered as one level organizations. There are present at least two levels in every control system. An obnoxious thought to egalitarians and do-your-own thingers, and in what concerns us here at odds with some of the basic ideas of futures research.

But what is central to cybernetics is the idea of correction, a very unpopular and unpleasant notion both to those who are corrected and to those who have to do it.

For present purposes, we might look at it this way (4)

TYPES OF CYBERNETIC SYSTEMS:

C.G.JUNG Introduced four <u>functions</u> that appear in mental operations. These four functions in human psychology are identical with four very general functions that are present in all control systems, the human brain being but one instance. Jung designated these functions: SENSATION, FEELING, THINKING, and INTUITION. As an illustration, take a very simple case of a control system, a thermostat. Its components correspond to three of Jung's functions. First, there is the sensor of temperature that inputs the ambient or "is" condition. Second, there is the designated goal temperature, a setting (decision) representing a policy, a normative or "ought" condition. Third, there is the decision center that takes the error signal between the "is" and "ought" conditions and switches heaters and/or coolers on and off as required. (The management decisions in the last function are not of the same level as the policy decisions leading to the "ought" setting.) The first function, the ascertainment of the "is" condition, corresponds to Jung's SENSATION (or S) function. The second function, the generation of the "ought" condition, corresponds to Jung's FEELING (or F) function. The third function, the formation of the error signal and the proper response to it, corresponds to Jung's THINKING (or T) function. The fourth function, INTUITION (or N),, does not enter directly into the operation of the simple thermostat. It is, however, involved in ascertainment of if and when the policy (normative setting) should be changed, and when the sensing and/or decision apparatus should be modified.

From these considerations, we may consider the N function as a self-referential or "meta" function, capable of operating in all three functional modes, but on a control level above that of the basic control system. In other words the N function considers the existing system, the thermostat in the present case, as a an "is" configuration, it generates alternative S, F, and T components whenever the "is" components appear inadequate and prescribes the new S,F, and T as "ought" configurations to be used in the evolution of a new thermostat. N then establishes a <u>META-T</u> (or T-2) function to manage the error signal between the "is" thermostat and the "ought" thermostat. The N function thus has the property that it can not only take the place of an S,F, or T function, but can create and fulfill the functions S-n, F-n, and T-n, where n = 2,3,... The N function creates, de-bugs, and temporarily manages, but delegates to S,F, and T the control processes when routine has been perfected. It is the entrepreneurial function, including managing when needed.

The above sketch of the function view-point gives us a language with which we can describe and analyze different types of control systems:

The T function is the normal management function and in non-evolving operations is sufficient to effect adequate control for goal attainment. Most systems have a META-T or T-2 function but it is present in various guises. In most U.S. corporations, the T-2 function is handled by the board of directors and is the responsibility of the chairman of the board. The president of the corporation, the chief executive officer, is responsible for T-level management. This works fairly well except when, as frequently happens, these tasks are merged. It takes an unusual person to be able to switch between the high state of involvement required to manage successfully a modern corporation and the high state of detachment required to envision the product, organizational and procedural changes needed to stay competitive in a fluid environment.

Peter Principle is incomplete, it is 2 parameter: level + function

Do not promote a good T-man to T-2

If must make it a T after T-2 — we never get good T-2's

With this brief description of the nature of control functions I would next like to turn to my central theme that of how we systematically exercise all kinds of subterfuges to disable the operation of the control systems. Why do we do this? Most probably it is a matter of hubris, no one wnts to be under any control. No one wants to be corrected and we will design whatever structure we can to seek to be free of correction. In short, WE DON'T BELIEVE IN CORRECTION (except for criminal) it is contrary to freedom.

The first approach is to to deny the applicability of the concepts. "cybernetics has been overated. It is ok for guiding missiles but putting it into management theory is an unwarranted extrapolation. We have largely therefore rejected cybernetics and general systems theories, not because they have been shown to be invalid, but because we dont like the idea behind them or their implications for the future of the way we are doing things.. Cybernetics is unamerican even if it was invented here.

But then to ~~make sure~~ convince ourselves it wont work we proceed to circumvent it (which would not be necessary if it really didnt work) by tampering with the error signal at every place it can be tampered with. And if you think we are going to be corrected who's going to do it, buddy.[2]

Let us look at some of these operations:

First tampering with the S function. Altering, not the <u>is</u> condition of the world, which is impossible but our perception of it using rosey glasses of every hue.

for perceptions

St. 45
6a

How long has it been since we sensed the world as it is? It was certainly before Vietnam. It was probably before Korea, for Truman had to tell MacArthur his military concepts were no longer meaningful in the new reality of no-win wars. I guess, the last time we sensed the world as it is, was July 15, 1945, the day before the first atom bomb was exploded at Alamogordo, New Mexico. But the date is not important. What is important is that our perceptions of the world do not match reality and we are making major decisions on the basis of faulty perceptions. (The Russians are as afflicted with this disease as we.)

"5" functions: False Perceptions

What are ~~the causes of the anisomorphisms~~ some of the 8. --the ~~second~~ "5" error signals--~~that are guiding us to the wrong runway?~~ deliberate and inadvertent

1) The first is: No perception of reality, Herman Kahn's "Reality has outstripped experience". Examples of this are:
   - o The bio and social/destructive power of nuclear weapons as against the power and military symbolisms with which we think about them
   - o Accounting systems that do not take into account all of the costs, especially the non-renewable and irreversible impacts on our planet. e.g. know how — Boulding re Adam Smith
   - o All systems in which the feedback signals are delayed or not sensed. Radioactive components in a system, for example.

2) The second is anachronistic thinking and refusal to change--assuming configurations that are no longer valid to still be true. Some examples:
   - o All strategic thinking about nuclear war based on obsolete symbols of national power and security. Battleship arms races & Nuclear
   - o The more money we spend on defense the more secure we are.
   - ~~o We are so affluent that we can have both guns and butter.~~
   - o Americans want large and powerful cars. They have bought them in the past and they will buy them in the future. (This is an example of 'the future is to be more of the past' . It is one of the most widespread and deceptive anisomorphisms.)
   - o Economic practices which tend to freeze capital where it is (e.g. capital gains taxes) and make it difficult for capital to flow where it is needed are supportive of anachronistic anisomorphisms.

3) The deliberate fabrication of misperceptions. (requiring truth in advertising legislation). Examples:
   - o The beautiful billboard people with their cigarettes.
   - o The images of most politicians.
   - o 'Bad Guys' on whom to project the blame, ~~currently the~~ such as multinational oil companies.
   - o The abuse and misuse of language. distortion

CORCOR

CORRECTION AND CORRECTABILITY

1. The search for freedom has too often become the search for freedom from correction.
2. The ultimate destiny of the uncorrectable system is extinction.
3. Immunity from correction derives from one or more of the following:
   a) Isolation.
   b) Monopoly, Professionism
   c) Buffer environments, subsidies, embargoes, protection
   d) Manipulation and control of environmental inputs
      Market manipulation and control, F function control
4. The morphology of the avoidance of correction:
   1) Isolation. It is impossible for certain systems to receive necessary inputs e.g. LBJ. Those who make themselves inaccessible in order to escape correction secure only their demise.
      Being above the law, Being too secure.
      "I have a parking place"
      Limited liability, proxy system etc.
   2) Faulty S function. False perceptons, illusions, delusions. Inability to perceive the world that is.
      IOD feedback
   3) Manipulation and destruction of the F functon. Equating ought and is (Kinsey), denegration of such values as duty and responsibility,
      "Doing your own thing"
   4) Faulty "T" function. Destroy the error signal instead of reducing it to zero. Faulty communication, Faulty records and memory. The voters will come running back in November.
      Laws and appropriations = solutions
      Throw away the tiller
   5) The diffusion of responsibility. Committees. Limited liability, complexity, anonymity
      Abrogation of the equation, "Responsibility is proportional to authority (prerogative)
      Khoumeini, in having absolute authority with no specified responsibilities has created the most dangerous political power situation since Hitler.
      "I was only following orders".
   6) The delegation of blame. When someone else pays the penalty, there is no correction.
      Mi Lai, The Indianapolis,
      Washington has become the laboratory for testing the ideas and theories of the Harvard Business and Law Schools.
      The nation not Harvard pays the penalty,

4) Self-deception in any of its fashionable forms: Escapism, denialism, refusal to look at unpleasant facts. Examples:
   - o Executives, business and government, who insulate themselves with cadres of 'yes men'.
   - o ~~Mutual admiration societies~~.
   - o Philosophical schools such as logical positivism which hold that facts which contradict theory must be ignored, defused with ad-hoc hypotheses or rhetorically nudged out of the picture.

5) Hubris, arrogance, chauvinism, particularly those brands that assume they wield more power and control than they do.
   - o The whales, the redwoods, the lakes will be here forever, and when they aren't we'll find a substitute.
   - o There is a technological solution to every problem. We may not have it in our pocket at the moment but that is no excuse to postpone or delay.
   - o The Titanic is unsinkable and we therefore need supply it with only a few token lifeboats.

6) Ontological confusion or the inability to perceive the nested nature of realities and which nest we are one is in.
   - o The important thing on the Titanic is the seating arrangement at the Captain's Table.
   - o The lady, Kitty Genovese, being stabbed in the yard is part of a TV performance.
   - o And perhaps this is where best to place that all-embracing inflationary anisomorphism--that between value and price.

One is inclined to conclude that social anisomorphisms will inevitably arise--especially the anachronistic variety in a world in the throws of rapid change. But anisomorphisms are not all bad. Sometimes reality can be paralyzing and we actually need a certain amount of deception to avoid being overwhelmed. But when anisomorphisms begin to interfere with the correctability, the governability of the system, we had best ask for a position redetermination.

There are those who feel that the decision makers should not be allowed to be above their mistakes. When a man is too high up to be fired after his decisions have proven disasterous for his company or its customers, then a system needing of correction does not get corrected. There are those who feel that when we are called to bail out a company, it should only be done with the proviso that the entire upper echelon of management be replaced. During Watergate it was decided that no one, no matter how high up, was above the law. Now it is felt that the other shoe should drop, and no one, no matter how high up, shall be above the consequences of his mistakes. When we got rid of kings, did we not also discard the idea that 'the king can do no wrong'?

Certainly, deliberately immunizing the decision making component of a system from correctability may lead to the entire system becoming uncorrectable, but not necessarily so. However, our policies of limited liability, and by inference limited responsibility, definitely violate the basic corrective processes of long-lived natural systems as evidenced in the principles of bio-evolution. This immunization of the decision maker from correction may be the most important anisomorphism of all in that it is a meta-anisomorphism, one that breeds other anisomorphisms.

As America enters the 80's, the situation is much like a pre-earth quake condition with intense stresses built up along , not only the economic and social fault lines, but along the San Andreas Fault of Western Culture itself. Our anisomorphisms must soon correct themselves out of their own stress, even if we refuse to act.

The test of the 80's, to paraphrase words uttered at another time of great tension for Americans, will be again to test whether this nation or any nation so conceived and so dedicated can continue to endure.

OM MANI PADME HUM

Albert Wilson

June 17, 1971

Scenario: The Next Thirty Years X403.1

In preparing a specific scenario to represent what I feel to be the most probable future for the world between now and the year 2000, I have first focused on those trends in our culture that I believe to be mutually contradictory and controversy generating since thay are the most likely candidates for future dialectical theses. Controversy draws in the physical and psychical energies of men and produces the eddies of events that oftimes grow into the movements of history. Dialectical controversy gives representation to both normative and determinative modes of change--perhaps with a better assignment of their proper respective weights than in any other approach. Second, because I feel that the next 30 years are times during which the highly improbable is more likely to occur than in any previous 30 year period of the past 500 years, I have added to my scenario some "likely improbable random events" whose occurrence would have far reaching effects.

Before turning to the dialectics of the future, a word about a dialectic of the past. I would identify the principal dialectical confrontation of the past century as the struggle between elitism and egalitarianism. This struggle has occurred in many guises. On the side of elitism there were the imperialisms of the West and Japan; there was racism finding overt expression in colonialism, in pogroms, and in genocide. There were the chauvinisms of master races and chosen peoples, the economic enslavement of minorities and women. On the egalitarian side thare was anti-colonialism with its defeats at Omdurman and Peking and with its victories at Little Big Horn and Dien Bien Phu. There were the workers movements, the internationals and the unions. There were the suffragettes and women's lib. There was Kiangsi and the Long March. There was Montgomery and the Freedom March. But the elitism-egalitarianist dialectic no longer energises. While elitism has not triumphed, it feels secure. Workers and unions have become elitist groups even supporting imperialist wars. The internationals have evolved into communist imperialism. Integration succumbed ~~under~~ to Black is Beautiful. Success invariably turns an egalitarian into an elitist, since all men fundamentally want to be elite. With the passing of the egalitarian threat, elitism can return to the emphasizing of its internal rivalries, no longer having to abandon business as usual as it did in 1871 when the threat of egalitarianism in the form of the communards beseiged within the walls of Paris, frightened the Versaillais French and Bismark into an alliance before the Franco-Prussian War had ended. Or in 1918 when Allies and Germans hastened into cooperation in Russia as Lenin's appeal fired Europe.

Thus a dialectic has run its course, not finding its resolution in an Hegelian synthesis, but in the reabsorption of an abortive idea by the overwhelming persistance of the human aspiration for uniqueness and significance. So we turn toward tomorrow as the Century of the Common Man ends and the egalitarian stragglers get into the busses, from which the day children are escaping, and ride off into the sunset. school

What are the new eddies that will draw in our thoughts and energies, eddies that may will become maelstroms that will twist the world around and perhaps even turn it inside out.

Albert Wilson June 17, 1971

The contradictory trends that I feel portend to develop into the major dialectical confrontation of the next three decades--and perhaps longer--are not two but three:

control of information

1) The growing centralism and paternalism of national governments with their control continually extending over more sectors of private life. Armed with computer technologies and behavioral modification techniques their control of the media and education will continue to increase resulting in moving the world very close to the negative utopia of Orwell.

control of resources

2) The control of material and informational resources passing into the hands of fewer and fewer corporate type organizations. These becoming increasingly of a multi-national nature, their power and financial resources sufficient to permit their successful challenging of the national governments.

control of authority

3) The growing disaffection with centralism and bigness on the part of increasing numbers of individuals. The loss of trust and confidence in authority of all types, and the growth of individual values of personal individuation and freedom.

During the next few years, I expect all three of these trends to continue: Big Brother getting bigger, corporations conglomerating, and people withdrawing their allegencies and loyalties from governments and institutions. The shape of the future will depend largely on whether the initial collision occurs between 1) and 2), 1)and 3), or 2) and 3). Preliminary intersections have occurred already in all three combinations. Government and the people are tending to ally against the corporations on quality of environment issues. People and Corporations are tending to ally against the government on ~~taxation~~ trends and bureaucratic invasions of freedom. Corporations and government having shared the intoxication of power and found a mutually power enhancing alliance in what is commonly called the military industrial complex, will continue this symbiosis that fulfills in large part their respective ambitions for power.

Three ~~principal~~ broad brush alternatives for the future emerge from these trends:

Future No. 1. Existing alliances possess considerable inertia and the continuation of the present governmental-corporate complex may therefore be considered the most probable future. In this branch of the scenario, we may expect to see foreign policy supporting exploitive corporation interests throughout the world, with the further growth of so called "friendly fascism" within the U.S. There will be numerous Vietnams which are imperatives of this alliance. This branch also contains the imperatives of an esculating arms race and the ultimate imperative of inevitable nuclear clash, if not through political confrontation of friendly fascism with other peoples of the world, then through an earlier triggering of the same result through some faulty circuit in the 99.9% automated nuclear threat and response system. This branch we ~~shall~~ might label the fascist future.

Future No. 2. The government good guy-corporation bad guy model of the Roosevelt era will again captivate the public thinking as the government mounts the fight against the polluters, wasters, and despoilers. This branch of the scenario seems to me to be the second most probable future because it involves the return to a familiar pattern of thought, an antecedent with a "good old days" flavor for many people. In this branch the public will approve the use of fascist

practices such as wire tapping and no knock entries against the corporations and express amazement when these procedures become legally instituted and become common practice against the private citizen also. The public will acquiesce that this is a small price to pay for the benefits of a 2.73% reduction in smog and the closing of 24 off shore oil rigs. Although this branch has great appeal to politicians as the way back to public endearment and unrivaled power, it must ultimately adopt curbs on its own sovereignty if it is to become really effective in solving the global problems with respect to the quality of life. But only limited mileage can be made with the ecological issue without facing deeper problems both philosophical e.g. attitudes toward ecological values and practical e.g. distribution. This branch, which we may term the liberal future since it is an extrapolation of the approaches of Roosevelt and Humphrey, is but an interim holding action that postpones with mounting cost really valid and viable solutions. The continuation of Big Brother, but a good Big Brother on the side of the people, may be one option for the seventies but not beyond.

In both Future No. 1. and Future No. 2, the trend toward centralism dominates with a corporate synthesis flavor in Future No. 1. and with a masses synthesis flavor in Future No. 2.

Future No. 3. In this branch both corporations and the public recognize the inadmissability of continued invasion of rights by government. A new coalition of left and right individualists, corporations, state rightists, and neo-isolationists emerges with the common goal of checking centralism. The initial thrust of this alliance will be the psychological down grading of the nation states and nationalism. Individuals and executives will increasingly distrust government and increasingly disobey central authority. The multi-national corporation will organize its activities so that it is as free as possible from the control of any nation on whose territory it operates. The concept of home office and identification with the nation of origin will both disappear, the corporation becoming multi-national in identity, responsibility, and participation as well as in operations. (This will be effected by a new echelon of corporate leadership springing from those who recognize the ultimate demands of global responsibility.) The corporation in attacking the centralism of national governments will diffuse its own centralism in order to escape the squeeze of the nation states. Individuals will follow corresponding patterns. There will be mounting pressures for local control of taxes, education, and public works. In both old and new communities revenue sharing will be replaced by local taxation being controlled locally. The first major assault on centralism may well be a joint corporation individual tax revolt, probably occuring within the next few years. A natural symbiosis between the MNC's (Multi-National Corporations) and the ILC's (Independent Local Communities) will develop for the production and distribution of goods and services and the support of pluralistic life styles. The attrition of centralism must of necessity be accompanied with the loss of some efficiencies in production but this will be overcompensated for by the restoration of meaning and dignity to work through "intermediate Technology". As centralized forces are phased out, regional organizations like the Mormon Church and local organizations like Synanon will become paradigms for political organizations designed to administer needed public activities. The contest with centralism may be prolonged, but as the vision of a pluralistic world order based on multi-national leagues of autonomous local communities materializes and its advantages realized, the shift will become more rapid.

Albert Wilson June 17, 1971.

There will be "scope matching" between political organizations and the tasks to be performed. Local organization for education, utilities, law and order; regional organization for transportation and agriculture; MNC organizations for production and trade; and global organization for ecology, peace, and space.

Geographically intermixed pluralistic leagues would provide the coordinate frame for rendering todays weapons of mass destruction obsolete. No territory could be damaged without almost equal damage to one's own territory (since each league would have representative parcels in every region.)

It will be recognized that the nation state is anachronistic with regard to scope-matching to essential tasks, and but a hold over from the idea of political possession of peoples by central authority--king, president, or chairman. In today's world the only task for which the nation state is scope matched is so-called national security. But this is a pseudo-task created by the nation state. The present configuration of nuclear threat and counter threat on the nation state base cannot be resolved by the nation states since they are part of an inseperable package with nuclear threat. The configuration of nuclear threat can only be dismantled by dismantling the system of nation states that are the infra-structure of the configuration. In addition, because of Deutsch's Theorem, the nation states can neither create nor participate in a really effective world organization. Another future consequence of the dissolution of the nation states will be the emergence of an effective world organization for those tasks of planet wide scope.

The pluralistic world which will emerge following the demise of todays centralistic culture will not only provide a haven for all traditional cultures but will permit experimentation and the growth of new cultures. It is therefore out of place in this paper to discuss futures in the particulars of life styles, sexual mores, family patterns, education, etc. In the ~~meristic~~ pluralistic world many varieties will co-exist and be empirically studied. Only those groups whose thing is homogenization that must be expressed in the taking over and coercion of others cannot be ~~xxxxxxxx~~ allowed to do their thing in the pluralistic world.

Pluralism has many problems, such as identification of the unit of pluralism, the question of planetary imperatives such as population limitation, and the requirement of sufficient maturity to find inner directedness prerequisite to living and let live. The existence of alternatives to self identification other than nationalism will in itself promote the phasing out of nationalism and the growth of realization of deeper self identities.

The following technological developments will abet change toward a ~~meristic~~ pluralistic world order:

1) The fusion generator. With ample cheap energy readily available anywhere, independent of massive power sources and networks, viable autonomous communities can be set up in areas that are today marginal or unsupportive. Recycling of water and other basics becomes feasible if energy is cheap enough.

2) Supplementary solar power sources for use in arid regions with the advantage of minimizing thermal pollution.

3) Lasar beam private communication networks using satellites for independent league networks.

4) Computers for marketing and distribution optimization of the products of intermediate technology.

5) Bio-feedback devices substituting individuation for production as the core activity of human life.

This third Future is appropriately termed the pluralistic future.

PART II.
"Likely Improbable Events" for the next 30 years.

These are events that would subsequently effect major changes on the planetary culture, but which cannot be considered probable in ordingry times. But if the next 30 years contain a high density of Maxwellian singular points, the times will not be ordinary and the improbable becomes more probable.

o Psychodelic or other introvertive explorations resulting in the grasping of the nature of man and the world as essentially different from that believed by ~~the~~ present scientific or past theological worldviews. The resulting noetic revolution would change core beliefs, attitudes, and behavior to forms with unimaginable social and cultural consequences.

o The outbreak of psychic disease that would spread across the planet as have plagues in the past causing widespread anomie with the subsequent breakdown of civilization and the driving of hundreds of millions to despair and suicide.

o A period of natural disorders with world wide earthquakes, vulcanism, and tidal waves radically revising the present topographic features of the planet, civilization surviving only in isolated enclaves.

o The emergence of a new super organism transcending man as the highest intelligence on the planet. This could arise from man by some mutative step, be created in the molecular biology laboratory, result from an "omega" coalescence of human intelligences into a super intelligence, come from outer (or inner) space, or be effected in computer hardware and software.

Any of these " likely improbable" developments would effect changes so radical that all determinative and normative trends would be overuled and the future would take a totally unforeseeable course. But in the absence of such an occurrence, the Futures No's 1, 2, and 3, seem to be the most probable alternatives lying ahead.

TRANSCRIPT DRAFT 11 Jan USC
Lecture Given USC Jan 11, 1971

URBAN SEMESTERS FUTURES

This futures business which has exploded on us in the last decade comes from several places. I think the original thrust was the recognition of a new source of power. A way to acquire power downstream a few years by making certain kinds of plans and influencing the right people--this has been largely sucessful for those who got in on the bandwagon initially, like the chain letters. Back in Denver in the 30's they started these chain letters, and if your name was on top of the list, you really got some money, but later on, down the list, were very basic mathematical reasons you didn 't have a chance. This futures business is the same way. It's hard to tell who is making decisions these days. We elect people to make decisions, but the decisions they make frequently are from a smorgasbord that has been prepared in the basement of the RAND corporation or some place like that, and you cannot know who has prepared it or what the assumptions are, and we get stuck with foreigh policies, and (....) the decision makers don't have time to look at. The futures game began shortly after World War II, largely by the military. They were the first to recognize that with modern wheapons being what they are, (....) we've got to make plans ahead. And so they set up think tanks, such as the RAND corporation, to begin to plan the future. And those who plan the future, and think about the future, really shape the future, and the future that we are now living in is largely the product of the weapons thinking generation. This (.....) bind that we've got, nation state against nation state, in a balance

Combining this result with (D5.3) then gives

$$(D5.4) \qquad C_1 = \frac{5}{2} C_0 \int U_0^3 \, dv \ .$$

Proceeding in a similar fashion, one easily established the following results:

$$(D5.5) \qquad \Delta(U_2) = 2\Delta_1(U_0,U_1) - C_2U_0 - C_1U_1 + 2C_1U_0^2 - C_0U_2 + 4C_0U_0U_1 - 2C_0U_0^3 \ ,$$

$$(D5.6) \qquad C_0 \int U_2 \, dv = 2\int \Delta_1(U_0,U_1) \, dv - \frac{7}{5} C_1 \ ,$$

$$(D5.7) \qquad C_2 = 2 \int U_0 \Delta_1(U_0,U_1) \, dv + 2C_1 \int U_0^3 \, dv + 4C_0 \int U_0^2U_1 \, dv - 2C_0 \int U_0^4 \, dv \ .$$

of terror, has been the result of one particular type of futures thinking, that has dominated this country, and the Soviet Union, and some of the others. Out of this has emerged a group that we can call the professional futurists. We'll speak of three different groups of futurists. This is the oldest group; the primary group--the professional futurists. They developed several methodologies. Morphological analysis; delphi tecnique; relevance trees; growth curves; envelopes (.....)--there's a whole bunch of statistical, mathematical, intuitive methodologies that are used to make the forecasts. These people have a pretty good kit of tools; they can sell this kit of tools to corporation presidents, the government, or universities, or whoever is willing to buy their expertise. These people have a lot of influence, and what they are selling is: we will help you plan for what you wish, and the kind of future you want, which is usually some (.....). That's the first group, and there are many sub-groups in these professional futurists--technocrats, people who believe that technology can solve all our problems, if we just have enough of it--and the other extreme, there are humanistic technocrats , Bucky Fuller and people of that sort. Now the second major group of futurists are a type of reaction to this first group. They sprang up primarilly in Europe, partly in the communist countries. These are people who have lived with state planning, and the kind of planning that the military is doing in this country, and the technocrats are advocating. They live with it--in Poland, Czechoslovakia, and places behind the Iron Curtain. They've

(D3.1) $\quad L = l(\varphi)$.

Under the substitution

(D3.2) $\quad \varphi = L\,U$,

we may replace φ by a function U with given norm

(D3.3) $\quad l(U)^2 = 1$,

and thereby consider L as a parameter. From (D1.1) and (D3.2) we must then have

(D3.4) $\quad \Delta(U) = L\,\Delta_1(U, U) - C\,U \exp(2\omega - 2\,L\,U)$,

with U a single-valued C^2 function on S_ϵ such that (D3.3) holds. In addition, (D2.16) gives

(D3.5) $\quad C = \int (1 + LU)\,\Delta_1(U, U)\,dv \Big/ \int U^2 \exp(2\omega - 2\,L\,U)\,dv$.

In general, U and C are functions of L. For the remainder of this study, we examine those solutions of (D3.4) that can be expanded in a power series in L and which converges uniformely for L in some interval $[0, a)$ with $a > 0$. We thus have

(D3.6) $\quad U = \sum_0^\infty U_i\,L^i$, $\qquad C = \sum_0^\infty C_i\,L^i$

with

(D3.7) $\quad k!\,U_k = \partial^k U/\partial L^k\Big|_{L=0}$, $\quad k!\,C_k = \partial^k C/\partial L^k\Big|_{L=0}$.

For obvious reasons, we refer to the series (D3.6) as expansions in

seen the dehumanizing aspects of this state planning, and together with a lot of people in Western Europe, and a few Americans, they have formed a kind of a humanist futuristics. These people are more concerned with what technology is doing to us, and what is happening to human values--will the traditional human values disappear? These people are criticised as being a little fuzzy minded; they don't have a real program--they're kind of worried, but they don't know what to do about it except look out, we've got to be aware of the situation. Now the third group you can call the participative futurists. These are people that do not look for to the centralized authority to provide the future; they are people who feel we just have to take the futurein our own hands--some small chunk of it, anyway. That small chunk can either be a prototype, a microcosmos, or a seed, depending on which way you want to view it, or shaping or developing the futre. Participative people may be dropouts, setting up their communes, or they may be people partly working with the establishment, trying to innovate new ideas, or they may be humanistic philosophers, people who are trying to get a revision, a reassessment, of where we're going. These groups, whom you must (.....) catalog, (.....) their members may be range anywhere from hippies to college professors or ex-government administrators and so on. So we have these three groups currently; the participative futurists; the humanistic futurists, whose principal thrust is to get people to become futures oriented--to start thinking about the future; and the professional, establishment type of futurist--the forcasters and planners who (.....) Now there is a fourth group--it is a very very small group--and its a kind of an ivory tower philosopher group--I use two words: Incherists, people who are think-

(D2.13) $$\int \varphi \exp(2\omega - 3\varphi)\, dv = 0, \qquad \int \varphi \exp(2\omega - 4\varphi)\, dv < 0,$$

and

(D2.14) $$C = -\int \exp(-2\varphi)\, \Delta_1(\varphi,\varphi)\, dv \Big/ \int \varphi \exp(2\omega - 4\varphi)\, dv .$$

Consequently, a combination of (D2.11) and (D2.14) shows that for any nontrivial φ satisfying (D1.1), we have

(D2.15) $$\int \varphi \exp(2\omega - 4\varphi)\, dv \int \Delta_1(\varphi,\varphi)\, dv + \int \varphi \exp(2\omega - 2\varphi)\, dv \int \exp(-2\varphi)\, \Delta_1(\varphi,\varphi)\, dv = 0 .$$

It is thus evident that a nontrivial must be a convex function about the trivial solution $\varphi_0 = 0$.

Another representation for C that will be of use in the following analysis is obtained by applying Δ to φ^2 and using (D1.3). The result is

(D2.16) $$C = \int (1 + \varphi)\, \Delta_1(\varphi,\varphi)\, dv \Big/ \int \varphi^2 \exp(2\omega - 2\varphi)\, dv ,$$

and it has the property that the denominator is a strictly positive functional.

3. Expansion in the L_2-Norm

In view of the nonlinearity of (D1.1), the solutions of this equation are intrinsically dependent on the specification of the norm of φ, while the only information available is that φ must be a single-valued C^2 function on S_ϵ. Let $l(\psi)$ denote the L_2-norm of an L_2 function on S_ϵ, that is

$$l(\psi)^2 := \int \psi^2\, dv ,$$

and set

ing about the future--futurists; I reserve the word futurologist for this fourth group; people who thinking about thinking about the future. In other words,looking at this whole picture, and seeing what each group is doing, where they're going, what their assumptions are, whether they make sense, and so on. Donna and I are largely in this group, futurologists--we are concerned with the assumptions people are making, with the value systems they are proposing, and the methodologies they are using. We are also in group three--we are participative futurists, we are dropouts. We've set up our own small group up in Topanga Canyon, called Eomega Grove, in which we do research funded by ourselves, doing our own work, teaching part time at different places, and so on. And having people who are interested in our program come and work with us, doing things like studying recycling, composting, intermediate technology, building hand looms, things of this sort. This I won't talk about today, it's just an example, I wanted to tell you where we were--we are doing a participatory thing at a grass roots level, down to earth level. What I'm going to talk about today is what we're doing as futurologists, in looking at this broad picture. Now, what is the philosophy--what are the philosophical assumptions behind the idea that we can think about the future--what are the ways we think about the future? One way is to think that the future is to be selected. There are several possible futres open to us--we can pick the one we like; we can shape the future; we can imagine it, invent it, and implement it, plan for it, (.....) Another philosophy is that the future is pretty largely shaped by what has gone before. It is deterministic. We can talk as much as wish, we can plan, we can act, we can fight wars, we can do anything we wish.

the condition expressed by (D2.8) can be satisfied only if $C > 0$. We have thus established the following result: Nontrivial, single-valued, C^2 solutions of (D2.2) exist on S_ϵ only if $C > 0$, in which case we have

$$(D2.9) \qquad \int p^4 \ln(p) \exp(2\omega)\, dv > 0 \ .$$

A further result can be obtained from (D2.7). For $k = 0$, we have

$$-\int p^{-2} \Delta_1(p, p)\, dv = C \int p^2 \ln(p) \exp(2\omega)\, dv \ .$$

Hence, since $C > 0$ and $p > 0$, we must have

$$(D2.10) \qquad \int p^2 \ln(p) \exp(2\omega)\, dv < 0 \ .$$

It is then readily established from (D2.2), (D2.3), (D2.9) and (D2.10) that p is a convex function about the trivial solution $p_o = 1$; that is, $p - 1$ is a convex function on S_ϵ .

Returning to (D1.1), and applying the results stated in (D2.5), we obtain

$$(D2.11) \qquad C = \int \Delta_1(\varphi, \varphi)\, dv \Big/ \int \varphi \exp(2\omega - 2\varphi)\, dv \ .$$

Hence, since $C > 0$, we obtain the inequality

$$(D2.12) \qquad \int \varphi \exp(2\omega - 2\varphi)\, dv > 0$$

as a condition for nontrivial solutions. This, however, is nothing more than the inequality (D2.10) under the inverse of the substitution (D2.1) . Similarly, from (D2.3), (D2.5) and (D2.9), we obtain

It doesn't make any difference--what's going to happen is going to happen--it's not in our power to do much about it. And you have in fact two activities, two basic activities: forcasting and planning. We all, to some extent, make predictions about what we're going to do next week. We also make plans about what we're going to do next week. The difference between a forecast and a plan is that a plan assumes I can do something. A forecast assumes that there's enough stability, in extrapolating what's happened in the past, that we can assume a certain coordinate range (.....) Science is only possible because we say the world tomorrow is going to be pretty much like the world yesterday. The laws of nature are not going to cange--certain basic laws are going to allow us to project into the future. So we have two basic facets--something that is free, subject to our choice; other things that are not free, not subject to choice. Now this seems like a very obvious statement, but it is a very important statement. There are lots of people who do not recognize there are certain limits, things that you just have to live with. The earth is finite. That's a fact. No matter how much planning, how skilled you are in economics, in any kind of manipulation, this imposes certain limits. I use the word determinative for those aspects of society that evolves in time (?), and I use the word normative for those aspects that are subject to our own choises. Now, we're not free in a complete sense, and the most critical question is where is the interface between freedom and the determinative, and we can all make fools of ourselves if we ignore this question. I think most of the people who are doing things in Washington, in corporations, and so one, are making gross fools of themselves because they do not look carefully at this question. There's a third factor--

For $p \neq$ constant, the C^2 continuity of p implies that $\int \Delta_1(p, p)\, dv$ is a strictly positive functional. It thus follows from (D2.4) that the value of C is given by

$$(D2.5) \qquad C = \int \Delta_1(p, p)\, dv \Big/ \int p^4 \ln(p) \exp(2\omega)\, dv$$

and that two cases can arise:

(i) $C < 0$, $\quad \int p^4 \ln(p) \exp(2\omega)\, dv < 0$,

(ii) $C > 0$, $\quad \int p^4 \ln(p) \exp(2\omega)\, dv > 0$.

The determination of the sign of $\int p^4 \ln(p) \exp(2\omega)\, dv$ is based on the following easily established identity:

$$(D2.6) \qquad \Delta(p^k \ln(p)) = p^{k-1}(1 + k \ln(p))\Delta(p) + p^{k-2}(2k - 1 + k(k - 1) \ln(p))\Delta_1(p, p) .$$

Substituting from (D2.2) into (D2.6), and using (D1.3), we obtain

$$(D2.7) \qquad \int p^{k-2}(2k - 1 + k(k - 1) \ln(p))\, \Delta_1(p, p)\, dv = C \int p^{k+2}(1 + k \ln(p)) \ln(p) \exp(2\omega)\, dv .$$

For $k = 1$, this gives

$$\int p^{-1} \Delta_1(p, p)\, dv = C \int p^3 \ln(p) \exp(2\omega)\, dv + C \int p^3 (\ln(p))^2 \exp(2\omega)\, dv ,$$

and consequently, by use of (D2.4), we have

$$(D2.8) \qquad \int p^{-1} \Delta_1(p, p)\, dv = C \int p^3 (\ln(p))^2 \exp(2\omega)\, dv .$$

Thus, since p and $\exp(2\omega)$ are necessarily strictly positive,

we cam call it the random factor. Somebody gets up in the building and pulls the trigger and kills the president--this was neither forcasted or planned on a major scale, and yet it has a very major effect on the future. Events of this sort can turn the world upside down. Perhaps one of the most important events of this sort, which can be traced down to a specific, occured during the Russo-Japanese war of 1905. There was a battle at sea to determine whether the Russian fleet could cut off Japanese sending forces to the mainland. One shell fired by the Japanese flag ship killed the Russian admiral and the pilot of the flag ship. Without going into a lot of detail, the naval historians have traced exactly how the effect of this one shell and what happened subsequently ~~xhex~~ lost the battle for the Russians, and how this particular battle lost the war because it led later to the defeat at Sushima, And, this is perhaps one of the most important events of the present century, because it destroyed an image--the image of the superiority and invincibility of the white race.Up until that time, all through what we now call the third world, there was a great deal of hesitancy about challanging the authority of the white race, but after admiral ~~Phgogou~~ Togo defeated the Russians at ~~xhexcowacgamex~~ the white man's own game, his own weapons, it electrified Africa and Asia. I was in Eiderbad several years ago, and visited the Nizon's palace. There was a room in the basement of that palace, where they said the Nizon went in here every day, to get courage. All around the wall were painting of the battle of Sushima, in which the Russian fleet was destroyed. This was the one event which led to the possibility that colonialism can be destroyed. And, what has happened subsequently, through Bangung , and the emergence of new nations (.....) all trace to that event. Now

Pivotal events
Events that destroy or create images

2. Conditions for Nontrivial Solutions

Let us make the substitution

$$(D2.1) \qquad p = \exp(-\varphi) , \qquad 0 < p < \infty .$$

Equation (D1.1) then becomes

$$(D2.2) \qquad \Delta(p) = -C\, p^3 \ln(p) \exp(2\omega) .$$

A direct application of (D1.3) thus gives

$$(D2.3) \qquad \int p^3 \ln(p) \exp(2\omega)\, dv = 0 .$$

If we apply Δ to p^2 and use (D2.2), we have

$$\Delta(p^2) = 2\,\Delta_1(p, p) - 2\,C\,p^4 \ln(p) \exp(2\omega) .$$

Again, applying (D1.3), we obtain

$$(D2.4) \qquad \int \Delta_1(p, p)\, dv = C \int p^4 \ln(p) \exp(2\omega)\, dv .$$

In the case of trivial solutions, there are two possibilities:

(i) p = constant $\neq 1$, $C = 0$,

(ii) $p = 1$, the value of C is left arbitrary.

The case $p = 1$ corresponds to most previous analyses, since (D1.2) shows that r is undetermined. The situation p = constant $\neq 1$ is easily seen to annihilate the jump discontinuity (i.e., $\mu = 0$ since $r \neq 0$). Noting that a continuous C, and hence a continuous r-spectrum is possible, we henceforth confine our attention to the nontrivial case.

we say what kind of a future do you talk about when it hangs on the nail in a horses shoe? Richard the Third. This is the kind of random event--call it random if you will, but it perhaps influences so many other subsequent events, that all the planning, all the forecasting doesn''t really matter. Well this doesn't mean that we can't plan our cities or forcast their futures or bring our own wills into the picture, but we have to be aware of others things that can be happening, call them contextual. So I'll write three words on the board: Determinative, [illegible] Normative, and contextual. This is the effect of the past; we can predict where the planets are going to be in the next century or two, because we know that the laws of nature with high probability are going to continue to be as they were. There are a lot of sociological things that come under this. We're not going to get rid of automobiles by June--we're going to take some time/ These have time consequences. This is the area of human freedom; choices, selection, planning, imagination--the kind of thing you're mostly concerned with here. This is the context in which the whole of society and each of us as individuals are imbedded, and events can happen from the outside. If you believe in one metaphysic, you can say these are random events; if you believe in another metaphysic, you can say that gods are acting and intervening in some way. The effect from where we stand is very difficult to disentangle, but say God is throwing dice or the (.....) probabilistically, or there is a purpose that moves and intervenes from time to time.We do not distinguish these, so we'll just call them contextual. So this, I feel, is an important philosophical background for our discussion. We have to give a little thought to the different aspects to any statement that we make, whether we're talking about a determinative

APPENDIX D. Analysis of the Complete nonlinear Discretization Equation

1. Statement of the Problem

In view of the scaling and normalization given in Section 32, the complete nonlinear discretization equation assumes the equivalent form

$$(D1.1) \qquad \Delta(\varphi) - \Delta_1(\varphi,\varphi) + C\,\varphi\exp(2\omega - 2\varphi) = 0$$

on the surface S_ϵ of the unit oblate spheroid in Euclidean three-dimensional space. Here $\Delta(\varphi)$ and $\Delta_1(\varphi,\varphi)$ denote the Laplace-Beltrami operators on S_ϵ, and the constant C is defined by

$$(D1.2) \qquad C = \xi r^2 , \qquad \xi = \frac{2\mu}{\Theta}\exp(-\pi\Theta/\mu) .$$

The problem to be examined in this Appendix is as follows: Determine single-valued C^2 functions φ on S_ϵ that satisfy (D1.1), and determine the values of the constant C that lead to such solutions.

It was shown in Section 32 that S_ϵ is a compact, oriented, Riemann manifold without boundary and with fundamental metric differential form $d\sigma^2 = m_{\alpha\beta}\,du^\alpha\,du^\beta$. We may thus use BOCHNER's *) extension of Green's theorem on the manifold S_ϵ. Accordingly, we have

*) Bochner, :Duke Math. J. 3, 334 (1937).

$$(D1.3) \qquad \int \Delta(\varphi)\,dv = 0 \qquad \int \{\eta\Delta(\varphi) - \varphi\Delta(\eta)\}\,dv = 0$$

for any C^2 functions φ, η, where $dv = \sqrt{\det(m_{\alpha\beta})}\,du^1\,du^2 = dS_\epsilon$ and the integrations are extended throughout S_ϵ. These equations provide the basic tools for this investigation.

or a normative statement. No one can predict these contextual types of events. Now this morning, what we would like to do is give a brief introduction to futurology, and this includes such things as the theory of time, and then discuss very briefly each of these, and then have some participative exercises, particularly in this normative. Two very important aspects to the whole subject: One is imagination, two, are values. The future is really not as bleak as most of us are led to think by reading various prophets. The future is only bleak if you have no imagination, and we'll get into that, in looking at the interface between the determinative and the normative. But the main thing I feel we should discuss together are values--what is our value system, what is the value system that is now crumbling, what is the one that is emerging, what are the sources of values, where do we get our values--experience from revelation, from the lepacrons, or whatever.We'll look at some meta-values, these very fundamental values, ultimate values; we will look at some ultimate values that are being disregarded increasingly; we'll look at some ultimate values which may possibly supplant the present system.

Now, if we have certain assumptions about the world, whether we verbalize these or not, they may take away our freedom. One of these might be our view about time. It's been pointed out by Benjamin Lee Whorf, who is really the father of linguistics, that what we think about the world is shaped largely by our language. Most Indo-European languages have past, present, and future tenses; Hopi is a language that does not. The Hopi do not think of time as we do; it's inconceiveable in their language. They do not think of past and presten. There are other Mahotl tribes with the same

Theorem 5.2. Let the λ-differentia satisfy the condition (C5.1) and let the hypotheses of Theorem 4.1 hold; then the λ-differentia is a constant if and only if the timelike unit eigenvector field of $\{\bar{K}_{AB}\}$ in $\mathbb{C}_n$ generates a geodesic congruence. In this case, the associated eigenvalue of $\{\bar{K}_{AB}\}$ is zero.

Proof. Under the present hypotheses, Theorem 5.1 shows that the timelike eigenvector field of $\{\bar{K}_{AB}\}$ satisfies the system of equations (C5.4). Thus, if $\{V^A\}$ generates a geodesic congruence in $\mathbb{C}_n$, we have $\partial_A \omega = 0$, and conversely. The remaining statement of this theorem is a trivial consequence of (C5.3).

A straightforeward application of previous results leads to a characterization of the λ-differentia in the general case.

Theorem 5.3. Let the λ-differentia satisfy the conditions (C5.1) and let the hypotheses of Theorem 4.1 be satisfied; then the space $\mathbb{C}_n$ admits a time-oriented irrotational isometry with generating vector

$$\bar{Y}^A = \exp(-\omega)\, V^A \ .$$

approach, and many anthropologists have now concluded that our view of time is not intuitive, it is not from phsics, it is not the way it is--it's due to the way we formulate it in our language. In other words, this whole idea of past, present, and futre may be wrong. It's Newtons idea, he formulated it. But we've all had experiences that certain events which occur later in time, seem already to have been determined, or already known to us. Very few people haven't had this experience; there's a very famous experience, this English philosopher Dunn, who had a dream about a terrible volcanic eruption, Mt. Pelee, in the Carribean. 40,000 people were killed in this. About three months later, this event happened, and he read it in the newspaper. It turned out there were only 4,000 people killed, but the headline in the paper said 40,000, and they had made a mistake. His dream was that he had seen this newspaper three months before the event odcured. Now you have two ways of looking at something like that--you can say this is silly, rediculous, and if you're a good newtonian you can throw these phenomena out because they say Sir Isaac didn't give us the best and final answer; and, most of us are very loyal to Sir Isaac--he is our real authority. But if you say there are phenomena like this, and in order to incorporate or internalize them, live with them, and to admit their reality, we may have to say the Sir Isaac has not said the last word. We have to be prepared to take that step. Well, 90% of the physics departments in the world will crumble, but we've got to go ahead with it. Well, we need a new epistomology--we need a new frame of reference in space and time. Now what kind of frame of reference in space and time can we put together ofr this purpose? Well, let't go back to the

An obvious sufficient condition for satisfaction of (C5.1) is

(C5.2) $\omega = f(\psi)$.

Theorem 5.1. If the -differentia satisfies condition (C5.1) and if the hypotheses of Theorem 4.1 are satisfied, then

(C5.3) $V^A \bar{K}_{AB} = V^\bullet_B \bar{\nabla}_A \partial^A_\bullet \omega$,

(C5.4) $V^B \bar{\nabla}_B V^\bullet_A = \partial_A \omega$,

where the vector field $\{V^A\}$ is defined in terms of the vector field $\{U^A\}$ by

(C5.5) $V^A = \exp(\omega - \psi)\, U^A$.

We accordingly have

(C5.6) $V^A V^\bullet_A = 1$.

Proof. Under the present hypotheses, Theorem 4.3 gives

$$U^A \bar{K}_{AB} = \exp(2\psi - 2\omega)\, U_B \bar{\nabla}_A \partial^A_\bullet \omega \quad .$$

The system (C5.3) then follows when $\{U^A\}$ is eliminated by means of (C5.5) and use is made of (C3.2) and (C4.7). Under (C4.7) and (C5.5), we have

$$V^B \bar{\nabla}_B V^A = \exp(\lambda)\, U^B \bar{\nabla}_B(\exp(\lambda)\, U^A) = \exp(2\lambda) U^B(\bar{\nabla}_B U^A + U^A \partial_B \lambda) .$$

Since (C1.3), (C4.7) and (C5.1) imply $U^A \partial_A \lambda = 0$, a direct application of Lemma 3.3 leads to (C5.4).

We can now give a very simple geometric characterization of the case in which the λ -differentia is a constant.

hopis. Instead of having past and future, the Hopis say they have known and unknown. Now this is the important dichotomy--we can recognize it too. Except we say these two things coincide--known is past, unknown is future. The hopi says xxx no, the known and unknown do not coincide. And we have a third division, determined and undetermined. We'd like to think, in Western science, that the moment of determination is the present, that something can be probable or improbable until the present, and then it has happened, and that's the way it is. But there are many events in the future that may have already been completely determined. So, lets bring in Hopi thinking and modify Sir Isaac. If this is the linear stream of Newtonian time, which we will modify, I won't go into this sort of thing, I'm just giving a very sketchy intorduction. What I'm trying to do here is to get you to question what you believe in, and the most fundamental thing you believe in is time, and the way Newton described it. Well, it is something I suggest we all really examine. This is the instant we call the present, and we'll call this past, and we'll call this future. Now, the Hopi said there is another impoertant line, and, we'll use a symbol like this, and call this the known, or knowable, and this the hidden. And in the third important division, we might eepresent this way, call this the determined, and the undetermined, still open to choice.

Q. ISN''T THERE A DIFFERENCE BETWEEN THE KNOWN AND THE KNOWABLE? There is quite a difference. The past may be knowable, but we do not know it in particular. There would be some events that we could research, we could find out what King Minos really did; it's knowable in principle, but it is unknown. So there is a very important difference, this is true. But our idea is that if it

If these conditions are satisfied, the corresponding eigenvalue ρ is given by

$$(C4.9) \qquad \rho = (n-2)\, U^A(\bar{\nabla}_A + \partial_A\omega)(U^B\partial_B\omega) + \exp(2\psi - 2\omega)(\bar{\nabla}_A\partial^A\omega).$$

Proof. In terms of the λ-differentia, the vector $\{Z_A\}$ defined by (C4.3) takes the form

$$Z_A = (n-2)\,(\bar{\nabla}_A + \partial_A\omega - \partial_A\psi)(U^B\partial_B\omega) \ .$$

A decomposition of $\{Z_A\}$ by projection parallel and orthogonal to $\{U_A\}$, together with (C1.3), (C4.4) and (C4.7) establishes the result.

5. The Condition $U^A\partial_A\omega = 0$

The λ-differentia, as defined by (C4.7), measures the extent to which the conformal relating parameter λ differs from the negative of the basic scalar ψ of the time-oriented irrotational isometry of $(H)_n$.*) The quantity ω thus determins the extent to which the

*) The reason for comparing λ with $-\psi$ rather than with ψ is due to the fact that the modulus of the vector field that generates the time-oriented isometry in $(H)_n$ is taken as $\exp(-\psi)$ rather than $\exp(\psi)$.

extent to which the conformal relating parameter can be used to annihilate the basic scalar ψ when considerations are shifted to the space $(C)_n$.

Particularly important in applications is the case where the λ-differentia is constant on the trajectories of the irrotational isometry in $(H)_n$:

$$(C5.1) \qquad U^A\partial_A\omega = 0 \ .$$

occurs here, it is not only unknown, it is unknowable. The Hopis say no. What we're really saying is, these three lines in western thinking coincide. But we have to imagine a world in which, uh, we can give this line let's call it present, let's call this the (.....), this zig-zag line between known and unknown, that's a word meaning "cover" or a "coverer". And we'll call this line the determinator. The assumption of Sir Isaac and the Western World is that the present, the (.....) and the determinator coincide. But this, Wharf argues, is a property of our language, not a property of the world. To break ourselves loose from this hang-up, we have to say the (....), the determinator, and the present may have any relationship with each other that we wish. Something out here may be knowable and known, even though it's in the future; something back here may have been determined already, and therre's nothing you can do about it. And so these lines, when you look at all the possibilities, some of them make sense, some don't. Make yourself a diagram and look at all the possibilities. Q. I DON'T UNDERSTAND--YOU'RE SAYING THAT THE PAST MIGHT BE UNDETERMINED? The past might be undetermined, that's right. In fact, in cosmology, looking at the models of the universe, it is possible to say exactly what the future is, it is not possible to say what the past has been. This whole idea of the past and future is peculiar to our scale ot things. Now this is not the Newtonian way of looking at it--it's completely alien to all that we have been taught, the way we've been brought up. But if you look at the extremes of size, both in quantam mechanics and in cosmology, you find that our ideas .....(Donna:) There's a real nice nitty-gritty little mundane example of how you could change the past, in psychological

Proof. Under the substitution (C4.3), the system (C4.1) becomes

$$(C4.4) \qquad U^A \bar{K}_{AB} = Z_B + \beta U_B \ .$$

Since $\{\bar{K}_{AB}\}$ is symmetric in the indices (A,B), we must have

$$(C4.5) \qquad \bar{K}_{AB} = a(Z_A U_B + Z_B U_A) + b U_A U_B + Y_{AB} \ ,$$

for some a and b and for some symmetric tensor $\{Y_{AB}\}$. If we substitute (C4.5) into (C4.4), we readily find that $a = 1$, $b = \beta - Z_A U^A$, and that $\{Y_{AB}\}$ must admit $\{U^A\}$ as a null vector.

The following equivalent statement of Theorem 4.1 will be required in the next Section.

Theorem 4.3. Under the hypotheses of Theorem 4.1, we have

$$(C4.6) \qquad U^A \bar{K}_{AB} = (n-2)(\bar{\nabla}_B + \partial_B\omega - \partial_B\psi)(U^A \partial_A\omega) + \\ + \exp(2\psi - 2\omega)\, U_B \bar{\nabla}_A \partial^A \omega \ ,$$

where the quantity ω, defined by the relation

$$(C4.7) \qquad \lambda = -\psi + \omega$$

is termed the λ-differentia.

Proof. The system (C4.6) follows directly from (C4.1) under the substitution (C4.7) and use of Lemma 1.1 to evaluate the quantity $U^A \partial_A \psi$.

Theorem 4.4. Under the hypotheses of Theorem 4.1, necessary and sufficient conditions for $\{U^A\}$ to be an eigenvector of $\{\bar{K}_{AB}\}$ are

$$(C4.8) \qquad \{\bar{\nabla}_B + \partial_B\omega - \partial_B\psi - U_B U^A(\bar{\nabla}_A + \partial_A\omega)\}(U^C \partial_C\omega) = 0 \ .$$

attitudes. Something happened in the past, and you can say that's going to determine everything from here on, some trauma, some event, some pain; and yet, it is pointed out that one can change his attitude now or in the future toward that event in the past which then which then will not will not keep determining things. Thats kind of a simple minded idea of how you can change the past. (Al:) That's psychological, but it's conceivable this could be physical, too.Q. IF SOMETHING IS UNDETERMINED IN THE PAST, CAN YOU MAKE IT DETERMINED? Let's look at the possibilities here. We have three things. Let's use this notation: The present, P; D for decker; R for the determinator. Now, which of these makes sense to us, Having this order, PDR/ They can have a lot of other orders--we can have RDP, we can have DRP, we can have DPR, we can have RDD. Now, we can also have this, which is the way we like to look at it; this is what we feel at home with, this one. Now this says the decker and the determinator both lie in the future--that there is an area in here which is knowable--there's some part of the future which is knowable. But beyond the decker is unknowable. This says that there is this part of the future that is undetermined; this part is determined. That doesn't get is in trouble, but this one does. If we get here, up to here is undetermined, this is determined, its possible to know something that hasn't been determined. This doesn't make sense, so we have to exclude those particular cases which do not make sense. In breaking this down, it doesn't mean that all these are possible; it only means that certain additional ones are possible, such as the idea that part of the future may be knowable, or the idea that certain events that are going to happen have been

Proof. The result is obtained by multiplying (C2.7) by $\{U^A\}$ and then using the previous Lemmas to simplify the result.

4. The Ricci Tensor of $\overset{\frown}{C}_n$

We are now in a position to prove a result of basic importance.

Theorem 4.1. Let $\overset{\frown}{H}_n$ be an n-dimensional, hyperbolic-normal metric space that admits a time-oriented irrotational isometry with basic vector $\{U^A\}$ and basic scalar ψ, and let $\overset{\frown}{C}_n$ be an n-dimensional, hyperbolic-normal metric space that is conformally related to $\overset{\frown}{H}_n$ with parameter λ; then

$$(C4.1) \qquad U^A \bar{K}_{AB} = (n-2)(\bar{\nabla}_B + \partial_B\lambda)(U^A \partial_A \lambda) + \\ + \exp(-2\lambda)\, U_B\, \bar{\nabla}_A \partial^A_{\cdot}(\psi + \lambda) .$$

Proof. By Lemma 1.1, the quantity $\{U^A K_{AB}\}$ can be written in terms of $\{U_A\}$ and $h^{AB} \nabla_A \nabla_B \psi$. Combining the results thus obtained with those of Lemmas 3.1 and 3.5, we obtain (C4.1).

As an immediate consequence of Theorem 4.1, we obtain an evaluation of the Ricci tensor of $\overset{\frown}{C}_n$.

Theorem 4.2. Under the hypotheses of Theorem 4.1, we have

$$(C4.2) \qquad \bar{K}_{AB} = Z_A U_B + Z_B U_A + (\beta - Z_C U^C) U_A U_B + Y_{AB} ,$$

where

$$(C4.3) \qquad Z_A = (n-2)(\bar{\nabla}_A + \partial_A\lambda)(U^B \partial_B \lambda) ,$$

$$\beta = \exp(-2\lambda)\, \bar{\nabla}_A \partial^A_{\cdot}(\psi + \lambda) ,$$

and $\{Y_{AB}\}$ is a symmetric tensor that admits $\{U^A\}$ as a null vector.

determined firmly by something that has already happened, in the past. Q. WHEN YOU SAY THAT THE PAST, ALL THAT'S HAPPENED, YOU CAN'T SAY IT IS ALREADY DETERMINED; SO LIKE A PAST PRESIDENT--THE ONLY WAY YOU KNOW THE PRESIDENT WAS REALLY FAMOUS, HISTORY WILL TELL. LATER ON WE'LL KNOW. That"s still undetermined, yes. SAY PRESIDENT KENNEDY, FOR EXAMPLE. MAYBE IN THE FUTURE WE MIGHT FIND OUT EVERYTHING HE DID WAS WRONG; THAT SOME OF THE THINGS WE THOUGHT WERE GOOD OR RIGHT, WE FOUND OUT IN THE FUTURE THAT THAT WAS WRONG. XXX That's still undetermined, yes...(another Q.) BUT WHAT HE DID HAS ALREADY BEEN DETERMINED; THE WAY WE INTERPRET IT..... That's true...SO I STILLDON''t FOLLOW HOW PHYSICAL THINGS IN THE PAST YOU CAN SAY THEY ARE UNDETERMINED. THEY'VE BEEN DETER-MINED. On our scale, I cannot think of an example of things in the past being undetermined. This to me is nonsense. I can think of things in the future being determined not in the present, but in the past. Of course, you have another example (.....) what Joseph Stalin said: History is what I write it to be. So he said that the whole idea of the past is something I will do now, in the present; and it isn't just Joseph Stalin, it's xxxx almost anybody that ever wrote a history book. Q. WOULD YOU JUDGE THAT THERE ARE TWO POLES, ONE THE NEWTONIAN BELIEFS, AND ONE THE EIN-STEINEAN, THAT IS, THAT THINGS ARE RELATIVE? The Einstein approach does not modify this in any way except to introduce the idea that if we are comparing observers at two different places, what will be present for one may not be present for another, because the finite communication of time between. So Newton and Einstein are essentially in the same place, except for the idea that Einstein introduces a finite communication time. Two observers may have..... Q. IN OTHER WORDS, THE DIFFERENCE IS TIME. Yes. IN A METAPHYSICAL

and hence the second of (C3.2) is established.

Lemma 3.3. The covariant derivative of the vector field $\{U^A\}$ assumes the following form when calculated in $\overset{(c)}{}_n$:

$$(C3.3)\qquad \bar{\nabla}_B U^A = \exp(-2\lambda)\, U_B\, \partial_\cdot^A(\psi + \lambda) - \delta_B^A U^C \partial_C \lambda - U^A \partial_B \lambda \ .$$

Proof. Making use of (C1.3), (C2.2), (C2.4) and (C2.5), the following calculation results:

$$\begin{aligned} \nabla_B U^A &= U_B\, \partial^A \psi = \exp(-2\lambda)\, U_B\, \partial_\cdot^A \psi = \bar{\nabla}_B U^A + P^A_{BC}\, U^C \\ &= \bar{\nabla}_B U^A + \delta_B^A U^C \partial_C \lambda + U^A \partial_B \lambda + \bar{h}_{BC}\, U^C \partial_\cdot^A \lambda \ . \end{aligned}$$

An obvious combination of this result with those of Lemma 3.2 leads to (C3.3).

Lemma 3.4. We have

$$\begin{aligned} (C3.4)\qquad U^A \bar{\nabla}_B \partial_A \lambda &= \bar{\nabla}_B(U^A \partial_A \lambda) + U^C \partial_C \lambda \partial_B \lambda - \\ &\quad - \exp(-2\lambda)\, \partial_C(\psi + \lambda)\, \partial_\cdot^C \lambda\, U_B \ . \end{aligned}$$

Proof. The result is an immediate consequence of the identity

$$\bar{\nabla}_B(U^A \partial_A \lambda) = U^A \bar{\nabla}_B \partial_A \lambda + \partial_A \lambda \bar{\nabla}_B U^A$$

and Lemma 3.3.

Lemma 3.5 The quantities $\{U^A K_{AB}\}$ and $\{U^A \bar{K}_{AB}\}$ are related as follows:

$$\begin{aligned} (C3.5)\qquad U^A(K_{AB} - \bar{K}_{AB}) &= -(n-2)\, \bar{\nabla}_B(U^A \partial_A \lambda) - (n-2) U^A \partial_A \lambda \partial_B \lambda \\ &\quad + \exp(-2\lambda)\, U_B\{(n-2)\, \partial_A \psi \partial_\cdot^A \lambda - \bar{\nabla}_A \partial_\cdot^A \lambda\} \ . \end{aligned}$$

SENSE, THIS IS WHAT IS DISTURBING ME--HOW COULD YOU MUDGE WHO IS SANE AND WHO IS INSANE; AND THE DETERMINATE VARIABLE, INSTEAD OF TIME, WOULD BE DIFFERENT EXPERIENCES. This is getting to Leibnitz. (Donna:) What would be the polar opposite of Newton? (Al:) It's not Einstein, its Leibnitz who"s the polar opposite of Newton. That it is the experience, or structure, that determines the time; not experience that's embedded in time. That was the basic idea of Leibnitz. We decided to go with Newton instead of Leibnitz. Leibnitz says that structure, experience, determines the notion of time. Newton says that time and space is something in which all experience is embedded, and he described them in terms of this absolute time and space, which was modifyed by Einstein, but it's still the same idea. So the polar to Newton's idea that you expressed was originally proposed by Leibnitz.

Q. IN OTHER WORDS, IT'S VERY CONSISTANT IN OUR WESTERN NEWTONIAN WORLD TO MAKE VALUE JUDGEMENTS OF WHO IS SANE AND WHO IS NOT SANE; IN OTHER WORDS, WHAT IS REALITY, WHAT IS THE PRESENT.....(Donna:) Furthermore, you could say that our particular system has decided that scitzophrenia is bad, and paranoia is somewhat OK--we've locked up all the skitzophrenias, and we have many paranoids running around holding public office. I mean, that's just a value judgement of the western world. Q. ARE THERE ANY OTHER SOCIETIES THAT THOUGHT DIFFERENT? (Al:) Indo-European languages--they all think more or les s in what we call the Greek way. But the other languages, people think somewhat differently. The striking differences was the (.....) languages--Hopi, Aztec, and so on. The Wharf study, in which these ideas come from those languages. They don't say that all of these things make sense or they're all possible. What they"re saying is, this is wrong.

3. Lemmas and Relations

The results stated by (C2.7) allow us to represent the Ricci tensor of $(H)_n$ in terms of the Ricci tensor of $(C)_n$ together with λ and its derivatives. In order to take advantage of this situation as a means of examining the implications of the time-oriented irrotational isometry in $(H)_n$, we shall need the following lemmas.

Lemma 3.1. We have

$$(C3.1) \qquad h^{AB} \nabla_A \nabla_B \psi = \exp(-2\lambda)(\bar{\nabla}_A + (n-2)\partial_A \lambda)(\partial^A \psi) .$$

Proof. From the definition of the covariant derivative and (C2.4), we obtain

$$\nabla_A \nabla_B \psi = \nabla_A \partial_B \psi - P^C_{AB} \partial_C \psi .$$

Hence, substituting (C2.5) into the above, multiplying by $\{h^{AB}\}$ and making use of (C2.2), we obtain (C3.1).

Lemma 3.2. We have

$$(C3.2) \qquad U^*_A = \exp(-2\lambda)\, U_A , \qquad U^A U^*_A = \exp(-2\lambda) .$$

Proof. From the definition of lowering an index and (C2.2), we have

$$U_A = h_{AB} U^B = \exp(2\lambda)\, \bar{h}_{AB} U^B = \exp(2\lambda)\, U^*_A ,$$

and hence the first of (C3.2) is established. One may easily verify from (C1.2) that $\{U_A\}$ is a unit timelike vector field on $(H)_n$. We thus have

$$1 = U^A U_A = U^A U^*_A \exp(2\lambda) ,$$

That's all that I want to say, that the Newtonian idea that these are all the same is open to question. Q. HOW DOES ALL THIS RELATE TO THE CONCEPT OF LEVELS OF CONSCIOUSNESS WHERE YOU CAN PUT YOURSELF INTO AN ENTIRE STATE THAT PEOPLE DON'T EVEN KNOW EXISTS, WHERE YOU'RE SORT OF IN LIKE A NON TIME SPACE CONTINUEUM--WOULD THAT HELP EXPLAIN THAT TYPE OF AN EXISTANCE? I don't feel qualified to answer that, except I feel it should be possible through the Leibnitzian approach to arrive at some hypothesis for this, whereas it is not possible with the Newtonian model. I cannot give you a hypotheses. (Donna:) A brief comment, which also speaks to your point, is that if you open up the possibility that there are other kinds of things; a simple example is that we know that in the dream, that time and the logical time going one way does not work, and most Newtonians would not be able to explain Dunn's experience with the volcano killing the people. But if you bring in these other possibllities here, without knowing the details of them right now, you've opened up your mind to looking for new explanations; that's the only point of that. Q. [illegible] ISN'T THE PROBLEM THAT IF THE CONCEPT OF TIME IS SO MUCH TIED UP WITH YOUR MIND, YOU BEGIN TO TRY TO CONCIEVE OF OTHER WAYS OF THINKING ABOUT TIME--WE HAVE NO LANGUAGE TO TALK ABOUT IT. I DON'T KNOW WHERE YOU'D GO FROM THERE. (Al:) This is the place to start--it's looking at what other cultures have done, and then try to translate that into our language; and the things we thought were frozen, we see alternatives that didn't exist before. So in moving P [illegible] and R to different places, the possibility of moving them, releases us from the restraint of western thinking. And there are many restraints we have. Q. IF SCIENCE, ACCORDING TO WESTERN (.....) IS THE ORDERING OF OUR EXPERIENCE...THEN IN THE

$$(C2.4) \qquad \Gamma^{A}_{BC} = \bar{\Gamma}^{A}_{BC} + P^{A}_{BC} ,$$

where the quantities P^{A}_{BC} constitute the components of a tensor (of indicated type):

$$(C2.5) \qquad P^{A}_{BC} = \delta^{A}_{B}\partial_{C}\lambda + \delta^{A}_{C}\partial_{B}\lambda - \bar{h}_{BC}\,\partial_{\cdot}^{A}\lambda \quad .$$

When we substitute (C2.5) into (C2.3) and use the definition of the covariant derivative, we obtain

$$(C2.6) \qquad K_{AB} = \bar{K}_{AB} + {}_{C}\bar{P}^{C}_{AB} - {}_{B}\bar{P}^{C}_{CA} + P^{C}_{CD}\,P^{D}_{AB} - P^{C}_{DA}\,P^{D}_{CB} \quad .$$

Thus, since (C2.5) leads to

$$\bar{\nabla}_{B}P^{C}_{CA} = n\,\bar{\nabla}_{B}\partial_{A}\lambda, \quad \bar{\nabla}_{C}P^{C}_{AB} = 2\,\bar{\nabla}_{B}\partial_{A}\lambda - \bar{h}_{AB}\,\bar{\nabla}_{C}\partial_{\cdot}^{C}\lambda ,$$

$$P^{C}_{CD}\,P^{D}_{AB} = n\,(2\,\partial_{A}\lambda\partial_{B}\lambda - \bar{h}_{AB}\partial_{C}\lambda\,\partial_{\cdot}^{C}\lambda) ,$$

$$P^{C}_{DB}\,P^{D}_{CA} = (n+2)\,\partial_{A}\lambda\,\partial_{B}\lambda - 2\,\bar{h}_{AB}\partial_{C}\lambda\partial_{\cdot}^{C}\lambda \quad ,$$

the system (C2.6) gives the following explicit evaluations:

$$(C2.7) \qquad K_{AB} = \bar{K}_{AB} - (n-2)\,\bar{\nabla}_{B}\partial_{A}\lambda + (n-2)\,\partial_{A}\lambda\,\partial_{B}\lambda -$$
$$- \bar{h}_{AB}(\bar{\nabla}_{C}\partial_{\cdot}^{C}\lambda + (n-2)\,\partial_{C}\lambda\partial_{\cdot}^{C}\lambda) ,$$

$$(C2.8) \qquad K = \exp(-2\lambda)\left\{\bar{K} - 2(n-1)\,\bar{\nabla}_{A}\partial_{\cdot}^{A}\lambda - (n-1)(n-2)\,\partial_{A}\lambda\partial_{\cdot}^{A}\lambda\right\} ,$$

$$(C2.9) \qquad G_{AB} = \bar{G}_{AB} - (n-2)\,\bar{\nabla}_{B}\partial_{A}\lambda + (n-2)\,\partial_{A}\lambda\,\partial_{B}\lambda +$$
$$+ \bar{h}_{AB}\left\{(n-2)\,\bar{\nabla}_{C}\partial_{\cdot}^{C}\lambda + (n-2)(n-3)\partial_{C}\lambda\partial_{\cdot}^{C}\lambda\right\} .$$

The quantities G_{AB} constitute the components of the Einstein tensor $\{G_{AB}\}$.

LIBNITZIAN WORLD, (....) NON P D R, HOW COULD YOU HAVE ANY WHAT WE KNOW TO BE TECHNOLOGICAL ADVANCE, WHEREAS SOMETHING HAPPENS, YOU DETERMINE THE CAUSE OF IT, YOU OBSERVE IT, YOU (....) USING MACHINES; IN OTHER WORDS, SINCE WE LIVE IN THE NEWTONIAN WORLD, WE MAKE A BASIS THAT THERE IS ACAUSE AND EFFECT FOR EVERYTHING. The whole idea of causality is a Newtonian causality. It is the idea that a preceding event causes a following event. Now questions are raised, what do you mean that a future event can cause a past event? This is what the philosopher Greeks would call Telos, or purpose. Now this is exactly what we do when we plan; we have a future event in mind effecting our actions today. In other words, the future is influencing the present in planning. In forecasting, we say the past, the picture, the trend, the curve, and so on, are projected into the future--that is the normal causality, past toward future. So we have future toward past where there is freedom and choice and planning; and we have past toware future in the determinative. So, one of the very basic differences between these is normative is future toward past, that operates in this direction; the determinative is the past affecting the future, operates the other way. Now, if we have a goal, a value, or something, which is in this normative, this is the future as imagined by us. Now the whole thing is, we've been talking of the physical world; Donna interjected an example from the psychological world. To complete this picture, we have to add one other factor--this is our consciousness. It's like a spotlight that focusses somewhere, and we are capable of running this up to the year 2000. We can imagine, or we can remember. And the path we take, there are hundreds of paths, we can imagine all kinds of futures, in the psychic realm, and we

they will be written with the same kernel letter but with a bar superimposed above.

Thus, the Ricci tensor of $\overset{(H)}{}_n$ is written as

$$(C2.3) \qquad K_{AB} = \partial_C \Gamma^C_{AB} - \partial_B \Gamma^C_{CA} + \Gamma^C_{CD} \Gamma^D_{AB} - \Gamma^C_{DA} \Gamma^D_{CB} ,$$

while in $\overset{(C)}{}_n$ we write $\left\{ \bar{K}_{AB} \right\}$. This convention has already been observed in writing (C1.1) and (C2.1).

Agreement 2.2 The metric tensor in $\overset{(H)}{}_n$ will be used to raise and lower indices in the usual fashion. If the metric tensor of $\overset{(C)}{}_n$ is used for this purpose, a dot will be placed in the original position of the index.

Thus, if V_A is a covariant vector field, we have

$$V^A = h^{AB} V_B , \qquad V^A_{\cdot} = \bar{h}^{AB} V_B .$$

Agreement 2.3 Covariant differentiation formed from the Christoffel symbols of H_n will be denoted by ∇, while $\bar{\nabla}$ will be used to denote covariant differentiation formed on the Christoffel symbols of $\overset{(C)}{}_n$.

Note that certain well-known results from the theory of conformal spaces carry over directly to conformally related metric spaces under suitable interpretations. The method of proof will only be indicated, since the details can be found in any adequate text on differential geometry.

As an immediate consequence of the definition of the Christoffel symbols of the second kind, we have

can imagine all kinds of pasts. Maybe only one of these happened; maybe only one of these will happen, but we are capable of running this focus point back and forth. So in the psychic world, we aren't hung up at all with the idea of present or past of future. Because were absolutely fee to move; we are outside of time, in our minds. But when we have to exchange energy and information, we have to drop back to the physical world. So, a metaphysic can be built, which would incorporate Hopi, Leibnitzian ideas, and our common experience of causality which allows us to operate a technology. Our task really is, if you're planning a new world, you've got to begin by a new epistomology. You've got to imagine things differently, and the first step is to get rid of these constraints such as the very deep constraints of our views of time. I'm giving this as one example. There's going to be a new civilization that's going to be very different from this one. It's going to have to begin with imagining and realizing the real freedoms that are available. And if we can break through these metaphysical hang ups that we have inherited from the enlightenment, Descartes, Newton, Locke, then we can begin to move out, and the future needn't be bleak. The future will be what we imagine it to be. The bad guys are not sitting in certain octagonal buildings and so on

END

Definition 1.1 The vector field $\{U^A\}$ and the scalar field ψ are referred to as the basic vector and scalar fields of the time-oriented irrotational isometry of $(H)_n$.

2. The Conformally Related Space $(C)_n$

Let $(C)_n$ denote an n-dimensional, hyperbolic-normal metric space with fundamental differential form

$$(C2.1) \qquad \bar{ds}^2 = \bar{h}_{AB}\, dx^A\, dx^B \ .$$

We assume that $(C)_n$ and $(H)_n$ have the same coordinate patches and coordinate functions (i.e., $\{dx^A\}$ in $(H)_n$ is the same as $\{dx^A\}$ in $(C)_n$, and the respective points of $(H)_n$ and $(C)_n$ have the same coordinates with respect to the coordinate systems in which $\{dx^A\}$ are computed).

Definition 2.1 If there exists a scalar function λ on $(H)_n$ (on $(C)_n$) such that

$$(C2.2) \qquad h_{AB} = \bar{h}_{AB} \exp(2\lambda) \ , \qquad (h^{AB} = \bar{h}^{AB} \exp(-2\lambda)) \ ,$$

holds at all points of $(H)_n$ (at all points of $(C)_n$), the space $(C)_n$ is said to be conformally related to the space $(H)_n$ with parameter λ. We assume throughout this discussion that the conditions of Definition 2.1 are met. It must be clearly noted that both $(H)_n$ and $(C)_n$ are well-defined metric spaces, in contrast to the usual case in which $(C)_n$ is considered as a conformal space with no metric structure of its own.

The separate metric structures of $(C)_n$ and $(H)_n$ require certain notational conventions for adequate distinction between similar quantities and operations in the two spaces.

Agreement 2.1 Basic geometric quantities will be written in the usual fashion when they refer to $(H)_n$. If these quantities are formed in $(C)_n$,

TOWARD THE INSTITUTIONALIZATION OF CHANGE

Albert Wilson

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January 1970

EOMEGA GROVE

Topanga, California

INTRODUCTION

This generation as no generation before in history is consumed with change. The rapidity of technological change and its societal consequences has thrust us onto a metaphorical surfboard that renders obsolete the traditional movement from one state of *static stability* to another by discrete steps of renewal, reform or revolution. Unless we can discover and apply processes leading to *dynamic stability*, present ecological, social, and psychological imbalances will continue to grow until they topple us. In brief, *we must change our mode of change*. Burke's warning that "a nation without means of reform is without means of survival" now becomes "a nation that does not continually reform its means of reform cannot survive." This challenge is recognized as is apparent in the increasing number of individuals and institutions concerned with the development of a *science of change*. This new science, frequently called Futurology or Futuristics, is predicated on the belief that a spectrum of alternative probable futures exists and that through our own efforts we can control the processes of change to enhance or diminish the probability of occurence of any specific future.

The development of a science of change is only part of the task of changing our mode of change. In addition are the problems of the application of the methodologies of futurology and thier assimilate them into public practice. Clearly the application of any science of the future that can be used to effect the shape of tomorrow's world clearly poses basic problems for a democratic society. It is evident that the delegation of the powers to select and implement choices among possible futures is as important to a sovereign citizenry as its delegation of the powers to govern. While it is a matter of urgency to replace the present processes of change characterized by the haphazard injection of innovation into our social

it is a matter of uncertainty whether new
structure at an ever increasing rate, [illegible] processes that permit the control of the direction and rate of change [illegible] subject to continuous re-evaluation on the basis of the quality of life they generate it is a matter of uncertainty whether [illegible] control may be operated consistently with the political principles of a democratic society. Hence, as the new science of Futures develops its methodologies and begins to test them, we must consider how the practice of a science of change may be properly incorporated into the national future so that democratic processes be preserved. We must ask how may we organize the efforts to define and implement the future so that those who are to live in that future may participate in its choice. If the study and practice of futures is to become institutionalized into American Society, who are to be the practitioners of futures and how are they to be monitored and held accountable to the public.

One reasoned approach to finding answers to these questions governing the incorporation of Futures into public procedure is to initiate a period of familiarization to enable concerned citizens to participate in the generation of alternative scenarios for the future and work with futurologists in exercises of establishing normative goals. A "Future State of the Union" Yearbook constitutes an experiment in providing this period of familiarization. The proposed yearbooks would help citizens to become more future oriented and provide a vehicle to create an experiental base for citizen participation in Futures that is prerequisite to the institutionalization of change on a national or global scale. Preliminary to the *design* of a set of evolving yearbooks on the Future State of the Union that will lead to democratic methods of providing society with the benefits of scientific forecasting, goal setting and planning is the formulation of design criteria and goals. These criteria and goals are necessarily related to the model

of change we postulate, the social descriptors we adopt, and the value system to which we subscribe. It is accordingly important to preface our specific design considerations with an exposition of the philosophical viewpoints of change, social structure, and value that we shall follow.

Because of this necessity to view the problem of the institutionalization of change on both a philosophical level and a design-strategy level, we have divided the paper into two parts. In the first part, we review general philosophical problems related to modeling of change, models of society, and selection of goals. In the second part, we propose some candidate design features for the first generation yearbook that are derivative from the philosophical boundary conditions outlined in part one. A specific proposal for conducting the requisite research and compiling of yearbooks on the Future State of the Union is contained in an accompanying paper by Olaf Helmer and the staff of the Institute For the Future.

Part I Some Philosophical Prerequisites

The question *What will the future be?* is older and more important to man than questions such as *What are the stars?; What makes corn grow?;* or *What makes fire burn?* While the search for answers to the last three questions eventually resulted in the extended areas of systematic knowledge we now call astronomy, biology, and physics, the search for answers to the first question has never produced more than a few isolated predictions. Only in the past few years have improvements in forecasting techniques and developments in control and correction concepts extended the promise that at last a systematic science of change may soon be available.

Until the experience of rapid change peculiar to our own age, the future has always been considered to be the business of the future. This was recognized by thinkers in previous ages in the ethical dilemma of setting up inheritances in perpetuity. The traditional American attitude to do what we want to do with little concern with the past is reflected in the founding fathers' dictum that "each generation must lead its own life, unexploited by dead men." The equally traditional American attitude to do what we want to do with little concern for the future, unexploited by the unborn, is reflected in a rapaciousness that has polluted the present. The recent reversal of indifference to the future is not because of a sudden upsurge of altruism, but because the rapidity of today's technological change throws the consequences of our acts back into our own face. We are brought to the necessity of restoring ecological balance because we ourselves, not our children or our children's children, have to live in the environments we create. We now find that to develop a science of change which seeks to choose the future has become an existential choice and to develop a strategy by which we may institutionalize change has become a strategy for survival.

MODEL OF CHANGE

Implicit in every forecasting technique and fundamental to the whole science of futures is a model of change. Our experience with technical and social change suggests that any model should allow for determinative, normative and random processes. Determinative processes are those that provide us with the recognizable patterns of social change. They are the processes such as the natural growth of economies, populations, and institutions that provide *continuity* in social change. Normative processes are those that have their origin in the needs, goals, and preferences of societal groups and sub-groups, whose implementation bends the course of the determinative toward the chosen goals and increases their probability of occurence. Random processes introduce *discontinuities* into the patterns of change, launching new sequences of events that may overrule established determinative and normative courses.

Forecasts of the probable future derived from the determinative components are primarily based on the extrapolation of existing trends, but forecasts can also be made by inference from evolutionary forces and by analogy with the past. We must recognize that forecasts are useful whether or not they are accurate. This is because the proper function of forecasts is to widen the domain of normative choice, not to narrow social control. The normative can only be brought into action through challenging the determinative. That is, if we believed the determinative to be totally deterministic, we would not challenge the future it predicts. The inaccuracies of our determinative forecasts supply the necessary credibility gap that supports our disbelief in their inevitability and hence motivates us to challenge the determinative through implementing our normative choices.

Determinative aspects

The word "determinative" is employed to indicate those processes of change whose paths are deterministic except wherein they are subject to the normative pressures of human volition. A determinative process may be totally deterministic, unmodifiable by any exercise of will. But in view of our extended ignorance of the nature of processes of change, it is best that we act under the premise -- true or false -- that our choices and our wills can alter the future directions of any trend and assume that no processes are strictly deterministic.

The primary problem of the determinative in futurology is to discover the basic patterns of social change and use these patterns to forecast the most probable future states of society that will develop accordingly. The primary methodology of the determinative is the extrapolation into the future of the magnitudes of statistical time series that have been derived by fitting to past magnitudes. The trends indicated by these series are our best guides to the most probable determinative futures since technological, ecological and social trends seldon change direction abruptly.

Long range forecasting involves the anticipation of the changes likely to occur in the patterns of change, that is, long range forecasting involves knowledge of higher order derivatives. However, in view of the increased and increasing role normative factors play in shaping the future, it is questionable that long range *determinative* forecasting is useful. Rather, the encounter with the future is more a dialectical process: the forecasting of short term determinative futures; the generating of normative responses; and the synthesizing interactions between the trends and the implemented norms.

Normative aspects

The basis of the normative in societal change is the belief that alternative futures exist. It is the belief that we can choose and create alternatives guided by our desires, needs, and capabilities. The fundamental questions of the normative must not be posed simply as "what do we want and how do we go about getting it." The normative process involves a distillation of our wants, needs, and values to provide us with goals; it involves the effects of attaining these goals on our future needs and wants and on our subsequent ranges of choice and potentialities for creating additional alternatives.

These general questions find specific expression in how do we guide and assess the creative and innovative forces in society. How do we choose the research to fund, the results to develop. How do we establish priorities. When should we meet deletorious trends innovatively, when should we use holding actions. Who is to decide on society's goals and priorties -- an elite oligarchy, the majority, who? The immediacy of these questions has given them the answers that are used in practice, but their importance has not received its only suitable recognition -- the development of a theory of choice based on the relevant political, technological, and axiological considerations.

Two broad classes of normative considerations must be recognized. We may term these the conscious normative and the subliminal or reactive normative. The conscious normative deals with the selection of goals based on the *recognized* needs, wants, and values of the articulate portion of society or the individual. The subliminal normative is a pressure of dissatisfaction with trends and choices contained in the inarticulate portion of society or the individual. It usually receives

no coordinated expression until the pressure reaches a critical value. The primary reason for this chasm is that the portion of society that exercises the normative is frequently not in communication with all the portions of society or the individuals whom their choices affect.

Random aspects

The primary premise of prediction is that the statistical properties of the universe in the future will be very much like those of the universe of the past. Forecasting and planning, the practice of science and the accumulation of knowledge depend on this fundamental temporal continuity of the world. In general, the present does not inject a "jump discontinuity" in the evolutionary trends that have been observed in the past. The jump discontinuity carried by the present is the jump from probabilities less than one to probability one, from the condition of "likely to happen" to the condition of "did happen."

But from time to time, discontinuities of the type that may be described as jumps from the condition "not likely to happen" to "did happen" occur. These are events that, though sometimes conceivable, are not forecastable. They are what we customarily term random events, neither predicted nor planned. But in spite of appearing to lie outside the principal determinative and normative process of change, random events may very often radically affect the course of change. They may even be *mutative events* re-orienting the entire direction of history. Whether the events we term random are indeed chance events, or only appear as chance events because of our exstensive ignorance of the processes of change is a deeper question for which we have no satisfactory answer at present. The immediate problem concerning random events is how to treat them in our thinking about the future.

A CYBERNETIC MODEL

In our times, we customarily endeavor to forecast the future by means of trends and extrapolations. In doing this, we assume a model of change that operates, at least in part, with deterministic processes. On the other hand, when we set goals and make plans we assume a model that is undetermined and responsive to our purposes and volitions. Thus, the practices of extrapolating trends and formulating plans require a model of change that is in part deterministic and in part normative. How may we formulate a model that will be able to subsume consistently both of these processes (that historically have been held to be contradictive) and provide in addition a place for random events.

The experience of recent years in designing sophisticated control systems such as those used in aerospace, petrochemicals, and communication together with the rapid developments in computer science has resulted in techniques for modeling complex systems containing large numbers of interacting subsystems. The basic concepts of the structure and behavior of these "cybernetic" systems supply a framework that allows a self-consistent model of change resolving the traditional contradictions of the deterministic and the normative. This may be seen in a general way by taking the trend extrapolations and forecasts concerning the most probable future to correspond to existing states in a control system; goals and plans to correspond to the desired states in the system. The difference between the most probable future and the desired future corresponds to the error signal. The determinative corresponds to the inertia of the existing state while implementation of a normative input corresponds to the correcting signal. Random events affect the control system in the same way they affect social systems, so a cybernetic model (at least to first order) can serve as our model of change.

The three general problem areas that correspond to the basic components of a cybernetic model are accordingly:

- The extrapolation of the recent course of events to ascertain a sequence of most probable future states and dates as would develop if unmodified by additional normative and random inputs.
- The evaluation of these most probable futures in terms of society's capabilities, needs, and preferences in order to specify *desired* future states and dates.
- The design of organizations, plans and strategies to implement the desired states.

Let us next look in more detail at the content of these basic problem areas and their sub-problems.

Predictions implicit in the determinative

The determinative acts as a "push" from the past. Its vector direction is defined by what has gone before. Its most probable path is implicit in what already exists just as the essential nature of the oak is implicit in the acorn. The vector length -- the duration in time of the determinative element -- has a most probable duration that is also implicit in what already exists. Since the cybernetic model allows the modification of existing configurations, we shall use the expression *quasi-determinative* for those existing vectors whose directions and durations may be altered by normative or random inputs, and use the expression *ortho-determinative* for those vectors that, being built into the hardware, are unalterable.

There are three classes of quasi-determinative factors: first, those factors that play a determinative role because of restrictions placed by technological feasibility. The total *potential* hydro-electric power of a nation affords an example. Given the present level of technology this is a bounded and non-modifiable quantity. However, as new technology pushes back the frontier of

feasibility, say through the development of weather control capabilities that could be used to cause more intensive rainfall in selected areas, the potential hydro-electric power could be increased. The question of whether to increase the potential and actual hydro-electric power then becomes a normative one. A second type of quasi-determinative factor arises because of our ignorance of alternatives (or even because of our ignorance of the existence of a parameter). Columbus' proposal to reach the East by sailing west violated the quasi-determinism governing feasible routes to China set by the concept of a flat earth. Without any advance in technology, a noetic change greatly increased the normative space available for the planning of routes to the East.

The third type of quasi-determinative factor is that implicit in our value system, the determinative constraints being imposed by our codes rather than our technology or ability to conceive of alternatives. In the Middle Ages, usury was forbidden by the principal ecclesiastical codes of the West. With the erosion of this proscription came the development of wide-spread credit, one of the most important normative factors in present economic structures. But all quasi-determinative factors are not undesirable. Some we choose to retain. For example, there are no conceptual or technological factors enforcing the quasi-determinative structure of a four year tenure of leadership on the United States Government. This is a factor which because of our value of stability, we intentionally retain as determinative rather than make normative.

While the limits of technological feasibility and noetic imagination are clearly determinative, the third limit of axiological proscription is violatable. For this reason the distinction between quasi-determinative factors of the third type and normative factors may appear somewhat superficial. It is essential, however, to be aware of the portions of

our action space that are bounded and the portions that are not bounded by value constraints.

What properly constitutes an ortho-determinative factor, or whether there even exist strictly ortho-determinative factors, are questions belonging to the meta-problems of the morphology of models of change. For the purposes of the cybernetic model, we may take as ortho-determinative factors those constraints such as physical laws, that to the extent of our present knowledge, may not now or in the future be modified by human volition.

There are three important sub-problems of the determinative problem area. The first is the design of suitable methodologies for extrapolating past events to give probable future states with their probable time tables. The Delphi Method is an example of a useful technique that has been developed for this purpose, one that has been especially valuable for making technological forecasts. The second important sub-problem is finding keys that aid in establishing the relative significance of observed trends and lead to identifying those parameters that serve as the best *indicators* of future states. The third sub-problem is the problem of determining the most probable aggregate effect of all the individual trends. The Cross-Impact Matrix is a useful technique that has been developed for this purpose.

The assessment and definition of the normative

Just as the determinative acts as a *push* from the past, the normative or goal-directed acts as a *pull* toward the future. The directions of the normative vectors are defined by the specific goals sought; the lengths of the vectors are set by the target

dates for implementation. Whereas the determinative vector space functions more or less like those used to describe purely physical systems (gas dynamics or plasmas), the normative vector space represents a set of conflicting individual and collective wills and defies homologization to a physical system. The introduction of freedom and volition into a system is more than merely the introduction of a large number of degrees of freedom. Volition cannot be simulated by conventional concepts of force. Aggregate volitional processes are more complex and outcomes less predictable.

The principal sub-problems of the normative area are:

- The generation of the full option space. The technique of morphological analysis is one of the most useful available for generation and recognition of all the possibilities available to choice. The morphological approach customarily generates the option space to the noetic limits, then introduces the various ortho- and quasi-determinative factors to reduce the space to the normative option space.

- The setting of goals. The decision as to which options within the normative option space are to be selected for implementation involves several aspects. There are the questions of who makes the decisions and by what process. What basic value system is to provide the yardsticks for benefits, costs, and risks. What priority algorithms are to be used. What are the dependencies of choice with time and so on. The setting of goals is customarily done by one of two approaches, frequently called the "top down" and the "bottom up" approaches. The top down approach begins with a value input using, for example, a societal need or preference as the point of departure. The bottom up approach derives its goals from the opportunities made available by change. Opting in the top down case is tree structured from a primary goal; while opting in the bottom up case is usually based on the importance of following new leads that may ultimately increase the option space. Whereas the botton up approach is generally justifiable in the case of *basic* research, its use in applied research and development is open to question.

- The assessment of normative feedback. In addition to the setting of goals or the advanced assessment of options, is the problem of the subjective assess-

ment of the feedbacks from earlier normative inputs. Here the Delphi Method is again useful in determining "Indices of Satisfaction" covering various developments.

° The aggregate effect of sub-goals. The problem of the aggregate effect of the cross-impact of large numbers of sub-goals and the cross-impact of these normatives with the determinatives again calls for the use of a methodology such as that of cross-impact matrices.

° The identification and measure of social pressure. There are societal processes of a determinative nature arising from aggregate volitions. These include the dialectical processes of Marxism. Normative pressures and counter pressures tend to grow from germinal dissatisfactions within societies. A problem of the normative area is to find indicators and measures of intensity of these pressures.

The implementation of the normative

The ingredients of implementation are will, decision, knowledge, resources, and organization. Will and decision not only set the goals aided by axiological inputs as outlined above, but operate to formulate plans and strategies, secure resources and create organizational tools required for achieving the goal. The implementation processes involve a complex multi-level structure with feedback loops between goal and plan, plan and resources, organization and plan, and so on. Ofttimes, as in the case of the goal, "Man, Moon, Decade," implemented by NASA, each level in the structure evolves rapidly with time.

Many of the sub-problems of implementation, because of their immediacy and specificity, have been widely studies. Techniques for solving these problems appear in the literature under classifications such as management science, systems management, or operations research. However, important considerations such as "How long does a given goal, plan, or organization remain meaningful in a rapidly evolving context" and "When cross-impacted with the complex of other current plans, does a given plan still lead toward its desired goal" have been neglected, resulting ofttimes in continuing efforts in directions that are counter-desirable.

FUTUROLOGY - WHY NOW?

This generation as no generation before in history is consumed with change, which is to say, consumed with the future. The current concern with the future arises from the belief that a spectrum of alternative probable futures exists and that through our own efforts we are able to shift the probability of occurence of any specific future. This conviction is generating a new science of the future, we may call futurology. But before examining the methods, aims and implications of this new science, let us inquire why a science of the future came into existence at this particular period in history. Why now?

The question, *What will the future be?*, is as old and as important to man as questions such as, *What are the stars?*, *What makes corn grow?* or *What makes fire burn?* These questions eventually became the extended areas of systematic knowledge we now recognize as astronomy, biology, and physics. The fact that the question *What will the future be?* did not result in a similar development of systematic knowledge and method until now suggests something unique about this particular period. We find four factors that may account for this upsurge of interest in the study of the future. These include the current rapid rate of change, the increased capacity to implement change, the recently acquired cybernetic concepts for modeling change, and the critical nature of the present moment to set precedents for future change. Each of these trends, although often formulated throughout the literature in somewhat different language, is in essence part of the same motivating force for studying

the future. Their confluence in our time affords an answer to why the study of the future appears just now. Let us consider each of these in turn in order to amplify their mutual context.

To study the future is, in part, to study the consequences of the past and the present. Until the experience of rapid change peculiar to our own age, the future had always been considered to be the business of the future. Philosophically, this was recognized by men in previous ages to be the ethical dilemma of setting up inheritances in perpetuity. Our traditional attitude to do what we want to do with little concern with the past is reflected in the founding fathers' dictum that "each generation must lead its own life, unexploited by dead men." Our equally traditional rapacious attitude to do what we want to do with little concern for the future, unexploited by the unborn, can no longer be rationalized. This not because of a sudden upsurge of altruism, but because the rapidity of todays technological change throws the consequences of our actions back into our own face. We are brought to the necessity of restoring ecological balance because we ourselves -- not our children or our children's children -- have to live in the environments we create. In the past with environments more nearly static, changes were accumulated piece by piece. Todays rapid rate of innovation condenses the cumulative effect. The study of the future now emerges as a necessity for survival in a rapidly changing environment.

Second, contrasted with men of previous ages, we can not only imagine utopias, we can implement them. We can or will soon possess a technology that will enable us to do almost anything we want to do. We now have at our disposal means of implementation that no previous generation possessed. This capacity to "do nearly anything we want" is coupled with the fact that we "know" that we can do nearly anything we want. This "knowing that we know" places even additional impetus on studying the future. So much so that the study of the future becomes an existential choice. Denial of this circumstance and attempts to return to an unknowing state of naivete are not only irresponsible, but nihilistic.

A third factor affecting why the study of the future now comes into its own results from our increased understanding of how complex systems behave. The experience of recent years in designing sophisticated control systems such as those used in aerospace, petrochemicals, and communication tegether with the rapid developments in computer science has resulted in techniques for modeling systems containing large numbers of interacting subsystems. In addition, the basic concepts of cybernetics supply a framework that allows a self-consistent model of change that resolves the traditional contradictions of the deterministic and the teleological.

Thinking of the world as a structure-in-time with the contents of the world (the oceans, the atmosphere, the life complex, man and his societies) as substructures-in-time, there are three historical views describing processes that govern change.

- The Deterministic View: future states of the structures evolve from some initial state in accordance with unambiguous physical laws in such a way that if the initial state and the laws are known, the states at all future times can be foretold.

- The Stochastic View: states of the structures evolve in accordance with certain random processes that permit a spectrum of futures each of which has a certain probability of occurence.

- The Teleological View: states of the structures evolve in accordance with processes whose probabilities may be modified by the intervention of the volitions of an intelligence such as man's (or historically, by the interventions of supernatural beings).

In our times, we endeavor to forcast the future by means of trends and extrapolations. In doing this, we have assumed a model of change that operates, at least in part, with deterministic processes. On the other hand, when we set goals and make plans we have assumed a model that is undetermined and responsive to our purposes and volitions. Thus, in recognizing both trends and plans, we require a model of change that is in part deterministic and in part teleological. We may see in a general way how a cybernetic model fulfills this requirement. Trend extrapolations and forecasts concerning the most probable future correspond to existing states in a control system. Goals and plans correspond to the desired states in the system. The difference between the most probable future and the desired future is the error signal. The determinative corresponds to the inertia of the existing state while implementation of a normative input corresponds to the correcting signal.

Historically, deterministic models of change tend to inculcate in their adherents a high level of passivity and unquestioning acceptance of whatever comes. Free-will models of change, on the other hand, tend to spread the feeling that what-

ever the choice, the consequences are readily repairable through counter choice and total freedom may be exercised with relative impunity. Both of these extreme views minimize responsibility. (An afterlife postulating punishment and reward is necessary to instill responsibility into the free-will model.) The cybernetic model of change that allows both determinative and volitional inputs makes patent our control and hence responsibility for the future. Thus, a systematic study of the future is now possible because the development of cybernetics affords us with qualitatively new root metaphors to view change. In this sense, the study of the future is the study of cybernetics.

Our fourth and last reason for "why futurology now" has to do with the peculiar quality of the present moment in human evolution. The rapid pace of change discussed earlier has been mainly of changes in *environment*, but we now stand at the threshold of a biological and psychological ability to modify *ourselves*. The two sides of this threshold have aspects similar to the two sides of the sonic barrier across which the laws of aerodynamics change. Since this barrier we are soon likely to cross is one that will change our own nature, we *could be* the last generation that has both the capacity and the motivation to formulate an ethical structure adequate for technological innovation. Once modified, men may no longer be free nor capable of plural approaches to self-reference. They will have passed through a "sonic-like" barrier where the motivational equations on the other side are not at all the same as the motivational equations on this side. Even though

we cannot know what the nature of this "super" human dynamics will be, we may expect from our experience of super-sonic flight that it will be quite different from the human dynamics we derive from our experience on this side of the barrier. Though modifications will probably be made with the goal of improving man, we cannot trust the outcome knowing ninety nine percent of mutative modifications are negative. In addition, there is always an element of determinism in the first event because it sets a precedent. For these reasons, the study of the future now becomes a last ditch, authentic effort to formulate an ethic compatible ~~to~~ with rapid technological change.

In summary, a science of the future appears in our generation in response to the rapidity of change of the environment, to our increased capabilities for effecting modifications, to the availability of cybernetic concepts and to the looming capabilities of genetic modification of human nature. Futurology may thus be considered as a strategy for survival, an existential choice, a study of cybernetic systems and an attempt to find an ethic for change.

PROBLEM AREAS OF FUTUROLOGY

We may succinctly define futurology as the study of the evolution of a system of volitional elements that interact mutually within an action space bounded by evolving technological, noetic, and axiological limits. Futurology like other disciplines may be divided into several branches corresponding to specific problem areas. The three broad problem areas are:

- The extrapolation of the recent course of events to ascertain a sequence of most probable future states and dates as would develop if unmodified by additional normative and random inputs.
- The evaluation of these most probable futures in terms of society's capabilities, needs, and preferences in order to specify *desired* future states and dates.
- The design of organizations, plans, and strategies to implement the desired states.

These three general problem areas, which are seen to correspond to the basic components of a cybernetic system, pose both a set of *sub-problems* and a set of *meta-problems*. We shall discuss the sub-problems in the context of the amplification of the three broad problem areas but before this, we give a brief description of the meta-problems.

Three important meta-problems are involved in futurology. These are, first, the morphology of possible models of change. While the cybernetic model provides an adequate working framework for the various inputs and techniques available to us now, it is none-the-less based on many tentative assumptions concerning the nature of man and the world. The task of formulating better models of change that are consistent with all of human experience and afford increasing predictive accuracy is a contin-

uing task for the futurologist. The second meta-problem is the construction of the value systems that are needed in deriving our goals. The cross-impacts between available knowledge, available technology and our value systems must be further explored. Because our largest immediate freedom is in the area of values, the axiological imperatives in futurology have been downgraded. The study of values and their source is thus a high priority problem for the futurologist. The third meta-problem has to do with epistimological determinism -- the directions into which the existing body of knowledge inclines us. The temporal order of experience, discovery, and invention suggests the path we most readily follow. Futurology is predicated on the existence of alternative futures or paths. It thus becomes an important task for the futurologist to find ways to extend our abilities to conceive alternatives. Let us now look at the contents of the three basic problem areas: the predictions implicit in the determinative; the assessment and definition of the normative; and the implementation of the normative.

The Determinative Problem Area

The determinative acts as a "push" from the past. Its vector direction is defined by what has gone before. Its most probable path is implicit in what already exists just as the essential nature of the oak is implicit in the acorn. The vector length -- the duration in time of the determinative element -- has a most probable duration that is also implicit in what already exists. Since the cybernetic model allows the modification of existing configurations, we shall use the expression *quasi-determinative* for those existing vectors whose directions

and durations may be altered by normative or random inputs, and use the expression *ortho-determinative* for those vectors that, being built into the hardware, are unalterable.

There are three classes of quasi-determinative factors: first, those factors that play a determinative role because of restrictions placed by technological feasibility. The total *potential* hydro-electric power of a nation affords an example. Given the present level of technology this is a bounded and non-modifiable quantity. However, as new technology pushes back the frontier of feasibility, say through the development of weather control capabilities that could be used to cause more intensive rainfall in selected areas, the potential hydro-electric power could be increased. The question of whether to increase the potential and actual hydro-electric power then becomes a normative ONE. A second type of quasi-determinative factor arises because of our ignorance of alternatives (or even because of our ignorance of the existence of a parameter). Columbus' proposal to reach the East by sailing west violated the quasi-determinism governing feasible routes to China set by the concept of a flat earth. Without any advance in technology, a noetic change greatly increased the normative space available for the planning of routes to the East. The third type of quasi-determinative factor is that implicit in our value system, the determinative constraints being imposed by our codes rather than our technology or ability to conceive of alternatives. In the Middle Ages, usury was forbidden by the principal ecclesiastical codes of the West. With the erosion of this proscription came the development of widespread credit, one of the most important normative factors in

present economic structures. But all quasi-determinative factors are not undesirable. Some we choose to retain. For example, there are no conceptual or technological factors enforcing the quasi-determinative structure of a four year tenure of leadership on the United States Government. This is a factor which because of our value of stability, we intentionally retain as determinative rather than make normative.

While the limits of technological feasibility and noetic imagination are clearly determinative, the third limit of axiological proscription is violatable. For this reason the distinction between quasi-determinative factors of the third type and normative factors may appear somewhat superficial. It is essential, however, to be aware of the portions of our action space that are bounded and the portions that are not bounded by value constraints.

What properly constitutes an ortho-determinative factor, or whether there even exist strictly ortho-determinative factors, are questions belonging to the meta-problems of the morphology of models of change. For the purposes of the cybernetic model, we may take as ortho-determinative factors those constraints such as physical laws, that to the extent of our present knowledge, may not now or in the future be modified by human volition.

There are three important sub-problems of the determinative problem area. The first is the design of suitable methodologies for extrapolating past events to give probable future states with their probable time tables. The Delphi Method is an example of a useful technique that has been developed for this purpose, one that has been especially valuable for making technological forecasts.

The second important sub-problem is finding keys that aid in establishing the relative significance of observed trends and lead to identifying those parameters that serve as the best *indicators* of future states. The third sub-problem is the problem of determining the most probable aggregate effect of all the individual trends. The Cross-Impact Matrix is a useful technique that has been developed for this purpose.

The Normative Problem Area

Just as the determinative acts as a *push* from the past, the normative or goal-directed acts as a *pull* toward the future. The directions of the normative vectors are defined by the specific goals sought; the lengths of the vectors are set by the target dates for implementation. Whereas the determinative vector space functions more or less like those used to describe purely physical systems (gas dynamics or plasmas), the normative vector space represents a set of conflicting individual and collective wills and defies homologization to a physical system. The introduction of freedom and volition into a system is more than merely the introduction of a large number of degrees of freedom. Volition cannot be simulated by conventional concepts of force. Aggregate volitional processes are more complex and outcomes less predictable.

The principal sub-problems of the normative area are:

- The generation of the full option space. The technique of morphological analysis is one of the most useful available for generation and recognition of all the possibilities available to choice. The morphological approach customarily generates the option space to the noetic limits, then introduces the various ortho- and quasi-determinative factors to reduce the space to the normative option space.

- The setting of goals. The decision as to which options within the normative option space are to be selected for implementation involves several aspects. There are the questions of who makes the decisions and by what process. What basic value system is to provide the yardsticks for benefits, costs, and risks. What priority algorithms are to be used. What are the dependencies of choice with time and so on. The setting of goals is customarily done by one of two approaches, frequently called the "top down" and the "bottom up" approaches. The top down approach begins with a value input using, for example, a societal need or preference as the point of departure. The bottom up approach derives its goals from the opportunities made available by change. Opting in the top down case is tree structured from a primary goal; while opting in the bottom up case is usually based on the importance of following new leads that may ultimately increase the option space. Whereas the bottom up approach is generally justifiable in the case of *basic* research, its use in applied research and development is open to question.

- The assessment of normative feedback. In addition to the setting of goals or the advanced assessment of options, is the problem of the subjective assessment of the feedbacks from earlier normative inputs. Here the Delphi Method is again useful in determining "Indices of Satisfaction" covering various developments.

- The aggregate effect of sub-goals. The problem of the aggregate effect of the cross-impact of large numbers of sub-goals and the cross-impact of these normatives with the determinatives again calls for the use of a methodology such as that of cross-impact matrices.

- The identification and measure of social pressure. There are societal processes of a determinative nature arising from aggregate volitions. These include the dialectical processes of Marxism. Normative pressures and counter pressures tend to grow from germinal dissatisfactions within societies. A problem of the normative area is to find indicators and measures of intensity of these pressures.

The Implementation of the Normative

The ingredients of implementation are will, decision, knowledge, resources, and organization. Will and decision not only set the goals aided by axiological inputs as outlined above, but operate

to formulate plans and strategies, secure resources and create organizational tools required for achieving the goal. The implementation processes involve a complex multi-level structure with feedback loops between goal and plan, plan and resources, organization and resources, organization and plan, and so on. Oftimes, as in the case of the goal, "Man, Moon, Decade", implemented by NASA, each level in the structure evolves rapidly with time.

Many of the sub-problems of implementation, because of their immediacy and specificity, have been widely studied. Techniques for solving these problems appear in the literature under classifications such as management science, systems management, or operations research. However, important considerations such as "How long does a given goal, plan, or organization remain meaningful in a rapidly evolving context" and "When cross-impacted with the complex of other current plans, does a given plan still lead toward its desired goal?" have been neglected resulting oftimes in continuing efforts in directions that are counter-desirable.

The one-dimensional decomposition employed in this section is not satisfactory, but does serve to illuminate where lacunae exist.

FUTUROLOGY

The question, *what is to be in the future?* is as old or older than such questions as *what are the stars?; What makes corn grow?; What makes fire burn?* The question, *What is to be in the future?*, is also as important to man as these other questions that ultimately become extended ~~to~~ areas of systematic knowledge -- the sciences of astronomy, biology, and physics. What is curious is that with the age and importance of the question *What is to be in the future*, that the development of a systematic and scientific approach to the future has lagged so far behind the development of systematic studies of other questions and phenomena. Perhaps this is because of a nouminousity that wraps the future and frightens men into passive acceptance of its structure. But numinosity also surrounded fire, thunder and the other objects and phenomena of nature until systematic knowledge gradually peeled away their mysteries. Perhaps man's lag in coming to grips with the future is attributable to historical, philosophical and religious views regarding himself, fate, destiny and the gods. But man's increasing capabilities to modify his environment and shape his destiny lead him to reject views of the world that place the future under the direction of inexorable fate. Perhaps the lag derives from basic misconceptions concerning the nature of time. Whatever the reason or reasons for the long delay in the development of a scientific approach to the study of the future, the past few years have witnessed the beginnings of a systematic exploration, the area we may now call Futurology, the long delay is at an end.

The first step taken by the new scinec of Futurology has been to reformulate the pivotal question from *What is to be in the future* to *what can be in the future*. This reformulation contains a great philosophical step for mankind -- the setting aside of a fatalistic model of the world and the adoption of a new model that allows for the analysis of the interaction of human plans and volition with a deterministic and stochastic infrastructure. The properties of the interface between the volitional and the already determined emerges as one of the basic questions of futurology.

Branches of Futurology

The branches into which a science is divided are usually determined by classifications accoring to the objects or phenomena studied, the techniques or methodologies used, or by basic questions. For example, Astronomy may be subdivided according to objects: planetary astronomy, solar astronomy, extragalactic astronomy; according to techniques: X-ray astronomy, IR astronomy, astrometry; or according to basic questions: Cosmogony, Cosmology. Thus scientists we call astronomers are joined becase of common interest in certain objects or phenomena, stars, planets, solar flares; certain techniques, spectroscopy, radio telescopes; or certain questions, The orogin of the stars, the age of the galaxies, or the development of astronomical knowledge. Already in the new science of Futurology -- the study of the future -- specialized objects and phenomena, techniques and methodologies, and basic questions are developing definitions of branches of futurology.

THE CONCEIVABLE FUTURES*

Donna Wilson

In general, futures studies are concerned with exploring and evaluating the set of all possible futures. Their authors treat of the possible, the probable, and the preferable. For example,

> "The future of the future is not only determined by what may be possible or probable in economic, technological, or socio-political terms but what man himself deems necessary, allowable and ultimately desirable in human terms."[1]

To consider some futures possible or probable imples determinism even though it be of a stochastic variety. To consider other futures preferable implies choice and assumes that intention, will or purpose can be meaningfully introduced. The questions that naturally arise are not whether or not it is useful and necessary to study this set of deterministic and normative futures, but rather: What are the sources of the set of conceivable futures from which the sub-sets of the probable and preferable futures derive?; How may we tap these sources?; and What are the means by which we might expand the set of conceivable futures? These are metaphysical questions concerning methodology, but the answers to some extent determine the concrete end results that derive from futures studies. The requirement to obtain or generate sets of alternative futures is implicitly recognized. For example, we encounter summons to "identify alternatives" to be fed as inputs into complex methodologies that analyze and formulate decision-making procedures;[2] admonitions "to imagine alternative futures;"[3] and titles to university courses offering "Design of Alternative Futures."[4] But what is the source of these identifications, imaginations and designs?

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*Based on material presented in the Department of Design, Southern Illinois University, 20 May 1969.

Since the realm of imagination and invention is first manifest to consciousness in images or symbols, it becomes a most basic matter to inquire if new images and symbols are discovered or designed? Each view implies quite different methods. Either view contains implicit but different constructs describing the nature of the human psyche. Let us be sure we understand the choice. The dichotomy is between directing our energies toward a goal or preparing ourselves to receive a gift. If symbols are in any sense contrived, then it should be possible to lay out a course of action toward their realization. By organizing our thinking and feeling and by directing our sensations and intuition, we could design new symbols that match our needs -- symbols to replace such inadequate images as hierarchies, one world, or the charioteer driving unruly horses.[5] On the other hand, if symbols are discovered in the sense that any phenomena of nature (such as galaxies, DNA molecules, the velocity of light or the human unconscious) are discovered, then the path toward their realization lies in improving and extending our methods of observation, that is, our methods of reception.

The view presented in this paper is that energizing and effective symbols are discovered, not contrived or designed. Their source is the unconscious and the process of discovering an image or symbol capable of structuring qualitatively new and valid conceivable futures is that of discovering any unconscious content -- it is the process of attaining a higher level of consciousness. Let us look briefly at this process of becoming conscious. We will then inquire into methods of obtaining access to the sources of symbols and finally, point out several specific methods that structure and give form to the images encountered in the quest for alternatives.

Consciousness

We can distinguish two quite different modes of behavior in becoming conscious of a previously unknown content: differentiation and integration. The mode of differentiating is to separate into two different parts, A and not A. What was originally a blurred whole becomes split into polar opposites when we differentiate. The mode of integrating is to assimilate these opposites throughout our whole being. Their presence is then forever and hence forth known, so to speak, because both A and its opposite not A become diffused throughout our knowing. But, integration does not mean to send back into unconsciousness the newly found opposites, that is, to repress or hide from ourselves the knowledge of having made the differentiation. To integrate newly differentiated content psychologically is to digest in the sense that we assimilate the food we take into our bodies. It no longer exists as food. It becomes blood and tissue and bone and some of it is eliminated. The metaphor is also apt in case we do not "digest" the content; it makes us ill and is regurgitated.

We must also be aware of the characteristic time constants over which the process of becoming conscious operates. Consciousness spans tremendous time scales. Some unconscious contents are realized in seconds, others take years. For an individual, consciousness can take at least as long as a lifetime and it may operate on many levels. Also, the acts of differentiating and integrating are not necessarily temporally sequential; both may be operating simultaneously. We do not yet know in detail how consciousness works, but it is not necessary to know in detail in order to discover content from the unconscious. Consciousness is a process that is manifest wherever we observe human life. The study of its nature, that is,

the study of the psyche, which is psychology, is the study of what we may become. When I am no longer intrested or curious about what I may become, then I am no longer alive nor have a future.

With this framework then, what can we say about the search for new symbols for our age? We recall that we are talking about preparation to receive, not organizing to attain when we employ the notion of searching for symbols or images that are the precursors of what we are able to conceive. The search is something of a journey and although we could cite many accounts of it from the recorded literature of all ages and regions, I like the one of the Navajo who inhabit the land of my own childhood in northern Arizona: "In the house of life I wander on the pollen path, With a god of cloud I wander to a holy place. With a god ahead I wander, And a god behind. In the house of life I wander on the pollen path."[6] It is this wandering on the golden pollen path that comprises a search for symbols. But, notice, the search is constrained to a path and, if we opt to follow it, help is assured.

The Source of the Conceivable

Before we inquire how to follow this path, let us first turn to the source of new images and symbols -- the unconscious. In one sense, the only precise statement that can be made about the unconscious is that it is not conscious. But this leads to going around in circles. Arnheim[7] puts it well:

> "...we cannot help being worried by a widespread inclination of modern artists to surrender their conscious initiative, to an extent unknown in the history of art. Creative work tends to be looked upon as something done through the artist rather than by the artist, and what used to be a spiritual activity turns into a spiritualistic one-man seance. A detached observer will seek the cause of the extreme passivity in the nature of our present civilization, while the artist himself is likely

> to justify his passive attitude by two assumptions: a) that there is a difference in principle between conscious and unconscious forces of the mind and b) that by relying on impulses deriving from "the unconscious" a work of art will acquire significance automatically and infallibly.
>
> We are accustomed to speaking of "the" unconscious as though it were a psychical power. But the unconscious is no power -- it is no thing at all. At best, one may call it a place where certain mental processes occur. Even this means using an "architectural" metaphor, that is, thinking of the human mind as a house of many mansions. Strictly speaking, "unconscious" is not a noun, but an attribute of mental phenomena; it simply tells us whether these phenomena are present in consciousness or absent from it. About their nature, it tells us nothing."

His quotation suggests some of the difficulty in deliberately trying to obtain access to unconscious phenomena; but if the unconscious is no thing, then what do creative and "self-actualizing" individuals mean when they insist that the unconscious is the source of the images that lead to their creations?

Without getting bogged down in phenomenology, I suggest that we can find similar difficulties in trying to comprehend astronomers' discussions of observing the cosmos. The question of "observing" entities and relations in the universe (that is, planets, stars, clusters of stars, galaxies, clusters of galaxies, etc. or the relations and processes obtaining between them) is usually described in terms similar to those employed by the creative artist. Astronomers claim that they do not observe the cosmos. They observe its manifestations. Cosmic entities and relationships are known through sensing and manipulating records of the data of sensation, which (in this case) is electromagnetic radiation. By this they mean that they cannot observe the universe directly in the same way that physicists operate in controlled situations in laboratories.

They cannot "get their hands on" the objects they are observing when making astronomical observations, but this is no great handicap. For, if we consider it, we realize that by utilizing this indirect method -- the method of remote data sensing -- man has left this planet earth and observed the moon first-hand, an accomplishment that would have been impossible had we no access to or knowledge of the cosmos.

If we substitute the word unconscious for the word cosmos in descriptions of astronomical observations, we can make similar operational-like statements about observing the human psyche. What we observe of the unconscious are manifestations of energy sources or sinks. These unconscious manifestations that are available to our remote data sensors (which include extensions of our senses) are dream images, fantasies, slips-of-the-tongue, emotional outbursts, etc. Experience of unconscious content and its aggregated complexes may also result in neurotic or psychotic behavior, mystical experience, works that we recognize as art, music, scientific discovery, literature, or other creative products. The "proof" of the existence of this source lies in the ability of its derivations to continue to engage us, that is, to energize us (the observer). Those structures that lose their capacity as energy sources fade and disappear. In other words, valid structures of the experiences of unconscious content endure over time.

The forms that result from integrating and assimilating experiences of unconscious content that break through into the conscious realm are thus one measure of increased consciousness or self-actualization. Whether or not every human being has access to unconscious content is no longer questioned in our age.[8] There is, however, a crucual difference between a self-actualizing development and a distorted or thwarted development

the experience of encountering the unconscious. We have only to open our eyes and ears to observe how rare it is to find creative individuals functioning at their full potential; or how common it is to find underdeveloped persons. This asymmetry is the condition that both our methods of education and our techniques to imagine alternative futures could modify. The imbalance between the number of creative and self-actualizing individuals and the exponentially increasing number of humans living on this planet justifies our concern to extend the realm of conceivables.

Methods of Reception

If organizing our energies to attain is not the way to discover the effective symbols that our age so desperately needs, then what can we do to prepare ourselves to receive these gifts from the gods? Reception in contrast to attainment is the mode of the feminine -- the Yin in contrast to the Yang, to use the Chinese imagery. But, let us be clear at the beginning that we are not discussing the outer, biological aspect of female or male. When referring to the Feminine Principle as opposed to the Masculine Principle, we mean the mode of acting that characterizes encompassing rather than penetrating, completing rather than perfecting, or comprehending rather than detailing. As men or women we both act in both modes. There are times when each of us needs to organize to attain and there are times when each of us needs to prepare to receive. It is only because Western Civilization has concentrated so exclusively on methods suited to the Masculine Principle that this natural complementary mode of the Feminine Principle need be recalled. Our one-sided masculine development needs to break its pencil-sharp focus and write with broad strokes. And let there be no confusion over the fact that women as well

men, who have been subjected to an education rooted in three centuries of sharp perfection rather than encompassing completion, must now reorient themselves if they would receive the gifts of the unconscious.

It may be that this reorientation is already upon us. The eruptive, irrational scene of today's drug experiments, encounter groups, power quests and other collective behavior certainly results in unconscious content breaking through the surface to consciousness. Descriptions of trips and peak experiences that relate joyous unity as well as nightmarish horror are identical in form to descriptions offered by mystics in ages past.[9] One difference, of course, is the larger number of individuals having and reporting such experiences today. But, for society as a whole, the question remains -- after the experience, what then? It is here that I feel the urgency that Theobald and other futurist writers convey.[10] The crucial aspect for those concerned with imagining alternative futures lies in whether or not these collective experiences can be integrated. If not, we risk becoming ill collectively, and in today's milieu of global weapons systems, collective illness is equivalent to annihilation.

Since methods for obtaining access to the sources of imagery are today quite visible in many accounts of the experiments,[11] we need not discuss them here. Rather, we will concentrate on methods that provide for integrating and assimilating newly differentiated content. Techniques for integration or synthesis are not abundant in the memory core of Western culture. As we have already indicated, methods of reductive analysis dominate our approach to education. Indeed it may be that this very emphasis on reductive methods accounts for the ecological and psychological imbalances which futures-oriented thinking tries to compensate.[12] But whatever the cause, consciousness is only half attempted when images and symbols appear. We are not conscious until we achieve the difficult

task of integration. And, in turning to consider these embryonic techniques that hopefully may improve our methods of reception, we may also expect to extend the realm of conceivable futures.

The methods we briefly describe in the remaining part of this paper include: the method of active imagination outlined by Jung; the use of the Chinese Book of Changes, the I-Ching, discussed by Argüelles; the way of the myth described by Campbell; and the method of possidiction suggested by Waskow. All of these methodologies in contrast to those that so far dominate the literature of futures studies such as Delphi, Morphological Analysis, Relevance Trees, etc.[13] are oriented toward reception of what we may become rather than extrapolation and evaluation of what we think we are.

Active Imagination

This first method called "active" imagination appears to contradict the admonition to adopt a receptive attitude. As we will show later, active and passive must be divided four ways, not two. In its original formulation as an auxillary method in dream analysis, Jung devised this process for consciously engaging the images that continually parade before us whenever the ego relaxes. In fact, he discovered this technique by working with his own fantasies.[14] In contrast to Eastern mediation techniques that attempt to clear the scene of all activity, the goal in active imagination is to engage the images with the conscious ego while at the same time avoid stopping the flow through censoring or evaluating. The essence of the method is found in the notion of "active" imagining rather than "passive" observance of fantasy. Since there is a natural tendency to avoid negative or painful experience, whenever we are simply passively

observing our own fantasies, we "turn-off" whenever anything unpleasant occurs. Jung found that if a patient would consciously try to watch the flow of imagery, even when negative or absurd things began to appear, it was often possible to discover helpful or healing information in the recorded material. Thus, in addition to the utilization of dream images during the course of a depth analysis, he encouraged some patients to utilize active imagination to generate unconscious content, or, rather, content that had broken through to consciousness but appeared strange and unfathomable to the conscious ego. Most often the method involves writing down conversation or dialogue with dream figures and accounts of their actions, behavior or thoughts as well as the settings; however, one can also actualize or give form to images that result from active imagination by painting or modeling clay or even through body movement. Although many Jungian authors and analysts claim uniqueness for this method, active imagination may be essentially what all creative persons have found to work for their own assimilation of newly differentiated content. The detailed ennunciation and examples of dialogue given in the literature, although not very inspirational or didatic for the reader, do give some idea of what the process involves.[15] It goes without saying that the response to the images and symbols gleaned through using this method is the pivotal point. For, just as with images presented in the more familiar "night" dreams, one must consciously choose to follow them wherever they lead and reconcile them with what is already conscious.

Another way to view the essential difference between an active reception of the flow of imagery and a passive observation is that the ego functions in an evaluating or censoring role as well as in an initiating role. Ego-linked mental processes reject, judge, defend and censor. Yet,

the ego also observers, detects and initiates mental activity. The task in utilizing an active reception of imagery is to engage the ego as observer and initiator while simultaneously keeping the evaluator or censor from rejecting and terminating the flow of images. We require two perpendicular axes to visualize this concept, the active-passive axis and the initiator-receiver axis. These provide four quandrants. In one, we find to passively receive which is day-dreaming, waiting for God to speak to us: in another, we find to actively receive which is what Jung means by active imagination. (The other two quadrants, although not of immediate interest here, are to actively initiate which is concentrated and critical thinking and to passively initiate which appears to be a contradiction. Perhaps it resembles the way some people engage their egos, hopping from here to there, evaluating every scrap that comes along.)

The I-Ching

Another method for assimilating and actualizing imagery in the experience of the unconscious is through the use of ancient Chinese Book of Changes, the I Ching. In a recent review that discusses today's crucial human condition,[16] Argüelles interperts the upsurge of interest in this ancient Chinese Oracle as much more than a playful kind of fortune-telling that appeals to Hippies, flower-children, members of the New Left or the sophisticated readers of Harper's Bazaar and Playboy. It is simply part of an intense turning from what Western minds might quickly label as reaction and revulsion against modern science and technology, but only if they fail to examine the phenomena more closely. Argüelles suggests this change in direction may be the early stirrings of what will eventually emerge in our own evolution but refuses to speculate on its final form. In the meantime, the I Ching can serve us as an "instrument of passage."

In brief, this ancient text was first introduced to the West during the 1920's when Richard Wilhelm returned from China. Its content and method of use were known only to small, esoteric groups until this recent upsurge of interest brought it out into the open. It consists of sixty-four hexagrams that depict favorable and unfavorable situations for human action and thought. Its symbolic language employs the notions of the "superior man" and the "inferior man" and as Argüelles points out, "...it is no astute psychological observation that a man chooses to identify with what is superior rather than inferior, but the I Ching is so constructed that whoever wishes to see himself as the "superior" man must follow a certain set of rules or principles in order to remain superior." And further, "an effort to comprehend the images that the I Ching provides will carry the individual into a state of consciousness which transcends the merely personal or ego-centered. Therefore the Book of Changes can be seen as an auto-regulative behavior mechanism contributing to the evolution of consciousness, which is man's inherited planetary responsibility."

The underlying theme of the Book of Changes as explained by Wilhelm[17] is that "opposites come together in time, and conditions, which are not in themselves compatible, become so through the fact that they follow each other and change into each other." This is the crux of the advice of Confucius that one should not forcefully carry through a given line of action under all circumstances since such an attitude naturally engenders its opposite and so perpetuates the conflict without any final victory. By standing within a central position, flowing with the experience of contradictory opposites, we are freed from having to remain bound to one pole, forever viewing the other negatively. This is the very integrated position that depth psychology urges us to attain -- to withdraw projections of the enemy "out there", to meet the shadow within, and to finally be able to say with

We find in reading Campbell that it has always been "the primary function of mythology and rite to supply the symbols that carry the human spirit forward, in contrast to those other constant human fantasies that tend to tie it back."[19]

In contrast to dream inages, the archetypal images of the universal elements in myth (i.e., the Hero's journey, death and rebirth, the birth of the Divine Child, etc.) bring one into contact with the "collective unconscious" that subsumes our "personal unconscious." Similarly, since each of us as individuals are limited "either as male or as female, as child, youth, mature adult or ancient, and in our life-role as craftsman, tradesman, servant or thief, priest, leader, wife, nun or harlot ... the totality -- the fullness of man -- is not in the separate member, but in the body of the society as a whole."[20] If we break off from this body, we merely break connection with the source of our very own existence. Quoting Toynbee,[21] Campbell warns that this schism in our body soul "will not be resolved by any scheme of return to the good old days (archaism), or by programs guaranteed to render an ideal projected future (futurism), or even by the most realistic, hardheaded work to weld together again the deteriorating elements." Its resolution is the task of the hero, "the man or woman who has been able to battle past his personal and local historical limitations to the generally valid, normally human forms;[22]...and this is not a work that consciousness itself can achieve. Consciousness can no more invent, or even predict, an effective symbol than foretell or control tonight's dream."[23]

The challenge of mythology as a method is to encounter the unconscious and render our "experience of the ineffable through the local and concrete." The creative engagement of our own myth affords a structuring force for newly acquired and unfamiliar experience; it allows a psychological meta-

invitations to university courses entitled "Design of Alternative Futures."[4] But what is the source of these identifications, imaginations, and designs?; How may we tap these sources?; and What are the methods by which we might expand the set of conceivable futures from which the sub-sets of the possible, the probable, and the preferable futures derive?

Since the realm of imagination and invention is first manifest to consciousness in images or symbols, it becomes a most basic question to inquire how new images and symbols emerge. If images or symbols are invented or otherwise subject to human will and intention, then it should be possible to describe a course of action leading toward their realization. By organizing our thinking and feeling and by directing our sensations and intuition, we could invent new images to match our social and psychological needs -- images to replace such inadequate ones as hierarchies, ant hills, or charioteers driving unruly horses.[5] On the other hand, if images or symbols are not contrived, then the path toward their realization lies in improving and extending our ability to gain access to their source. Following the constructs of depth psychology, the view presented in this paper is that energizing images or symbols emerge through the process of attaining higher levels of consciousness. The source of images and symbols is the unconscious. The process of realizing images capable of generating qualitatively new conceivable futures depends on the ability of an individual human psyche to assimilate and give form to his own experience of encountering the unconscious. Let us look briefly at this process of attaining a higher level of consciousness and then inquire into several specific methodologies that improve and extend our ability to imagine alternative futures.

CONSCIOUSNESS

We can distinguish two different modes in the process of attaining a higher level of consciousness: differentiation and integration. The

mode of differentiating is to separate into two different parts, A, and, not A. What was originally a blurred whole becomes split into opposites when we differentiate. The mode of integrating is to assimilate these opposites through out our whole being. Because both A and its opposite not A become diffused throughout our knowing, they are both available to conscious recall. Although conscious content can temporarilly return to the unconscious state, integration does not mean to repress the knowledge of having made a differentiation. To integrate newly differentiated content psychologically is to digest in the same sense that we assimilate food we eat. It not longer exists as food, it becomes blood, tissue, bone, etc. and part of it is eliminated. The metaphor is especially apt in case we do not "digest" the newly differentiated content psychologically; it makes us ill and is regurgitated. Also, attaining higher levels of consciousness spans very large time scales. Some content is realized in seconds, other takes years. And, the acts of differentiating and integrating are not necessarily temporally sequential; both may be operating simultaneously. We do not yet know in detail how consciousness works, but it is not necessary to know in detail in order to attain higher levels of consciousness or to discover content from the unconscious. Consciousness is manifest wherever we observe human life. The study of its nature, that is, the study of the psyche which is psychology, is the study of what we may become. When I am no longer intrested in what I may become, then I am no longer alive nor have a future.

With this framework then, what can we say about the source of new images and symbols -- the unconscious. In one sense, the only precise statement that can be made about the unconscious is that it is not conscious. But this leads to going around in circles. Arnheim[6] puts it well:

> "... we cannot help being worried by a widespread inclination of modern artists to surrender their conscious initiative, to an extent unknown in the history of art. Creative work tends to be looked

> upon as something done through the artist rather than by the artist, and what used to be a spiritual activity turns into a spiritualistic one-man seance. A detached observer will seek the cause of the extreme passivity in the nature of our present civilization, while the artist himself is likely to justify his passive attitude by two assumptions: a) that there is a difference in principle between conscious and unconscious forces of the mind and b) that by relying on impulses deriving from "the unconscious" a work of art will acquire significance automatically and infallibly.
>
> "We are accustomed to speaking of "the" unconscious as though it were a psychical power. But the unconscious is no power -- it is no thing at all. At best, one may call it a place where certain mental processes occur. Even this means using an "architectural" metaphor, that is, thinking of the human mind as a house of many mansions. Strictly speaking, "unconscious" is not a noun, but an attribute of mental phenomena; it simply tells us whether these phenomena are present in consciousness or absent from it. About their nature, it tells us nothing."

This statement from a widely accepted art critic suggest some of the difficulty in describing creative activity and its requisite access to unconscious phenomena; but without getting bogged down in the phenomenological issues raised by Arnheim's quotation, I suggest that we can find similar difficulties in trying to comprehend astronomers' discussions of observing the cosmos. Astronomers do not claim to observe the cosmos. They claim to observe its manifestations. Cosmic entities and relations (planets, stars, galaxies, etc. and the processes obtaining between them) are known through sensing and manipulating records of cosmic energy which in this case is electromagnetic radiation. Because of the great distances, astronomers cannot observe the universe directly in the sense that physicists operate in controlled situations in laboratories. They cannot "get their hands on" the objects of study, but this is no serious handicap. For by utilizing this indirect method -- the method of remote data sensing -- man has left this planet and observed the moon first-hand, an accomplishment that would have been impossible had we no access to or knowledge of the cosmos.

If we substitute the word unconscious for the word cosmos, we can make similar operational-like statements about observing the human psyche. What we observe of the unconscious are manifestations of energy sources and sinks. These unconscious manifestations are dream images, fantasies, slips-of-the-tongue, emotional outbursts, etc. Experiences of encountering the unconscious and its aggregated complexes may result in neurotic or psychotic behavior, mystical experience, works that we referr to as art, music, scientific discovery, literature, or other creations. The "proof" of the existence of this source and the evaluation of its derivations lie in the ability of its emergent images and symbols to continue to engage us, that is, to continue to attract our conscious attention. Those structures that lose their capacity to engage us fade and disappear. In other words, valid structures derived from experiences of encountering and assimilating images from the unconscious endure over time.

The forms that result from integrating experiences of unconscious content that break through into the conscious realm are not in themselves a measure of increased consciousness. These derivations must be submitted to tests of validity just as the results of any other observational method are subject to verification such as the scientific method. The important point for the generation of conceivable futures is that tests of validity be applied to the forms derived from utilizing the processes of imagination, not to the process of imagination itself. We now know that every human has access to unconscious content.[7] There is, however, an observable difference between a creative development of images received from the unconscious and a distorted development of encountering the unconscious. In addition to the obvious distortions observed in the psychotic breakdowns, we may note the infrequent occurence of creative individuals functioning at their full potential and the more common occurence of "under-developed" persons

existing at low levels of consciousness. This asymmetry is the condition that justifies our concern to extend the realm of conceivable futures.

METHODS OF RECEPTION

The difference between organizing our energies to attain images from the unconscious and preparing ourselves to receive these "precursors of consciousness" is similar to the difference between controlled experimentation and observation referred to above. A detailed ennumeration of this difference and its affect on human creativity is beyond the scope of this paper, but it is clear from the work of C. G. Jung, Joseph Campbell, Herbert Read and other similar investigations that conscious, intentional effort cannot invent or design effective symbols or energizing images. At best, creative individuals can extend and foster an environment that nurtures successful encounters with the source of symbols. An immediate consequence of this basic discovery from the researches in depth psychology is that no amount of organization of effort will generate qualitatively new alternative futures. What is called for is a reorientation in the emphasis of rationality and reductive analysis that have dominated Western Culture since the scientific enlightment.

It may be that this reorientation is already upon us. The eruptive, irrational scene of today's drug experiments, encounter groups, power quests, and other collective behavior can be explained in large measure as unconscious content breaking through the surface to consciousness. Descriptions of "trips" and "peak experiences" that relate joyous unity as well as nightmarish horror are identical in form to descriptions offered by mystics in ages past.[8] One difference, of course, is the larger number of individuals having and reporting such experiences today. But, for society as a Whole, the question remains -- after the experience, what then? It is here that one senses the urgency of certain futurist writers.[9] For those concerned with imagining alternative futures, the crux of the matter lies in whether or not these

collective experiences can be integrated. If not, we risk becoming ill collectively, and in today's milieu of global weapons systmes, collective illness may be equivalent to collective annihilation.

Since methods for obtaining access to the source of imagery are described in numerous accounts of the current experiments,[10] we need not outline them here. Instead, we will concentrate on methods that provide for assimilating newly differentiated content. As we have already indicated, reductive analysis dominates our approach to education and as a result, techniques for integration or synthesis are not readily abundant. It may well be that this very emphasis on reductive methods accounts for the ecological and psychological imbalances that futures-oriented thinking tries to compensate.[11] But whatever the cause, attaining a higher level of consciousness is only half attempted when images and symbols appear. We have not increased our consciouness until we achieve the difficult task of integration. In turning to consider these embryonic techniques as a means to improve our method of reception, we can do no more than outline their essential features in this brief summary. Further assessments of how successful these methods prove to be in the generation of conceivable futures remains to be developed. So far they have not been widely used in this area of research. They include: 1) the method of active imagination outlined by Jung; 2) the use of the Chinese Book of Changes, the I Ching, discussed by Argüelles; 3) the way of the myth described by Campbell; and 4) the method of possidiction suggested by Waskow. In contrast to those methodologies such as Delphi, Morphological Analysis, Relevance Trees, etc.[12] that so far dominate the literature of futures studies, these are oriented toward reception of what we may become rather than extrapolation and evaluation of what we think we are.

SECTION V. CANDIDATE FEATURES OF PROPOSED FSOU YEARBOOKS

Introduction

We live in a culture that focuses on decisions and decision makers. Our status ladder's top rung is for the executive, our highest rewards are for those who do our choosing. In emphasizing the opting, we too frequently ignore the options. We relegate to a subsidiary role the generating of the alternatives among which the choice must lie and the testing of whether the candidate options adequately exhaust the possibilities open to us or do justice to our creative powers. In emphasizing the optors, we too frequently ignore the criteria by which the choices are made. We tend to leave unexamined the unprogrammed pressures that intrude into the decision making process. The spotlighting of the most dramatic part of the action -- the decision itself, serves to render less visible the rest of the action: the decisions already implicit in the array of options placed before the decision maker, the decisions already existing in the decision making process and in the yardsticks or pressures by which the choice is made.

In order to bring into perspective these overlooked but vital components of the choices governing our movement into the future, we must bring before our citizenry the germinal ideas, the research programs, the unfolding trends, the prospective opportunities, the incipient threats, possibilities, probabilities, forecasts, all of the ingredients that go together to generate our options. We must view these ingredients and their implications not when the newspapers tell us that they have arrived as options on the decision makers' desks, but as long beforehand as is possible in order that they may be understood, discussed, assessed, and given appropriate support or opposition according to our preferences. Participation in the

generation and assessment of options is the citizen's responsibility in a democracy. Citizen participation cannot be secured only through expression of choice after otpions are printed on a ballot. By then the future has to a large degree already been shaped. In an age of rapid change a way must be found for the citizen to participate in the generation and selection of the options.

The FSOU yearbooks constitute an experiment in finding ways for how this may be accomplished. The proposed Yearbooks have features which will lead to the development of methods by which every citizen can generate his own scenarios of the future and and assess candidate options. But the Yearbooks must do more than facilitate the citizen's recognition of the possibility of choice. It is important that the Yearbooks make visible the factors that impede the free exercise of choice. But even more importantly, to give choice without also giving criteria for assessing or methods of opting is futile. Therefore experiments in evolving methods by which all can assess and makes choices must also be features of the Yearbooks.

Implicit in every forecast and forecating technique is a model of the process of change. The experiential base of technical and social change requires a model that includes determinative, normative, and random processes. Determinative processes are those that provide us with the recognizable patterns of social change. They are the processes such as the natural growth of economies, populations, and institutions that provide <u>continuity</u> in social change. Normative processes are those that have their origin in the needs, goals, and preferences of societal groups and sub-groups, whose implementation bends the course of the determinative toward the chose goals and increases their probability of occurence. Random processes introduce <u>discontinuities</u> into the patterns

of change, launching new sequences of events that may overrule established determinative and normative courses.

Forecasts of the probable future derived from the determinative components are primarily based on the extrapolation of existing trends, but forecasts can also be made by inference from evolutionary forces and by analogy with the past. We must recognize that forecasts are useful whether or not they are accurate. This is because the proper function of forecasts is to widen the domain of normative choice, not to narrow social control. The normative can only be brought into action through challenging the determinative. That is, if we believed the determinative implicitly, we would not challenge the futures forecast by the determative components. The inaccuracies of our determinative forecasts supply the necessary credibility gap that supports our disbelief in their inevitability and hence motivates us to challenge the determinative through implementing our normative choices.

In order to structure the components of change, we need indicators of the nation's existing condition against which to compare the expected future condition. We need indicators of qualitative change as well as of quantitative change, measures of innovation as well as of growth. We need indicators of individual change and satisfaction and indicators of aggregate change and satisfaction. A procedure for evolving useful sets of all these types of social indicators is another task for the FSOU Yearbooks.

Eventually we hope, through the study of the future, to be able to recognize the germinal futures while still in the seed stage, and to nuture or weed these futures as they grow in probability. We hope to effect an increasing responsibility to the future in all who play a role

in creating the future: the innovators -- idea men, science fiction writers, researchers, inventors; the evaluators -- philosophers, commentators, pollsters; the implementors -- RFP writers, publishers, and funders; and the decision makers -- executives, politicians, and voters. And further, to make everyman aware of his need to participate in all four functions of creating the future.

DETERMINATIVE ASPECTS

The word "determinative" is employed to indicate those processes of change whose paths are deterministic except wherein they are subject to the normative pressures of human volition. A determinative process may be totally deterministic, unmodifiable by any exercise of will. But in view of our extended ignorance of the nature of processes of change, it is best that we act under the premise -- true or false -- that our choices and our wills can alter the future directions of any trend and assume that no processes are strictly deterministic.

The primary problem of the determinative in futurology is to discover the basic patterns of social change and use these patterns to forecast the most probable future states of society that will develop accordingly. The primary methodology of the determinative is the extrapolation into the future of the magnitudes of statistical time series that have been derived by fitting to past magnitudes. The trends indicated by these series are our best guides to the most probable determinative futures since technological, ecological and social trends seldom change direction abruptly.

Long range forecasting involves the anticipation of the changes likely to occur in the patterns of change, that is, long range forecasting involves knowledge of higher order derivatives. However, in view of the increased and increasing role normative factors play in shaping the future, it is questionable that long range determinative forecasting is useful. Rather, the encounter with the future is more a dialectical process: the forecasting of short term determinative futures; the generating of normative responses; and the synthetic interaction between the trends and the implemented norms.

TECHNOLOGICAL AND ENVIRONMENTAL FORECASTS

The prime mover of most change in today's rapidly changing world is technological innovation. The accumulation of scientific knowledge and its application through technology have changed our standard of living, our style of life, our values, our mores, and even our basic view of ourselves and the world. And now it is becoming increasingly evident that technological processes through pollution and combustion are changing our eco-environment and quite possibly, the climatic environment. If social change and environmental change are derivative to technological change, then the most critical area of forecasting is technological forecasting. This not only because of science and technology's affect on the social and physical environment but because the level of technology defines the frontier of what is feasible for man to do, and in extending the limits of the possible, the level of technology plays a central role in defining the area in which man's realizable goals must lie and within which normative decisions must be made.

With this much importance attached to the growth of scientific knowledge and to development of technology, we logically inquire what controls the manner and direction of this growth, how may possible future innovations be predicted and how are the preferable future innovations to be selected. Scientific knowledge grows organically. The researcher not only pursues those interesting leads that contain promise of a solution to his problem but also other interesting leads that may have nothing to do with his primary research problem. The direction of growth of knowledge is thus only partially controlled by research problem selection and the exercise of the normative consequently

does not effectively enter into the basic research stage. It is in the applied and developmental stages that normative go or no-go decisions are made. Thus, while the initial assessment of whether or not to persue a lead may be made solely by the researcher, the responsibility for success or failure resting on his judgement; the subsequent assessments of whether to exploit the possibilities revealed by basic research through its application and development properly involve the consideration of all the societal and ecological consequences of implementation. It is for this reason that what is indicated as a possibility by current and anticipated research results be assessed before development in terms of societal and ecological benefits and risks. An important function of the FSOU Yearbooks is to provide both forecasts of highly probable research results and, if developed, pre-assessments of their likely societal and ecological consequences.

Experience with the Delphi technique as a methodology of technological forecasting indicates strong convergence among the panelists on the developments that are most likely in the near future. The most uncertain components are the dates at which predicted developments will take place. There is also promising experience with the Delphi technique in technological assessments. Thus, for the FSOU Yearbooks, Delphi provides a useful initial methodology for technological forecasting and for advanced and after-the-fact assessments of prospective and accomplished technological developments. The possibly procedure for Delphi forecasting and assessing technological change could be set up stepwise along the following lines:

- Survey of new and anticipated basic research results in various fields of science through interrogating key scientists and Compiling lists of what research is being funded and conducted by universities, industry and government. Major RFP's.

- Evaluations of the importance and probable dates of realization of results using Delphi scientific panel.

- Evaluations of social and environmental consequences of implementing probable future research results using scientific and other Delphi panels.

- Publication in the FSOU Yearbook of the Delphi analyses of prospective research break-throughs, their probable dates of occurence, and the societal and ecological assessments. Readers of the FSOU Yearbook who desired could then enroll as normative panelists to opt on the desirability of implementation of specific anticipated discoveries.

Until the present, the normative response to new technological possibilites has been to opt for the limit of feasibility. We have rather consistently done everything that our increasing technological capabilites permitted us to do regardless of the societal or ecological consequences. The idea of assessment in advance and possibly opting not to implement all new scientific discoveries is only now taking hold. The proposed Delphi steps would innagurate an experiment in evolving an alternative approach. A set of technological possibilities together with their social and ecological assessments could appear each year. The assessments of the normative panelists on the advisability of implementation of the set could be published in the following Yearbook.

HIGHLY PREDICTABLE SOCIETAL DEVELOPMENTS

The impetus of a two century thrust of accelerated technological development has won for technology an almost uncontested role as the ~~iniator~~ initiator of change. While great societal changes of the past such as the Reformation and the French Revolution were inspired by innovative religious and social thought, today's societal changes are almost exclusively responses to situations created by technological innovation. One penalty of societal evolution per adaptation to technological change has been the near abandonment of strictly societal normative goals. The social normative has been forced to find its primary expression through seeking to guide technological innovation in paths compatable with human weal and need. But so far the social normative has had only a minor voice in the thrust of technological development. This situation has two consequences. First, the process of evolution per adaptation to a rapidly changing technological environment has defocused innovative social thinking on basic philosophical considerations concerning the nature of man and the good life to refocus on social holding actions to care for the wounds created by some of technology's sharp edges; and second, the process of evolution per adaptation has been nuturing a growing normative pressure within the collective psyche that may surface with explosive force unless it can find expression in a genuine social normative iniative. As an example we see the increasing antipathy of the youth to science and technology as a clue to the existence of some incipient normative pressure.

The task of predicting highly probable societal developments contains two central aspects. The first is to project the likely social responses to the most probable technological futures in sight today. These most probable futures may be made available through the techniques

described in the section on technological forecasts. Since projecting social response involves a double prediction (both a technological forecast and the likely social response to it) the forecasts of future societal changes are subject to much greater uncertainties than technological forecasts alone. This double uncertainty which follows from the fact that forecasts, like probabilities combine as products not sums, emphasizes the already mentioned lack of a social normative iniative. It is conceivable that this one-sided dominance of technology to initiate change could be replaced with a growing ferment of innovative social thinking. For example, the appearance of such proposals as guaranteed annual income, semi-autonomous cultural communities such as hippie communes, pluralistic co-existing all white, all black and integrated communities and economies, introduces the requirement for forecasting and assessment exercises based on innovative sociological ideas. The Delphi methodological approach described for technological forecasting and assessment could be adapted with suitable panels for such social forecasting. However, until innovative social imagination catches up with technological innovation, the Delphi technique is a useful initial approach to the first of the two social forecasting tasks: a program based on the following could be used for forecasting highly predictable societal developments:

- Survey of the most probable social responses to the set of technological forecasts by joint sociology/technology panel.
- Survey of probable psychological responses to the socio-technolgical events using a socio-psychological panel.
- Synthesis of above responses with the assessments of normative panelists selected from the feedback from publication of the FSOU Yearbooks.

The second societal forecast task is to reach the pulse that records the growth of hidden normative pressures in order to anticipate

what may later develop into intense overt reactions. Because this notion is central to the possibility of making accurate societal forecasts, it will be worthwhile to amplify how normative pressures grow within the collective psyche. From depth psychology we now know that a balancing function operates between the conscious and unconscious realms of human nature. Pressures build up when there exist imbalances in realizing all sides of our personal or collective nature. Because of the one-sided dominance of rational technological innovation, we can today see evidence for a counter-swing to the irrational side of human nature in the wide-spread use of drugs, the withdrawal of the youth from established social codes, the increase of interest in astrology, mysticism, and Eastern religion, and the general disenchantment with science and technology. The germinal evidence of this anti-rational societal trend however, was visible in art and literature since the turn of the century. Thus, it is in the contemporary art and literature that we turn in order to sense the pulse of present and future hidden pressures. The task of making visible what lies just under the surface of consciousness has always been the role of the artist, the poet, and the shamen of every age. The se individuals and their creations are the precursors of consciousness. Had we looked, the trend toward withdrawal and experiments with drugs could have been detected in the writings of Jack Kerouac during the 1950's even though we might not have been able to predict the form it would take with the youth in the 1960's. Societal forecastors must find ways to incorporate interpretations of art critics such as Wylie Sypher who points out that "just as the concepts of mass and force in modern science have given way to theories of field and ultimate particles, so, too, one finds in

art and literature a corresponding trend toward the disintegration of the traditional representational objects and forms....The dominant themes of modern art and literature, and especially the tendency toward non-identity, reflect the major intellectual developments of our times." (Loss of Self in Modern Literature and Art, New York: Vintage Books, 1962).

The second task for social forecasting may be approached, therefore, through identifying the central themes that appear in the imagination of artists. It will not be sufficient, however, to query artists themselves to obtain these themes, because creative individuals work to give conscious form to the images they find in the unconscious. The interpretation of the results of contemporary art must be done by those who are primarily concerned with detecting contextual and temporal relations among the products of creative endeavors in the same manner that the fruits of scientific research require interpretation and assessment by someone other than the scientist.

SURVEY OF NEEDS, OPPORTUNITIES AND CRISES ARISING FROM DETERMINATIVE FACTORS.

One of the most valuable products of technological and social forescasts is the anticipation of critical stituations toward which present trends are leading. Advanced knowledge of shortages and surpluses can be used cybernetically to relieve excessive fluctuations. Advanced knowledge of a shortage of medically trained personnel or a surplus of physicists can guide students in the selection of courses of study. Proper forecasting of needs obviously provides opportunities, but most "need" situations are cybernetically more complex than just oiling the squeaky wheels. The response to an anticipated shortage of medically trained people, for example, may invovle implementations on many levels requiring different accomodation times. It is not just a matter of enrolling more students in medical courses to assure an increased supply of doctors in four to six years. New medical colleges that cannot begin to receive students before four or six years may be required. And the correction of the shortage may require a new educational orientation such as multi-level training for different health care tasks. The acceptance and implementation of such new approaches may require even more years before the tide can be turned. Hence, in addition to forecasts per se, a most useful feature of FSOU yearbooks would be forecasts giving the restorative effects of remedial measures taken to counter undesirable trends -- PERT charts describing corrective responses and their probable effects.

In many developing critical situations no solutions exist and research must be undertaken with no precisely predictable time table for the availability of results. In other cases solutions are available but years of education are required before political processes can respond to the needs. The advanced warnings of crises together with information

regarding the availability or non-availability of solutions is the first step in the educational effort.

Today there is public awareness of many critical problem areas: pollution, education, health care, transportation, etc. primarily because the public directly experiences the effects of these problems. But the trends toward criticality in these areas have been known to specialists for years -- valuable years in which corrective steps could have been initiated at relatively smaller costs. A way is needed to make forecasts of critical situations available to the public and to train ourselves to respond before the consequences and costs of undesirable trends overwhelm us. To respond in advance is a sine-qua-non factor for man's survival in the future. Reprogramming ourselves to before-crises responses is the most critical long range corrective measure to be made. This task must be begun now.

NORMATIVE ASPECTS

The basis of the normative in societal change is the belief that alternative futures exist. It is the belief that we can choose and create alternatives guided by our desires, needs, and capabilities. The fundamental questions of the normative must not be posed simply as "what do we want and how do we go about getting it." The normative process involves a distillation of our wants, needs, and values to provide us with goals; it involves the effects of attaining these goals on our future needs and wants and on our subsequent ranges of choice and potentialities for creating additional alternatives.

These general questions find specific expression in how do we guide and assess the creative and innovative forces in society. How do we choose the research to fund, the results to develop. How do we establish priorities. When should we meet deletorious trends innovatively, when should we use holding actions. Who is to decide on society's goals and priorities -- an elite oligarchy, the majority, who? The immediacy of these questions has given them the answers that are used in practice, but their importance has not received its only suitable recognition -- the development of a theory of choice based on the relevant political, technological, and axiological considerations.

Two broad classes of normative considerations must be recognized. We may term these the conscious normative and the subliminal or reactive normative. The conscious normative deals with the selection of goals based on the recognized needs, wants, and values of the articulate portion of society or the individual. The subliminal normative is a pressure of dissatisfaction with trends and choices contained in the inarticulate portion of society or the individual. It usually receives

no coordinated expression until the pressure reaches a critical value. The primary reason for this chasm is that the portion that exercises the normative is frequently not in communication with all the portions of society or the individual whom their choices affect.

VALUES, PREFERENCES, AND GOALS

Value may be considered to have its origin in man's need to supply relations between parameters that are found to be unrelated through either deterministic or stochastic laws. Variables that are neither functionally nor statistically dependent are thus oftimes made "axiologically dependent," that is, if no conditions of necessity or probability link them, they may be connected by "shoulds" or "should nots." Further, the absence of conditions of necessity is the condition of freedom. Hence values and freedom arise from the same roots, with values implying freedom, and freedom requiring values.

With value systems basic to normative processes, how do value systems affect social evolution. Our behavior and our attitudes are frequently shaped by our deeper level value systems. For example, we observe the proclevity of the American public to litter the country side with beer cans and trash. We posit legislative sanctions in the form of fines and penalities to change this behavior, but knowledge of psychological factors that determine "littering behavior" make us aware that it is the attitude behind the act of littering that must be changed if the behavior is to be changed and legislation alone is inadequate. Further, we can trace attitudes to an even deeper level that we will call "core belief" that includes our value systems. As an example, a historian recently pointed out that the exploitive attitude of Western man toward nature is traceable to the Judeo-Christian creation myth of man being given dominance over the earth and sanction to use it as he sees fit. (See "The Historical Roots of Our Ecological Crisis," by Lynn White, Science 155:1203-1207, 10 March 1967.) In developing this theme, White shows that "Christianity in absolute contrast to ancient paganism and Asian religions not only established a dualism of man

and nature but also insisted that it is God's will that man exploit nature for his proper ends." He concludes that "...we shall continue to have a worsening ecologic crisis until we reject the Christian axiom that nature has no reason for existence save to serve man." Thus, an examination of core beliefs and value systems is a prerequisite to understanding certain patterns of behavior. It should be noted that many of the contributing deeper level core beliefs are not necessarily conscious and by making them visible, both psychological reaction and denial will set in, making the task of setting normative goals more complex.

For purposes of social change, a value system is characterized by its depth and durability and its rate of modifiability in response to contextual changes such as technological innovations. It is important to locate "watersheds" over which society passes that alters basic desiderata (e.g., the Biblical value to "be fruitful and multiply" after passing a population watershed leads to the opposite value of population limitation). The re-examining of basic value is an invasion of an area long "off-limits" except to theologicans. It has now become an essential area in studying and realizing those futures compatible with the health of society.

Preferences derive primarily from human longings and appetites and though associated with basic needs and values, preferences are independent of both. We may consider the preferable, the necessary, and the allowable respectively as what we want, what we need, and what we value. In the exercise of the normative, preferences act as filters by which we narrow the range of alternative ways in which we satisfy our needs while staying within our prescribed values. In general, preferences lean toward maintaining the status quo and

and are not easily modified because satisfaction once found returns to the same ground.

Goals, plans, and other normative mode ingredients may be classified by their scope and purview, the time for their execution and fulfillment, their degree of detail and specificity and their cybernetic level with respect to other goals and plans. In general for plans and goals, there are trade offs between comprehensiveness and specificity, extensiveness and intensiveness, field of view and resolving power. There are also trade offs between frequency of renewal and specificity. Furthermore, levels of plans and goals also may be defined as in a control hierarchy with general plans or goals defining the form of all subsidiary plans and goals, as the Constitution of the United States delimits all lesser codes, or as a building code delimits all specific house plans. We thus find that for goals and plans there are definite, almost functional, interrelations between cybernetic level, comprehensiveness, time of viability, frequency of modification, and degree of specificity. Some of the questions arising in practice are how to test the consistency of the short and long range goals (e.g., the constitutionality of specific laws), and to find the effect of feedback on the form and content of plans resulting from their partial execution.

Priorities are of two types, those of precedence, as the Constitution over other laws, and those referring to temporal sequence of execution. Priorities of the first type can be established in a top-down manner through ordering by specificity and purview. Priorities of the second type are more complex and must be treated by a process such as PERT.

SOCIETAL OPTIONS

The normative is exercised by filtering the spectrum of options, made available by our imaginations and technological capabilities, through the filters of necessity, preference, and allowability.

Because of our selection of indicators we frequently reduce our options, returning areas of normative choice to the determinative. For example, in measuring our progress using past performance, by comparing rates of change or growth of income, production, etc., objective goals tend to become lost. The directions into which we intend to move become blurred in our performance analyses and we drive into the future steering by the rear-view mirror. Another example of a practice leading to the abdication of normative freedoms is intrinsic in market analyses. Markets are primarily where the "action" is or has been. The projection of markets into the future is confining the search for opportunity to the direction set by the push of the past. Large capital investments in certain product areas contain a determinative inflexibility that militates to bring the customer to the existing product area rather than to search for the areas of need toward which to take production. It is in the inertia of such unwieldy configurations that the production advantages of bigness begin to weigh less and the flexibility advantages of smaller operations in being more responsive to need begin to weigh more.

The presentation of societal options can be given in the FSOU Yearbook through scenarios of social systems possible with certain technological developments. For example, a future consisting of a set of independent societies that each exist on the re-cycling of resources can be drawn with several alternative forms to present options for a world that will soon have to resort increasingly to re-cycling.

The reader can then exercise his own creativity by developing alternative re-cycling societies compatible to his own preferences and values.

RANDOM ASPECTS

The primary premise of prediction is that the statistical properties of the universe in the future will be very much like those of the universe of the past. Forecasting and planning, the practice of science and the accumulation of knowledge depend on this fundamental temporal continuity of the world. In general, the present does not inject a "jump discontinuity" in the evolutionary trends that have been observed in the past. The jump discontinuity carried by the present is the jump from probabilities less than one to probability one, from the condition of "likely to happen" to the condition of "did happen."

But from time to time, discontinuities of the type that may be described as jumps from the condition "not likely to happen" to "did happen" occur. These are events that, though sometimes foreseeable, are not forecastable. They are what we customarily term random events, neither predicted nor planned. But in spite of appearing to lie outside the principal determinative and normative process of change, random events may very often radically affect the course of change. They may even be mutative events re-orienting the entire direction of history. Whether the events we term random are indeed chance events, or only appear as chance events because of our exstensive ignorance of the processes of change is a deeper question for which we have no satisfactory answer at present. The immediate problem concerning random events is how to treat them in our thinking about the future.

One useful approach to low likelihood events with major dislocative consequences is the construction of "What if .., " scenarios. What if the presidenct were assassinated? -- a random event that Americans have

encountered four times in their history. What if there is a major earthquake in California; What if an ICBM is accidentally fired, What if there is a nation-wide power failure, and so on. Events of this sort can happen and having happened in some for or other in the past, they enter into our thinking about the future in the form of contingency planning. In fact we usually prepare contingency plans for foreseeable events whose dislocative effects are large even though their probability of occurence is small. But members of the class of foreseeables that we take seriously enough to counter with contingency plans are usually defined as having probabilities of occurence sufficiently large that they have already occured at least once.

But there are other "what ifs". What-ifs that have not occured before but if they did there is little question as to their major perturbative consequences. Large radio telescopes pick up signals that can only be attributed to transmission by another intelligence in the universe. A new death dealing virus created in the laboratory accidentally gets out of control. LSD is dumped into the reservoirs of thirth major cities in the world. These are what-ifs conjured up in the imagination by science fiction writers. Their consequences and/or implications would be major. Except for having recognized their possibility -- being forewarend is being forearmed -- we have no plans for coping with them. The problem posed by this class of what-ifs is again how to treat them in our thinking about the future. Their probabilities may not be sufficient to justify the preparation of contingency plans. But their probabilities are sufficient to justify "contingency fantasies", that is, thinking through the possibilities, the implications, and synthesizing alternative responses without going to the formality of planning, creating organizations, or assigning responsibilities.

A third class of what-ifs are those random events whose explicit content cannot be specified but whose form can be imagined -- a scientific discovery of revolutionary consequences; an unexpected watershed in our social and physical evolution; a totally unexpected dead end to present practices; or a breadown in our present systems.

The first class of what-ifs, those that have happened before and for which we make contingency plans, constitute tests of our practices and institutions. The second class of what-ifs, those that have not happened before but which we can imagine in their specific content, consitutute tests of our motivations and Weltanschaungs. The third class constitutes a test of our very ability to imagine. In thinking about the future, it is the responsibility of the forerunners of consciousness to extend the realm of the imaginable and in so doing to become an early warning network for the collective social and technological imagination.

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TOWARD THE INSTITUTIONALIZATION OF CHANGE

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PREFACE

The Institute for the Future, under a grant from the Russell Sage Foundation, is preparing plans for the publication of an annual series of reports on the future state of the Union. This paper, which is part of that preparatory effort, is concerned with some of the underlying conceptual problems of such an undertaking and presents a discussion of some of the features that might be included in the yearbooks.

CONTENTS

INTRODUCTION

This generation as no generation before in history is consumed with change. The rapidity of technological change and its societal consequences have trust us onto a metaphorical surfboard that renders obsolete the traditional movement from one state of static stability to another by discrete steps of renewal, reform, or revolution. Unless we can discover and apply processes leading to *dynamic* stability; present ecological, social, and psychological imbalances will continue to grow until they topple us. In brief, we must change our mode of change. Burke's warning that "a nation without means of reform is without means of survival" now becomes "a nation that does not continually reform its means of reform cannot survive". This challenge is recognized as is apparent in the increasing number of individuals and institutions concerned with the development of a "science of change". This new science, frequently called Futures Research or Futurology, is predicated on the belief that a spectrum of alternative probable futures exists and that through our own efforts we can control the processes of change to enhance or diminish the probability of occurence of any specific future.

The development of a science of change is but part of the task of changing our mode of change. In addition are the problems of the broad application of the methodologies of futures research and their assimilation into public practice. Clearly the application of any science of the future that can be used to affect the shape of tomorrow's world poses basic problems for a democratic society. It is evident that the delegation of the power to select and implement choices among possible futures is as important to a sovereign citizenry as its delegation of the powers of government. While it is a matter of urgency to replace the present processes of change characterized by the haphazard injection of innovation into our social structure at an ever increasing rate, it is a matter of uncertainty whether new processes that permit the control of the direction and rate of change, subject to continuous re-evaluation on the basis of the quality of life they generate, can be found. It is even more uncertain whether such processes would be consistent with the principles of a democratic society. Hence, as the new science of futures research develops

its methodologies and begins to test them, we must give high priority to how the practice of a science of change may be properly incorporated so that participatory democracy will be preserved. We must be concerned with how we may organize the efforts to define and implement the future so that those who are to live in the future will participate in its choice. If the study and practice of futures research is to become institutionalized in American society, we must weigh carefully such matters as who are to be the practitioners of such research and how are they to be monitored and held accountable to the public.

One democratic approach to a strategy of incorporating the methods and results of futures research into public practice is to initiate a period of public familiarization with futures thinking so that concerned citizens can participate in the generation of alternative scenarios for the future and work with futurologists in the exercise of establishing normative goals. A series of "Future State of the Union" Yearbooks has been suggested as an experiment to provide such periods of familiarization. The proposed yearbooks could help citizens become future-oriented and provide the vehicle for citizen participation in futures research that is the prerequisite to democratic institutionalization of change on a national or global scale.

Prior to the design of a set of evolving yearbooks on the Future State of the Union, we must formulate design criteria and objectives. These criteria and objectives are necessarily related to the model of change we postulate, to the social descriptors we adopt, and to the value system to which we subscribe. Accordingly, it is important to preface our specific design considerations with a general exposition of philosophical viewpoints of change, social structure, and value systems. Because of the necessity to view the problem of the institutionalization of change on both a philosophical level and a design-strategy level, we have divided this paper into two parts. In the first part, we review general philosophical problems related to modeling of change, modeling of society, and selecting of goals. In the second part, we propose some candidate design features for the first-generation yearbooks derived from the boundary

conditions outlined in Part I. A specific proposal for conducting the requisite research and the compilation of yearbooks on the Future State of the Union will be the subject of a report by Olaf Helmer.*

*Olaf Helmer, "Report on the future of the Future-State-of-the-Union reports", Institute for the Future (Report in preparation).

Part I. Some Philosophical Prerequisites

The question *What will the future be?* is perhaps older and certainly of more immediacy to man than such questions as *What are the stars?; What makes corn grow?;* or *What makes fire burn?* While the search for answers to the last three questions eventually resulted in the extended areas of systematic knowledge we now call astronomy, biology, and physics; the search for answers to the first question has never produced any dependable methodologies or basic principles. Only in the past few years have improvements in forecasting techniques and developments in control and correction concepts indicated that a first approximation to a systematic science of change may soon be available.

Until the experience of rapid change peculiar to our own age, the future has generally been considered to be the business of the future. This was recognized by legalists in previous ages by forbidding inheritances in perpetuity. This was recognized by the founding fathers in their dictum that "each generation must lead its own life, unexploited by dead men". This traditional American attitude to do what we want to do with little concern for the past is balanced by the equally traditional American attitude to do what we want to do with little concern for the future. Each generation must lead its own life unexploited by the unborn. This view has been reflected in the rapaciousness that has polluted the present. The recent reversal of indifference to the future is not due to a sudden upsurge of altruism, but rather to the visible backlash of our own acts. In an age of rapid change the consequences of our activities are thrown back into our own faces. We are brought to the necessity of restoring ecological balance because we ourselves, not our children or our children's children, have to live in the future we create. We now find that the choice to develop a science of change which allows us to choose among alternative futures has become an existential choice, and the strategy by which we may institutionalize change has become a strategy for survival.

MODEL OF CHANGE

Implicit in every forecasting technique and fundamental to the whole science of futurology is a model of change. Our experience with technical and social change suggests that a comprehensive model of change should allow

for determinative, normative, and random processes. *Determinative* processes are those that provide the recognizable patterns of social change. They are the processes such as the natural growth of economies, populations, and institutions that provide the continuity of society. *Normative* processes are those that have their origin in the needs, goals, and preferences of social groups and sub-groups and whose implementation bends the course of the determinative toward the chosen goals and increases their probability of occurrence. *Random* processes introduce discontinuities into the patterns of change, launching new sequences of events that may overrule established determinative and normative courses.

Forecasts of the probable future are primarily based on the extrapolation of existing trends, but forecasts can also be made by inference from evolutionary processes and by analogy with the past. Such forecasts are useful whether they are accurate or not. This is so because the proper function of a forecast is to illuminate the domain of normative choice, not to specify some predetermined end. The normative can only be effectively activated through challenging the determinative. If we believed the probable future forecast by the determinative to be unalterably deterministic, we would not challenge its predictions. The inaccuracies of our determinative forecasts supply the necessary credibility gap that supports our disbelief in their inevitability and hence motivates us to challenge the determinative through implementing our normative choices.

Determinative Aspects

The word "determinative" is employed to indicate those processes of change whose paths are deterministic except wherein they are modified by the normative pressures of human volition. It is possible that a determinative process may be totally deterministic, unmodifiable by any exercise of will. But in view of our extended ignorance of the nature of processes of change, wherever strict determinism has not been demonstrated, it is best that we act under the premise -- true or false -- that our choices and our wills can alter the future directions of any trend.

The primary problem of the determinative in futures research is to discover the basic patterns of social change and use these patterns to forecast the most probable future states of society that will develop accordingly. The primary methodology of the determinative is the extrapolation into the future of the magnitudes of quantitative statistical time series that have

been derived by fitting to past quantities. The trends indicated by these series are our best guides to the most probable determinative futures since technological, ecological or social trends seldom change direction abruptly.

Long-range determinative forecasting involves anticipation of the changes likely to occur in patterns of change. That is, long-range forecasting may be said to be forecasting that involves knowledge of higher-order derivatives. However, in view of the increasing role normative factors play in shaping the future, it is questionable that long-range determinative forecasting is useful. The proper encounter with the future is better described by a dialectical process: the forecasting of short-term determinative futures; the generating of normative responses; and the synthesizing of the interactions between trends and implemented norms.

Normative Aspects

The basis of the normative in social change is the belief that there exist alternative futures. It is the belief that we can create and choose alternatives guided by our imaginations, needs, and capabilities. The fundamental questions of the normative must not be posed simply as "what do we want and how do we go about getting it?" The normative process involves a distillation of our wants, needs, and values to provide us with goals; it involves the effects of attaining these goals on our future needs and wants and on our subsequent ranges of choice and potentialities for creating additional alternatives.

These general questions find specific expression when we ask ourselves how we guide and assess the creative and innovative forces in society. How do we choose the research to fund, the products to develop, the plans to implement? How do we establish priorities among competing objectives? How do we resolve the goals of conflicting interests? When should we meet deleterious trends innovatively, when should we use holding actions? Who is to decide on society's goals and priorities -- an elite oligarchy, the majority, or who else? The immediacy of these questions has given them answers that are used in practice, but their importance has not received its suitable recognition, namely, the development of a theory of choice based on relevant political, technological, and axiological considerations.

Two broad classes of normative considerations must be recognized. We may term these the *conscious* normative and the *subliminal* or reactive normative. The conscious normative deals with the selection of goals based on

recognized needs, wants, and values of the articulate portion of society or of the conscious portion of an individual. The subliminal normative acts as a pressure of dissatisfaction with trends and choices and is diffused throughout the inarticulate portion of society or the unconscious of the individual. It usually receives no coordinated expression until the pressure reaches a critical value. The primary cause for this pressure increase is that those who exercise normative choice are frequently not in communication with all portions of society or all individuals whom their choices affect.

Random Aspects

The primary premise of prediction is that the statistical properties of the universe in the future will be very much like those of the universe of the past. Forecasting and planning, the practice of science, and the accumulation of knowledge depend on this fundamental temporal continuity of the world. In general, the present does not inject a "jump discontinuity" in evolutionary trends. The jump discontinuity carried by the present is the jump from probabilities less than one to probability one; from the condition of "likely to happen" to the condition of "did happen".

But from time to time, discontinuites of the type that may be described as jumps from the condition "not likely to happen" to "did happen" occur. These are events that, though sometimes conceivable, are not forecastable. They are what we customarily term *random events*, being of low probability they are neither predicted nor planned. But they may be mutative events re-orienting the entire direction of history. Whether the events we term random are indeed chance events, or only appear to be chance events because of our extensive ignorance of the processes of change, is a deeper question for which we have no satisfactory answer at present. The immediate problem concerning random events is how to allow for them in our thinking about the future.

A CYBERNETIC MODEL

In our times, we customarily endeavor to forecast the future by means of trend extrapolations. In doing this, we assume a model of change that operates, at least in part, deterministically. On the other hand, when we set goals and make plans we assume a model that is undetermined and responsive to our purposes and volitions. Thus, the practices of extrapolating trends and formulating plans require a model of change that is in part deterministic and in part normative. How may we formulate a model that will be

capable of consistently subsuming both of these processes (ontological *vis-a-vis* teleological, historically held to be contradictive) and provide in addition a place for random events?

The experience of recent years in designing sophisticated control systems such as those used in aerospace, petrochemicals, and communication, together with the rapid developments in computer science, has resulted in techniques for modeling complex systems containing large numbers of interacting subsystems. The basic concepts of the structure and behavior of these *cybernetic* systems supply a framework that allows a self-consistent model of change resolving the traditional contradictions of the deterministic and the normative. This may be seen in a general way by taking the trend extrapolations and forecasts concerning the most probable future to correspond to existing states in a control system; and taking the goals and plans to correspond to the desired state of the system. The difference between the most probable future and the desired future corresponds to the error signal. The determinative corresponds to the inertia of the existing state while implementation of a normative input corresponds to the correcting signal. Random events affect the control system in the same way as they affect social systems, so a cybernetic model (at least to first order) can serve for our model of change.

The three general problem areas that correspond to the basic components of a cybernetic model are accordingly:

- The extrapolation of the recent course of events to ascertain a sequence of most probable future states and dates as would develop if unmodified by additional normative and random inputs.
- The evaluation of these most probable futures in terms of society's capabilities, needs, and preferences in order to specify desired future states and dates.
- The design of organizations, plans, and strategies to implement the desired states.

Let us next look in more detail at the content of each of these basic problem areas and their sub-problems.

Predictions Implicit in the Determinative

The determinative acts as a "push" from the past. Its vector direction is defined by what has gone before. Its most probable path is implicit in what already exists just as the essential nature of the oak is implicit in the acorn. The vector length (the duration in time of the determinative element) has a most probable magnitude that is also implicit in what already exists.

Since the cybernetic model allows the modification of existing configurations, we shall use the expression *quasi-determinative* for those existing vectors whose directions and durations may be altered by normative or random inputs, and use the expression *ortho-determinative* for those components that, being built into the hardware, are unalterable.

There are three classes of quasi-determinative factors: first, those factors that play a determinative role because of restrictions placed by technological feasibility. The total potential hydro-electric power of a nation affords an example. Given the present level of technology this is a bounded and non-modifiable quantity. However, as new technology pushes back the frontier of feasibility, say through the development of weather control capabilities that could be used to cause more intensive rainfall in selected areas, the potential hydro-electric power could be increased. The question of whether to increase the potential and actual hydro-electric power then becomes a normative one. A second type of quasi-determinative factor arises because of our ignorance of alternatives (or even because of our ignorance of the existence of a parameter). Columbus' proposal to reach the East by sailing west violated the quasi-determinism governing feasible routes to China set by the concept of a flat earth. Without any advance in technology, a "noetic" innovation greatly increased the normative space available for the planning of routes to the East.

The third type of quasi-determinative factor is that implicit in our value system, the determinative constraints being imposed by our codes rather than our technology or ability to conceive of alternatives. In the Middle Ages, usury was forbidden by the principal ecclesiastical codes of the West. With the erosion of this proscription came the development of wide-spread credit, one of the most important normative factors in present economic structures. But all quasi-determinative factors are not undesirable. Some we choose to retain. For example, there are no conceptual or technological factors enforcing the quasi-determinative structure of a four-year tenure of leadership on the United States Government. This is a factor which because of our value of stability we intentionally retain as determinative rather than make normative.

While the limits of technological feasibility and noetic imagination are clearly determinative, the third limit of axiological proscription is violatable. For this reason the distinction between quasi-determinative factors of the third type and purely normative factors may appear somewhat

superficial. It is essential, however, to be aware of the portions of our choice-of-action space that we bound by value constraints and the portions that we leave unrestrained.

What properly constitutes an ortho-determinative factor, or whether there even exist strictly ortho-determinative factors, are questions belonging to the morphology of models of change. For the purposes of the cybernetic model, we may take as ortho-determinative factors those constraints such as physical laws that, to the extent of our present knowledge, may not now or in the future be modified by human volition.

There are three important sub-problems of the determinative problem area. The first is the design of suitable methodologies for extrapolating past events to give probable future states with their most probable time tables. The Delphi method is an example of a useful technique for this purpose, one that has been especially valuable for making technological forecasts. (*Social Technology* by Olaf Helmer, New York:Basic Books, 1966.) The second important sub-problem is finding keys that aid in establishing the relative significance of observed trends and lead to identifying those parameters which serve as the best indicators of future states. The third sub-problem is the problem of determining the most probable aggregate effect of all the individual trends. The cross-impact matrix analysis is a useful technique that has been developed for this purpose. ("Initial Experiments with the Cross Impact Matrix Method of Forecasting" by T. J. Gordon and H. Hayward, *Futures* 1:100-116, 1968.)

Assessment and Definition of the Normative

Just as the determinative acts as a push from the past, the normative or goal-directed acts as a pull toward the future. The directions of the normative vectors are defined by the specific goals sought; the lengths of the vectors are set by the target dates for implementation. Whereas the determinative vector space functions more or less like those used to describe purely physical systems (gas dynamics or plasmas), the normative vector space represents a set of conflicting individual and collective wills and defies homologization to a physical system. The introduction of freedom and volition into a system is more than merely the introduction of a large number of degrees of freedom. Volition cannot be simulated by conventional concepts of force. Aggregate volitional processes are more complex and outcomes are less predictable.

The principal sub-problems of the normative area are:

- The generation of the full option space. The technique of morphological analysis is one of the most useful available for generation and recognition of all the possibilities available to choice. The morphological approach customarily generates the option space to the noetic limits, then introduces the various ortho- and quasi- determinative factors to reduce the space to the normative option space.

- The setting of goals. The decision as to which options within the normative option space are to be selected for implementation involves several aspects. There are the questions of who makes the decisions and by what process. What basic value system is to provide the yardsticks for benefits, costs, and risks? What priority algorithms are to be used? What are the dependencies of choice on time? and so on. The setting of goals is customarily done by one of two approaches, frequently called the "top-down" and the "bottom-up" approaches. The top-down approach begins with a value input using, for example, a societal need or preference as the point of departure. The bottom-up approach derives its goals from the opportunities made available by change. Opting in the top-down case is tree-structured from a primary goal; while opting in the bottom-up case is usually based on the importance of following new leads that may ultimately increase the option space. Whereas the bottom-up approach is generally justifiable in the case of basic research, its use in applied research and development is open to question.

- The assessment of normative feedback. In addition to the setting of goals or the advanced assessment of options is the problem of the subjective assessment of the feedbacks from earlier normative inputs. Here the Delphi method is again useful in determining "indices of satisfaction" covering various developments.

- The aggregate effect of sub-goals. The problem of the aggregate effect of the cross-impact of large numbers of sub-goals and the cross-impact of these normatives with the determinatives again calls for the use of a methodology such as that of cross-impact matrices.

- The identification and measure of social pressure. There are societal processes of a determinative nature arising from aggregate volitions (similar to the dialectical processes of Marxism). Normative pressures and counter-pressures tend to grow from germinal dissatisfactions within societies. A problem of the normative area is to find indicators and measures of intensity of these pressures.

Implementation of the Normative

The ingredients of implementation are will, decision, knowledge, resources, and organization. Will and decision not only set the goals aided

by axiological inputs as outlined above, but operate to formulate plans and strategies, secure resources and create organizational tools required for goal achievement. The implementation processes involve a complex multi-level structure with feedback loops between goal and plan, plan and resources, organization and plan, and so on. Ofttimes, as in the case of the "Man, Moon, Decade" goal implemented by NASA in the 1960's, each level in the structure evolves rapidly with time.

Many of the sub-problems of implementation, because of their immediacy and specificity, have been widely studied. Techniques for solving these problems appear in the literature under classifications such as management science, systems management, or operations research. However, important considerations such as "How long does a given goal, plan, or organization remain meaningful in a rapidly evolving context?" and "When cross-impacted with the complex of other current plans, does a given plan still lead toward its desired goal?" have been neglected, resulting ofttimes in continuing efforts in directions that are counter-desirable.

ON SOCIAL INDICATORS

The understanding and predicting of the behavior of complex systems, be they physical, biological, economic, or whatever, depend on the development of a theoretical model of the system in which the relations between various observable parameters may be mathematically simulated. In the absence of a formal theory sometimes forecasts of future states of a system can be derived from the temporal patterns of certain observables of the system (e.g., weather forecasts). In either case, the prerequisite to prediction is the identification of a set of measurable parameters to whose changes the system appears to be most sensitive.

In treating the nation and society as a system it is quite in order to call for a set of social indicators to serve as the base on which to construct either a statistical or formal model. However, since the choice of the proper indicators can be made only as knowledge of functional or statistical relations between indicators can be established, selection of indicators must be made by successive approximation. The complexity of social systems has precluded the emergence of the sort of sharp functional

relations between parameters that are observed in simpler systems (such as the relation between temperature, volume, and pressure of a gas). There is therefore considerable uncertainty not only in where to begin with the matter of formulating a good set of social indicators, but also in whether a social system can be usefully described for purposes of evaluation and prediction in terms of a limited set of measurables.

Several social indicators have been proposed and are currently in use. For example, President Eisenhower, in his third State of the Union address in 1955, in addition to his report on the nation's economy, discussed the states of health, housing, race relations, and pollution. He also spoke in general terms about freedom, justice, and peace. John Kennedy added problems of cities, crime, education, and transportation. The following subjects are cited by the recent Health, Education and Welfare Panel on Social Indicators as basic social indicators:

- Opportunity and social mobility
- Health
- Public order and safety
- Learning, science, and art
- Participation and alienation
- Physical environment.

In some of these areas measurable ingredients of the aggregate indicator are readily evident, e.g., life expectancy, days of bed disability for Health, incidence and type of crime for Public Order, etc. But meaningful measures of the condition of the arts or the degree of alienation are not so evident. While the above indicators undoubtedly have something to do with the social well-being and future prospects of the nation, it is not at all clear that they are the most meaningful or sensitive indicators by which to structure the components of change or to compare the nation's existing condition with an expected future condition. We need indicators of qualitative change as well as of quantitative change, measures of innovation as well as of growth. We need indicators of individual change and satisfaction and indicators of aggregate change and satisfaction. Procedures for evolving useful sets of all these types of social indicators will be a continuing task in preparing the Future State of the Union yearbooks.

Accepting that better indicators will be recognized through successive selections involving feedback evaluations, we properly begin with the indicators already proposed. However, these indicators might profitably be supplemented by experiments with two additional approaches: first, indicators dervied from societal decompositions; and second, "soft" indicators such as satisfaction indices.

The Decomposition Approach to Social Indicators

Social indicators as conceived in much of the recent discussion on the need for social accounting (e.g., the HEW publication, *Toward a Social Report*, Washington, D.C.:G.P.O., 1969; or *Social Indicators*, ed. Raymond A. Bauer, Cambridge, Mass.:The MIT Press, 1966) generally refer to the condition of individuals. For example, the basic categories of the HEW report are Health and Illness, Social Mobility, Income and Poverty, Crime, Learning, Science and Art, Participation and Alienation. The inherent reference to individuals is predicated on the assumption that the optimum state of society is isomorphic to certain optimum states of being or becoming for individuals. That is, this approach to social indicators requires measuring conditions of individuals in society and, in turn, statistically treating these measurements in the aggregate following the pattern of "aggregative measures" utilized in the National Income statistics. While the condition of the individual is certainly an important ingredient in the condition of the society, it is an insufficient measure of the whole. This is because in any aggregate (such as a human society) in which the whole is greater than the sum of the parts, statistics based on the state of the elemental parts frequently fail to show the state of the relations between the parts. Before continuing to discuss indicators to measure the "social health of the Nation", it is important to know what constitutes a social entity. Until we have some clear notion of what distinguishes a society from an aggregate of individuals, it is difficult to identify indicators that measure the state of its health. It may not be a valid assumption that a healthy society is a set of healthy individuals. The identification and utilization of meaningful social indicators depends on whether society can be modeled as an organic whole or only as a statistical aggregation of individual behaviors.

The problem of formulating social indicators belongs to the class of problems called "parts and wholes" treated under the theory of levels (see for example, *Hierarchical Structures*, eds. Whyte, Wilson and Wilson, New York: American Elsevier, 1969). It is intrinsically bound up in the problem of specifying boundaries between sub-groups and isolating interfaces across which information and/or mass-energy exchange can be observed. It is for this reason that one point of departure in the task of parameterizing a social entity is that of decomposition of the society to locate various interfaces among sub-entities of the society.

The purpose of a decomposition is to identify interfaces between subsystems that may be useful in making visible salient parameters or indicators. The useful interfaces are those across which flows (inputs and outputs) may be observed and measured. The most significant interfaces will be those providing maximum isolation, that is, those across which the interactions or flows drop to a minimum. The parameters providing the most economical and sensitive descriptions will in general be those causally related to these minimum traffic interfaces.

Before outlining proposed decompositions that will be useful in the search for social indicators, we may illustrate how indicators derive from minimum exchange interfaces with the current "generation-gap" phenomena. The gap reflects a decomposition of society by "cohort aggregates" well known to students of demography (see "Social Forecasting" by Otis Dudley Duncan, *The Public Interest*, No. 17, Fall 1969, pp 88-118). "A cohort is the aggregate of all persons who experience an event defining their membership at approximately the same time; the birth cohort of persons born in a given year or in a five-year period is the prototypical example." The generation gap satisfies the condition of minimum exchange across interfaces since its characteristic feature is the inability of the older members of society to communicate with the youth, and vice versa. If we ask what characterizes this interface we are led, among other parameters, to the much discussed ability of the youth to perceive hypocrisy in social modes and practices. Thus, one parameter that isolates the youth from the older generation is their perception of social hypocrisy. The increase in the perception of hypocrisy (measurable from a content analysis of rock-and-roll

music, humor, in-group jargon such as "plastics", television themes, radio disc-jockey commentary, etc.) indicates an existing or emerging social trend. Whether or not the incidence of hypocrisy is increasing or simply the detection of hypocrisy is increasing needs further exploration, but the level of hypocrisy (the ability to ignore in practice, codes claimed to be generally accepted) is an important indicator of the state of society, and the response to its being made visible cannot help but further affect societal evolution.

To implement the decomposition approach to social indicators, we suggest the following general decompositions: by *institutional function* such as manufacturing, agriculture, education, defense, service, etc. In this decomposition, the most important institutions and organizations would be identified and classified by their size, function, resource consumption, production, and waste. Size is measured by budget, number of employees, customers, and/or members. Function is defined by the social need met and by a set of characteristic times associated with the activity cycles such as production, new product introduction, and institutional obsolescence. Resource consumption and production are measured by the usual physical and economic measures, while waste will be measured in terms of pollutants generated and social, economic and ecological degeneration caused through direct and indirect operations. Other interesting decompositions would be by *cohorts* such as youth, the elderly, veterans, white suburbia, draft resistors, etc. and by *special interest groups* such as the peace movement, minorities, conservationists, national rifle association, civil rights, and so on. It is found that decompositions of society into sub-groups according to minimum exchange interfaces identify those groupings which impose life styles, value systems, standards of success and failure, and world views on their members. In today's milieu of global communication and travel, these groupings are no longer necessarily geographically contiguous. The purpose of alternative decomposition is to reveal parameters that recur in more than one decomposition. It is these parameters that are most likely to be the most significant and useful social indicators.

In addition to these suggested decompositions as a means of formulating social indicators, there exist methods for numerically analyzing large data

files that result from decomposition studies such as Honeywell's relevance tree techniques and the cross-impact matrix technique. Although matrix characterization is a powerful tool in that it allows for quantitative specification and is amenable to high-speed computer programs, the central feature in the validity of any decomposition is its ability to represent the whole social structure. Matrix operations will not salvage erroneous or misleading decompositions. It is important, therefore, to provide a sufficiently large number of alternative decompositions and clusterings for analyses by these numerical tools in order to find meaningful descriptors of the social structure.

Soft Indicators

Indicators may be considered to be of two types, hard or soft. We shall call *hard* those indicators derived from measurables such as birth rate, level of literacy, number of strikes, infant mortality, and so on. Their utilization is a quantitative description of the present situation in terms of human and natural resources. The second type of indicators which we shall call *soft*, are the subjective feelings of satisfaction or dissatisfaction of people. These are not readily quantifiable beyond rough scales of low or high. These "indices of satisfaction" may refer to feelings about events that have already happened (such as the landing of men on the moon) or to feelings about what will probably happen (such as the deployment of supersonic transport planes).

We can readily see that soft indicators provide a very direct way to evaluate the condition of a social system. Ultimately every evaluation is a matter of feeling, a subjective assessment of satisfaction or dissatisfaction. Since feelings cannot be accurately mapped on arithmetic scales, and since arithmetic values of measured parameters do not stimulate our feelings in nearly so sensitive a way as the events and issues themselves, there seems to be little gained in attempting to measure and translate a social system into a special set of numerical indicators, then run these numbers through a computer to give another set of numbers and finally ask people how they feel about these reduced numbers. For purposes of evaluating our satisfaction

or dissatisfaction with a social system--and this is our primary purpose in modeling our social system--we should be able to short-cut the quantitative simulation modeling used for typical physical and economic systems and go directly from the event, the situation, or the trend to our feelings concerning them.

The key to the selection of the most meaningful soft social indicators lies in the set of situations, trends, etc. that evoke our most intense feeling responses--the matters about which we feel concern. It will undoubtedly develop that many of the matters for which we feel the greatest concern are also readily measurable and their changes analyzable by conventional techniques. We may, accordingly, expect that the "feeling" approach to indicators will not remain "seat-of-the-pants" evaluating. It is also a point of departure for meaningful measurable social indicators.

A central feature of the Future State of the Union yearbook series could be to employ soft in addition to hard social indicators. Through the use of the Delphi technique it would be possible to ascertain indices of preference and satisfaction with regard to both prospective and realized technological, ecological and societal developments.

ON VALUES, PREFERENCES, AND GOALS

The nature of values and value systems and their role in the formulation of goals are fundamental ingredients in the design of normative procedures. In this section we review some attributes of values and goals and the problems they pose for the institutionalization of change.

Value may be considered to have its origin in man's need to supply relations between parameters that are found to be unrelated through either deterministic or stochastic laws. Variables that are neither functionally nor statistically dependent are thus ofttimes made axiologically dependent, that is, if no conditions of necessity or probability link them, they may be connected by "shoulds" or "should nots". Further, the absence of conditions of necessity is the condition of freedom. Hence, values and freedom arise from the same roots, with values implying freedom and freedom requiring values.

With value systems basic to normative processes, how do value systems affect social evolution? Our behavior and our attitudes are frequently shaped by our deeper-level value systems. For example, we observe the proclivity of the American public to litter the countryside with beer cans and trash. We impose legislative sanctions in the form of fines and penalties to change this behavior, but knowledge of psychological determinants of "littering behavior" shows that it is the attitude behind the act of littering that must be changed if the behavior is to be changed, and legislation alone is inadequate. Further, we can trace attitudes to an even deeper level that we may call "core belief". Core beliefs include our deepest value systems and although they are always active in shaping attitudes and behavior, they are not necessarily conscious. As an example, a historian recently pointed out that the exploitive attitude of Western man toward nature is traceable to the Judaic-Christian creation myth in which man is given dominance over the earth and sanction to use it as he sees fit. ("The Historical Roots of our Ecological Crisis," Lynn White, *Science* 155:1203-1207, 10 March 1967.) In developing this theme, White shows that "Christianity in absolute contrast to ancient paganism and Asian religions not only established a dualism of man and nature but also insisted that it is God's will that man exploit nature for his proper ends." He concludes,"... we shall continue to have a worsening ecologic crisis until we reject the Christian axiom that nature has no reason for existence save to serve man." Thus, an examination of core beliefs and value systems is a prerequisite to understanding certain patterns of behavior. It should be noted that since many of the contributing deeper-level core beliefs are not conscious, by making them visible, both psychological reaction and denial may be expected, making the task of setting normative goals more complex.

For purposes of social change, a value system is characterized by its depth and durability and its rate of modifiability in response to contextual changes such as technological innovations. It is important to locate watersheds over which society passes that alter basic desiderata (e.g., the Biblical value to "be fruitful and multiply" after passing a population density watershed leads to the opposite value of population limitation).

The re-examining of basic values has been thought to be an area long "off limits" except to theologians. It has now become an essential foundation area in studying and realizing those futures compatible with the health of society.

Preferences derive primarily from human longings and appetites and, though associated with basic needs and values, may be independent of both. We may consider the preferable, the necessary, and the allowable, respectively, as corresponding to what we want, what we need, and what we value. In the exercise of the normative, preferences act as filters by which we narrow the range of alternative ways in which we satisfy our needs while staying within our prescribed values. In general, preferences lean toward maintaining the *status quo* and are not easily modified because satisfaction, where once found, returns to the same ground.

Goals, plans, and other normative mode ingredients may be classified by their scope and purview, the time for their execution and fulfillment, their degree of detail and specificity, and their cybernetic level with respect to other goals and plans. In general for plans and goals, there are trade-offs between comprehensiveness and specificity, extensiveness and intensiveness, field of view and resolving power. There are also trade-offs between frequency of renewal and specificity. Furthermore, levels of plans and goals also may be defined as in a control hierarchy with general plans or goals defining the form of all subsidiary plans and goals--as the Constitution of the United States delimits all lesser codes or as a building code delimits all specific house plans. We thus find that for goals and plans there are definite (almost functional) interrelations between cybernetic level, comprehensiveness, time of viability, frequency of modification, and degree of specificity. Some of the questions arising in practice are how to test the consistency of the short- and long-range goals (e.g., the constitutionality of specific laws) and to find the effect of feedback on the form and content of plans resulting from their partial execution.

There is one approach to goal setting, characteristic of sub-groups within a competitive society, that may ultimately prove limiting. Individuals and sub-groups tend to adopt as an indicator of "how we're doing" a measure of their input and output in some form such as salary, net profit,

units produced, attendance, circulation, and so on. It is then usually assumed that the optimum value for the indicator is some "as-large-as-possible" value, and maximization of the indicator is adopted as the primary goal. Individuals, corporations and other organizations then tend to evaluate their status and progress by the portion of the whole that they possess or have use of; that is, by their relative position in the competitive hierarchy. Thus, each sub-component of society tends to define its values and goals, not in terms of quality, inner satisfactions or fulfillments but with respect to position relative to other like components within the competitive context, irrespective of the state or direction of movement of that context. Two limiting consequences of this practice are the relative de-coupling of sub-group values from considerations of the status of the aggregate and the tendency to set goals for the aggregate through emulation of the competitive expansion syndrome of the sub-groups.

This approach to self-evaluation through measurements with respect to the state of the competition within a prescribed context is an emphasis on relativism that is highly correlated with extroversion in individuals. In this sense, it is not surprising that a culture which highly values extroversion (in contrast to introverted cultures such as India) should adopt this method of self-evaluation. However, the time comes when each individual or organization or nation must look inward and approach its self-evaluation in terms of its own inner structure, measuring its performance against its own potential performance. Competitive situations may supply surrogate goals for performance evaluation over indefinite periods, but in the long run performance must be measured against the function defined by the internal organic structure. A man may measure his performance and achievement against his buddies in nightly drinking bouts, but eventually his performance will have to reckon with his own intrinsic physical and psychological structure. Inner-directed evaluations require specified goals, bench-marks that are independent of position with respect to the competition.

In recent years, the appointment of various commissions to define national goals and the search for social indicators marks either the development of some measure of national maturity or a recognition that the national kidneys cannot take much more "Old Competitor" booze. Independent of the direction in which we are moving, our relative position with respect to the

competition (or with respect to the past) provides the surrogate "goals" against which most of our present evaluations are made. The selection of intrinsic or "ortho"-goals cannot easily be made without a deeper understanding of the nature of man and his relation to the universe. Until some of the philosophical questions have received more thought and better answers, we cannot expect individuals or groups to operate according to inner-directed goals or to abandon the sense of meaning afforded by the coordinates of competition. We may thus anticipate a continuation of indicators of competitive position such as the number of Vieg Cong killed last week *vis-a-vis* the number of Americans killed, although this type of indicator has little relevance to the status of the military situation and no relevance as a measure of national self-interest or welfare.

There remains the important question of whose goals? Assuming that some form of machinery is provided that enables all individuals to participate in the formulation of the norms and goals toward which we shall direct the forces of change under our control, there remain groups and individuals who are very much concerned but are voiceless. Who is to speak for mankind? Who is to speak for the unborn? Who is to speak for the non-human portions of the living complex that forms the context on which our own lives and future depend? Unless all of these are given voice, those who control the forces of change will inevitably lose their own voice.

Part II. Candidate Features of Future State of the Union Yearbooks

We live in a culture that focuses on decisions and decision makers. Our status ladder's top rung is for the executive; our highest rewards are for those who make our choices. In emphasizing the opting, we too frequently ignore the options. We relegate to a subsidiary role the generating of the alternatives among which the choice must lie and the testing of whether the candidate options adequately exhaust the possibilities open to us or do justice to our creative powers. In emphasizing the optors, we also too frequently ignore the criteria by which the choices are made. We tend to leave unexamined the unprogrammed pressures that intrude into the decision making process. The spotlighting of the most dramatic part of the action -- the decision itself -- serves to render less visible the rest of the action; the decisions already implicit in the array of options placed before the decision maker, the decisions already existing in the decision making process, and in the yardsticks or pressures by which the choice is made.

In order to bring into perspective these overlooked but vital components of choice governing our movement into the future, we must bring before our citizenry the germinal ideas, the research programs, the unfolding trends, the prospective opportunities, the incipient threats, possibilities, probabilities, forecasts--all of the ingredients that go together to generate our options. We must view these ingredients and their implications not when the newspapers tell us that they have arrived as options on the decision makers' desks, but as long beforehand as is possible in order that they may be understood, discussed, assessed, and given appropriate support or opposition according to our preferences. Participation in the generation and assessment of options is the citizen's responsibility in a democracy. Citizen participation cannot be secured only through expression of choice after options are printed on a ballot. By then, the future has to a large degree already been shaped. In an age of rapid change a way must be found for the citizen to participate in the generation and selection of the options.

The Future State of the Union yearbooks constitute an experiment in finding ways in which this may be accomplished. The proposed yearbooks should have features which will lead to the development of methods by which

every citizen can generate his own scenarios of the future and assess candidate options. But the yearbooks must do more than facilitate the citizen's recognition of the possibility of choice. It is important that the yearbooks make visible the factors that impede the free exercise of choice. But even more importantly, to have choice without also having criteria for assessing or methods of opting is futile. Therefore experiments in evolving criteria by which we can assess and make choices must also be a feature of the yearbooks.

In accordance with these guidelines, the following subjects are proposed as candidate departments for the initial yearbook:

- ° Technological and Environmental Forecasts: anticipated developments and opportunities stemming from new scientific and technological advances.
- ° Highly Predictable Societal Developments: anticipated societal changes and reactions to technological and social innovations.
- ° Survey of Critical Situations and Needs: anticipated shortages, imbalances, and excesses in resources, society and the ecology.
- ° Societal Options and Scenarios of Possible Futures: anticipated consequences of low-likelihood dislocative events, choices and opportunities requiring evaluation and decision.
- ° Miscellaneous Features: overviews of major current plans and projects, resource inventories, statistics of key social indicators, etc.

The more detailed descriptions of these proposed departments follow in the next sections. In order for the yearbooks to be more than glorified newsletters, the selection of indicators and specific items to be compiled under the above categories must be organized so as to make visible progress toward avowed goals. That is, implicit in the concept of "State of the Union" are the idea of movement, an assumed set of desiderata, and a set of meaningful parameters that make visible motion relative to these desiderata or goals. To identify the salient indicators and how they can best be used to display significant social trends will require the experience of several years with feedback from earlier yearbooks. The organization need not be sophisticated at the outset, but its refinement is a continuing effort for subsequent volumes.

TECHNOLOGICAL AND ENVIRONMENTAL FORECASTS

The prime mover of most change in today's rapidly changing world is technological innovation. The accumulation of scientific knowledge and its application through technology have changed our standard of living, our style of life, our values, our mores, and even our basic view of the world and ourselves. And now it is becoming increasingly evident that technological processes through pollution and combustion are changing our eco-environment and, quite possibly, the climatic environment. If social change and environmental change are derivatives of technological change, then the most critical area of forecasting is technological forecasting. This not only because of science and technology's effect on the social and physical environment but because the level of technology defines the frontier of what is feasible for man to do, and in extending the limits of the possible the level of technology plays a central role in defining the area in which man's realizable goals must lie and within which normative decisions must be made.

With this much importance attached to the growth of scientific knowledge and to development of technology, we logically inquire what controls the manner and direction of this growth, how may possible future innovations be predicted and how are the preferable future innovations to be selected. Scientific knowledge grows organically. The researcher not only pursues those interesting leads that contain promise of a solution to his problem but also other interesting leads that may have nothing to do with his primary research problem. The direction of growth of knowledge is thus only partly controlled by research problem selection, and the exercise of the normative consequently does not effectively enter into the basic research stage. It is in the applied and developmental stages that normative go or no-go decisions are made. Thus, while the initial assessment of whether or not to pursue a lead may be made solely by the researcher, the responsibility for success or failure resting on his judgment; the subsequent assessments of whether to exploit the possibilities revealed by the basic research through its application and development properly involve the consideration of all the societal and ecological consequences of implementation. It is for this reason that what is indicated as a possibility by current and anticipated

research results should be assessed, before development, in terms of societal and ecological benefits and risks. An important function of the Future State of the Union yearbooks is to provide both forecasts of highly probable research results and, if developed, pre-assessments of their likely societal and ecological consequences.

Experience with the Delphi technique as a methodology of technological forecasting indicates strong convergence among the panelists on the developments that are most likely in the near future. The most uncertain components are the dates at which predicted developments will take place. There is also promising experience with the Delphi technique in technological assessments. Thus, for the Future State of the Union yearbooks, Delphi provides a useful initial methodology for technological forecasting and for advanced and after-the-fact assessments of prospective and accomplished technological developments. Possible procedural steps for Delphi forecasting and assessing technological change could be set up along the following lines:

- Survey of new and anticipated basic research results in various fields of science through interrogating key scientists and compiling lists of what research is being funded and conducted by universities, industry and government, with review of major Requests for Proposals.
- Evaluations of the importance and probable dates of realization of results, using Delphi scientific panel.
- Evaluations of social and environmental consequences of implementing probable future research results, using scientific and other Delphi panels.
- Publication in the yearbooks of the Delphi analyses of prospective research break-throughs, their probable dates of occurrence, and the societal and ecological assessments. Readers of the yearbooks who desired could then enroll as normative panelists to opt on the desirability of implementation of specific anticipated discoveries.

Until the present, the normative response to new technological possibilities has been to opt for the limit of feasibility. We have rather consistently done everything that our increasing technological capabilities permitted us to do regardless of the societal or ecological consequences. The idea of assessment in advance and possibly opting not to implement all new scient-

ific discoveries is only now taking hold. The proposed Delphi steps would inaugurate an experiment in evolving an alternative approach. A set of technological possibilities together with their social and ecological assessments could appear each year. The assessments of the normative panelists on the advisability of the implementation of the set could be published in the following yearbook.

HIGHLY PREDICTIVE SOCIETAL DEVELOPMENTS

The impetus of a two-century thrust of accelerated technological development has won for technology an almost uncontested role as the initiator of change. While great societal changes of the past (e.g., the Reformation and the French Revolution) were inspired by innovative religious and social thought, today's societal changes are almost exclusively responses to situations created by technological innovation. One result of societal evolution through adaptation to technological change is the near abandonment of socially innovated goals. Instead, the social normative is forced to find its primary expression through seeking to guide technological innovation in paths compatible with human weal and need. And to date, the social normative has had only a minor voice in shaping the course of technological development. This situation has two consequences. First, the process of evolution through adaptation to a rapidly changing technological environment defocuses innovative social thinking on basic philosophical considerations concerning the nature of man and the good life and refocuses on social *holding actions* to bind up the wounds created by some of technology's sharp edges. Second, the process of evolution via adaptation nurtures a growing normative pressure within the collective psyche that may surface with explosive force unless it can find expression in a genuine social normative initiative. As an example we may cite the increasing antipathy of youth to science and technology as an indicator of incipient normative pressure buildup.

The task of predicting highly probable societal developments contains two central components. The first is to project the likely social responses to the most probable technological futures in sight today. These most probable futures may be made available through the techniques described in the

section on technological forecasts. Since projecting social response involves a double prediction (both a technological forecast and the likely social response to it) the forecasts of future societal changes are subject to much greater uncertainties than technological forecasts alone. This double uncertainty which follows from the fact that forecasts, like probabilities, combine as products, not sums, emphasizes the already mentioned lack of a social normative initiative. It is conceivable that this one-sided dominance of technology to initiate change could be replaced with a growing ferment of innovative social thinking. For example, the appearance of such proposals as guaranteed annual income, semi-autonomous cultural communities such as hippie communes, pluralistic co-existing all-white, all-black and integrated economic communities introduces the requirement for forecasting and assessment exercises based on innovative sociological imagination. The Delphi methodological approach described for technological forecasting and assessment could be adapted with suitable panels for such social forecasting. However, until innovative social imagination catches up with technological innovation, the Delphi technique is a useful initial approach to the first of the two social forecasting tasks. A program based on the following could be used for forecasting highly predictable societal developments:

- Survey of the most probable social responses to the set of technological forecasts by joint sociology-technology panel.
- Survey of probable psychological responses to the socio-technological events using a socio-psychological panel.
- Synthesis of above responses with the assessments of normative panelists selected from the feedback from publication of the yearbooks.

The second societal forecast task is to reach the pulse that records the building-up of hidden normative pressures in order to anticipate what may later develop into intense overt reactions. Because this notion is central to the possibility of making accurate societal forecasts, it will be worthwhile to amplify how normative pressures build up within the collective psyche. From depth psychology we now know that a compensatory function operates between the conscious and unconscious realms of human nature. Pres-

sures build up when there exist imbalances in realizing all sides of our personal or collective nature. Because of the one-sided dominance of rational technological innovation, we can today see evidence for a counter-movement toward the irrational side of human nature in the widespread use of drugs, the withdrawal of youth from established social codes, the increase of interest in astrology, mysticism or Eastern religion, and the general disenchantment with science and technology. The germinal evidence of this anti-rational societal trend, however, was visible in art and literature since the turn of the century. Thus, it is to the contemporary art and literature that we turn in order to sense the pulse of present and future hidden pressures. The task of making visible what lies just under the surface of consciousness has always been the function of the artist, the poet, and the shaman of every age. These individuals and their creations are the precursors of consciousness. Had we looked, the trend toward withdrawal and experiments with drugs could have been detected in the writings of such authors as Jack Kerouac during the 1950s, for example, even though we might not have been able to predict the precise form it would take with the youth in the 1960s. Societal forecasters must find ways to incorporate interpretations of art critics such as Wylie Sypher, who points out that "just as the concepts of mass and force in modern science have given way to theories of field and ultimate particles, so, too, one finds in art and literature a corresponding trend toward the disintegration of the traditional representational objects and forms... The dominant themes of modern art and literature, and especially the tendency toward non-identity, reflect the major intellectual developments of our times." (*Loss of Self in Modern Literature and Art,* New York: Vintage Books, 1962.)

The second task for social forecasting may be approached, therefore, through identifying the central themes that appear in the imagination of artists. It will not be sufficient, however, to query artists themselves to obtain these themes, because creative individuals work to give conscious form to the images they encounter in the unconscious. The interpretation of the results of contemporary art must be done by those who are primarily concerned with detecting contextual and temporal relations among the products

of creative endeavors in the same manner that the fruits of scientific research require interpretation and assessment by someone other than the scientist.

SURVEY OF CRITICAL SITUATIONS AND NEEDS

One of the most valuable products of technological and social forecasts is the anticipation of critical situations toward which present trends are leading. Advanced knowledge of shortages and surpluses can be used cybernetically to relieve excessive fluctuations. Advanced knowledge of a shortage of medically trained personnel or a surplus of physicists can guide students in the selection of courses of study. Proper forecasting of needs obviously provides opportunities, but most "need" situations are cybernetically more complex than just oiling the squeaky wheels. The response to an anticipated shortage of medically trained people, for example, may involve implementations on many levels requiring different accommodation times. It is not just a matter of enrolling more students in medical courses to assure an increased supply of doctors in four to six years. New medical colleges that cannot begin to receive students before four or six years may be required. And the correction of the shortage may require a new educational orientation such as multi-level training for different health care tasks. The acceptance and implementation of such new approaches may require even more years before the tide can be turned. Hence, in addition to forecasts per se, a most useful feature of the Future State of the Union yearbooks would be forecasts giving the restorative effects of remedial measures taken to counter undesirable trends--"PERT" charts describing corrective responses and their probable effects.

In general, by a critical problem is meant a situation that is tending to a "crisis point" or a point at which some irreversible development occurs that radically alters the subsequently available spectrum of choice. Examples are an arms race moving to the crisis point of outbreak of nuclear war, increased pollutional alteration of the atmosphere leading to the triggering of major climatic change, spread of the use of drugs so as to lead to social collapse. Measures of criticality are given by the size of the area or number of persons affected, the temporal duration of the physical, social, or psychological dislocations, the degree of ultimate irreparability, and the

rate of approach to the crisis point. Since critical situations, as defined, arise out of the activities both of society as a whole and various of its sub-components, it is important to identify the major activities contributing to the criticality and their distribution among sub-groups. It is also important to trace the contributing activities to more basic activities and attitudes, disclosing both direct and indirect factors. For example, it is not sufficient to look at the problem of atmospheric pollution only in terms of the automobile and industrial smog. The total role of combustion in human activity and in the natural environment must be analyzed. It is also useful to examine the "characteristic times" in the growth of crises such as the time from recognition of a critical situation to the beginning of implementation of corrective action. Many critical situations have to do with approaching a limit in some natural or man-made resource. The values of known limits, estimates of the remaining distance to these limits, and rates of change in the use are important inputs for identifying characteristic times of such critical problems.

In many developing critical situations no solutions exist, and research must be undertaken with no precisely predictable timetable for the availability of results. In other cases solutions are available but years of education are required before political processes can respond to the needs. The advanced warnings of crises together with information regarding the availability or non-availability of solutions is the first step in the educational effort.

Today there is public awareness of many critical problem areas: pollution, education, health care, transportation, and so on. The public directly experiences the effects of these problems. But the trends toward criticality in these areas have been known to specialists for years--valuable years in which corrective steps could have been initiated at relatively smaller costs. A way is needed to make forecasts of critical situations available to the public and to train ourselves to respond before the consequences and costs of undesirable trends overwhelm us. To respond in advance is a *sine-qua-non* factor for man's survival in the future. Reprogramming ourselves for "before-crises" responses is one of the most critical long-range corrective measures to be made.

SOCIETAL OPTIONS AND SCENARIOS OF POSSIBLE FUTURES

The exercise of the normative process is limited by the spectrum of available choice. The available options are those produced by our imaginations and technological capabilities filtered by physical and moral allowability. Through our selection of indicators we frequently further reduce our options, returning areas of the normative to the determinative. For example, in measuring our progress through focusing on past performance and comparing rates of change or growth of income, productions, and so on, alternative possibilities available to us tend to become lost. The directions into which we move become dominated by our performance analyses and "we drive into the future steering by the rear-view mirror". Another example of a practice leading to the abdication of normative freedoms is market analysis. Markets are primarily where the "action" is and has been. The projection of markets into the future is confining the search for opportunity to the direction set by the push of the past. Large capital investments in certain product areas contain a determinative inflexibility that forces the customer to the existing product area rather than initiating searches for the areas of need toward which to alter production. It is in the inertia of such unwieldy configurations that the production advantages of bigness begin to weigh less and the flexibility advantages in being more responsive to need of smaller operations begin to weigh more.

The participation of citizens in societal options can be developed in the Future State of the Union yearbooks through scenarios of social configurations compatible with anticipated technological developments. For example, a future consisting of a set of societies each of which exists primarily on the recycling of its own bank of resources can be sketched in several alternative forms to present options for a world that will soon have to resort increasingly to recycling. The reader can then exercise his own creativity by developing alternative recycling societies compatible to his own preferences and values.

Another important use of scenarios is their help in thinking about low-likelihood events with major dislocative consequences. This is the type of event described in the model of change as a random event. What if the

President were assassinated?--a "random event" that Americans have encountered four times in their history. What if there is a major earthquake in California? What if an ICBM is accidentally fired? What if there is a nationwide power failure? And so on. Events of this sort can happen and, having happened in some form or other in the past, they enter into our thinking about the future in the form of contingency planning. In fact, we usually prepare contingency plans for foreseeable events whose dislocative effects are large enough though their probability of occurrence is small. But members of the class of foreseeables that we take seriously enough to counter with contingency plans are usually defined as having probabilities of occurrence sufficiently large so that they have already occurred at least once.

But there are other "what-ifs"; what-ifs that have not occurred before but if they did there is little question as to their major perturbative consequences. Large radio telescopes pick up signals that can only be attributed to transmission by another intelligence in the universe. A new death-dealing virus created in the laboratory accidentally gets out of control. LSD is dumped into the reservoirs of thirty major cities in the world. These are what-ifs conjured up in the imagination of science fiction writers, but their consequences and/or implications would be major. Except for having recognized their possibility--being forewarned is being forearmed--we have no plans for coping with them. The problem posed by this class of what-ifs is again how to treat them in our thinking about the future. Their probabilities may not be sufficient to justify the preparation of contingency plans. But their probabilities are sufficient to justify "contingency fantasies", that is, thinking through the possibilities, the implications, and synthesizing alternative responses without going to the formality of planning, creating organizations, or assigning responsibilities.

A third class of "what-ifs" are those random events whose explicit content cannot be specified but whose form can be imagined: a scientific discovery of revolutionary consequences, an unexpected watershed in our social and physical evolution, a totally unexpected dead-end to present practices; or a breakdown in our present systems.

The first class of "what-ifs", those that have happened before and for which we make contingency plans, constitutes tests of our practices and in-

stitutions. The second class of "what-ifs", those that have not happened before but which we can imagine in their specific content, constitutes tests of our motivations and Weltanschauungs. The third class constitutes tests of our ability to imagine. In thinking about the future, it is the responsibility of the forerunners of awareness to extend the realm of the imaginable and in so doing to become an early-warning network for the collective social and technological imagination.

MISCELLANEOUS FEATURES

In addition to the four principal features of the yearbook, sections making available certain statistical information of importance to futures analysis might be included. Even though these data are published elsewhere, their collection in one place may prove useful, if for no other purpose than to spotlight current thinking concerning the most relevant data for futures research. These could include resource inventories and their projections, statistical trends in key indicators such as population, college enrollments, unemployment, etc.

It might also prove worthwhile to present descriptions of major proposals and plans being considered or implemented by governmental and other institutions with evaluations of their impacts on the future (for example, ABM, SST, steam car, etc.). Overviews and critiques of such items as proposed tax modifications, drug legislation, and other controversial issues that require advanced public discussion could be included. The yearbook would serve as a forum for the pros and cons of new proposals in this section.

Additional features, as suggested earlier, might include new concepts and emergent ideas in the arts and literature and their portents--new utopian schemes, curriculum experiments and trends in education. These features would evolve when feedback to the successive yearbooks indicates the most effective material for achieving the primary goal of institutionalization of change.

CONCLUSION

It is reasonable to expect that progress toward the institutionalization of change on a national or global scale will be slow--perhaps too slow to respond to the urgencies created by today's anarchistic mode of change. Nonetheless, a beginning must be made and the proposed Future State of the Union yearbooks suggest a good beginning, their main defect being that they did not begin two decades ago.

Several factors jointly contribute to the slow pace of bringing order to change: Foremost among these is that the need to structure change and subject it to public norms is not yet fully appreciated. Second, at present there does not exist a functioning science of change. The science of Futures is in an embryonic stage though progress in the development of techniques and principles is rapid. Third, there are powerful commercial interests whose short-term advantage is to continue unfettered their present practices of reductionist innovation. "Planning" is generally a dirty word and held to be a threat to freedom. Finally there is the immense inertia of centuries of custom and of the habit of thought that holds the future to be the business of the future.

It is on the level of these habits of thought that the greatest challenge to our future exists. There is little question but that effective techniques of forecasting, determining cross interactions of various technological developments, and ascertaining people's feelings about trends can be devised. But can the traditional attitudes that localize self-interest provincially in space and time, and the traditional behavior patterns that respond only to short-delay feedbacks be illuminated as having become dangerous to those who possess them and to the world as well? Herein lies the basic challenge of the future. This challenge itself reflects a crisis--perhaps the crisis that underlies most of the others.

ANTICIPATED SOCIETAL DEVELOPMENTS IN THE NEXT 20 YEARS

Albert Wilson

21 December 1970

Growth of cultural pluralism finding habitation in new polis type communities.

Growth of global federalisms in business, science, and education.

Increasing recognition of the "dead-endedness" of the national state and its inability to cope with the world's problems. Erosion of the power and influence of the nation state both through increasing restoration of local sovereignty and the creation of global social structures through mechanisms functioning according to Deutsch's Theorem (Bull.Atomic.Sci., Nov.1970, p46).

Appearance of "desovereignized" international areas throughout the world. These may initially be "deweaponized" areas like Antarctica, later the innaugeration of politically autonomous regions reporting only to a global security organization.

The end of the era of "National Man". Individuals will seek identity through vocation, world view, or commitment rather than through place of birth or nationality.

The growth of "intermediate technology" in both underdeveloped and developed countries to assure economic autonomy from centralized industrialization.

Downgrading of centralized authority - political, religious, academic, whatever. This would have such effects as the erosion of credentalism.

Coercive "backlash" on the part of centralized authority taking various forms of economic, legal and social "excommunication" with possible violence.

The major dialectical theme now emerging, which subsumes the above specifics, is the struggle between authoritarian centralism and diffused pluralism. This struggle is redefining the major dialectical theme of the past century (see Churchill, Whitehead, etc.), that is, egalitarianism (homogenization) versus elitism (special priviledge). Under the new definition, far right and far left become bedfellows.

FUNDAMENTALS OF FUTUROLOGY

Final Exam

The list of sixty-six 'T' statements generated by the class during the quarter provides an overview of both the determinative (in the sense that the T statements represent trends) and the normative (in the sense that the T statements incorporate preferences) futures that are open to us. From your considered interaction with these statements (taken as given, taken in part, or as supplemented by their suggestiveness), select the set of trends you feel will most likely play a major role in defining the future. Consider their implications and interactions and prepare your scenario of the most probable future.

This is not an exercise in imagining the future or expressing your preferences (these will unavoidably be in your analysis, however). It is a reflection of your 'gestalt' interaction with some of the directions in which our culture appears to be moving.

Your scenario should not attempt to describe every facet of the world of the year 2000, but to sketch those aspects that come through to you as highly probable implications of the salient trends. Your scenario should not be over four typed pages in length. It should include an explicit crisp statement of each of the salient trends you select. (To avoid overload, it is suggested you restrict your considerations to fewer than six trends.) A prefered format would be to structure your scenario in terms of prevailing life-styles, institutions, values, attitudes, processes, and products. Omit detailed descriptions of gidgets and gadgets; emphasize effects or implications of projected products and processes.

The exams will be due 17 June at the last meeting of the class. In addition, be prepared to give a 10 minute presentation of your scenario at this last meeting in order that we may all benefit from an exchange of ideas.

T.1 New forms of family organization will develop with communal families more common. People may choose to live in groups to cut down on the tensions of inter-generational conflict. With a group there would be fight arbitrators available as well as a wider range of people to care about and interact with. This would cut down on the current number of lonely, frustrated parents expecting to live through their children.

T.2 Trend toward disappearance of the ranch house in the suburbs with an increase in easier to maintain condominiums. With less room to live in there will be less emphasis on material possessions which crowd the life space. Furniture will be increasingly built in. Money currently spent on the home will be spent on recreation and education. The emphasis will be on experiences.

T.3 People will become a world people -- race and nationality will have little meaning. Society will consist of small groups of persons drawn together temporarily by common work or recreational interests. Man will be very mobile, moving from group to group, place to place, job to job, with great frequency. The family unit will still exist among a conservative portion, that is, less mobile unit of the population, but will have disappeared among the highly mobile persons. There will be a lot of leisure time.

T.4 Complex machine systems will free man from blue collar and white collar jobs. These persons will then be available to explore new technological areas, build new machine systems, and the process will repeat itself. A certain portion of the freed-up work force will always be in the process of learning or retraining.

T.5 World markets will continue to consolidate, forming larger and fewer economic groupings. This economic cooperation will lead to political cooperation. National boundaries will tend to disappear. These economic changes will affect man socially.

T.6 Man will conquer pollution. There will be very few wilderness areas, most of the land having been given over to the urban areas. Man will be living on other planets, in space stations, and under the sea - wherever his work takes him.

T.7 Man will consider himself a free agent and government will have little control over him. Work will be very important to man. His social group, his leisure time activities, his home type and family structure may be determined by his work-type, availability, and location.

T.8 The 'experience' will become increasingly important to man. He will buy an experience along with a product. Drug induced experiences will become more popular. Drugs will be legalized. Because man considers himself a free agent, there will be no moral or ethical standards to which he feels bound. He will adopt or fit in with the moral and ethical practices of his temporary social group. Man's behavior will change as he changes work/social group.

T.9 An increasing gap between the thinking of the older generation and the younger. The old middle-class values will be less and less trusted , as they are not found to work in a world where productive effort is rewarded by higher taxes and where the future is seen as so frightening that enjoying the present seems the only plausible course to many. Increasing fragmentation of the American scene into different pressure groups.

T.10 Taking the determinative to mean forces which can be altered by the actions of man, I believe that the life circumstance of the world populations are progressing toward utopian concepts and that the persistance of the appearance of a situation is accepted as the actual status of the situation. Since drugs, electronic and other means are rapidly becoming available for mood-changing, it is reasonable to believe that such means can be employed to predictably alter that which man senses. This will alter 'appearance' which, if they persist will be thought to be reality. It is probably easier to provide man with altered senses than to alter reality. The trends which could easily dominate the global future is the continued dissemination of psychologically oriented propaganda, materials and devices destined to alter man's concepts of reality.

T.11 A revolution in educational methods will lead to more unification among socio-economic equals, cutting across racial and religious barriers. Liberalizing and changing concepts of marriage, divorce, abortion, planned parenthood will change the structure of the family.

T.12 An increasing use of computers and robots to do both menial and complex jobs.

T.13 There will be less ethnic differentiation between products of different nations with the low bidder (i.e., the country with the lowest paid labor) making a majority of the merchandise and the wealtheir nations specializing in technological areas. Inflation will continue at a similiar rate. Shorter work hours. Ever-larger middle-class with fewer very rich or very poor. A trend toward an increased tax bite.

T.14 A trend toward more government crack down on polluting industries and protection of natural resources. A trend toward smaller footage living quarters.

T.15 A trend toward an emphasis on self-knowledge, mind-expansion, privacy, personal dignity. There will be less hostility toward minority groups including women and homosexuals. Hostility will be deflected toward 'Big Brother' government, high powered corporations and crowded conditions.

T.16 A trend in the evolution of new modes of international conflict. World powers, overtly or otherwise, tend to search for means of sustaining nationalistic competition without endangering national survival. This will lead to a number of experiments and changing alliances and will exert a great influence upon social trends after the fashion of the current Viet Nam experiment.

T.17 Technological progress relating to the physical sciences will be controlled more by environmental considerations than at present and less by military/space exploration needs. However, the behavioral sciences will receive increasing support by governments as means of promoting national interests.

T.18 A trend toward changes in the patterns of distribution of people and use of resources. Modes of production will change due to advanced technology and altered needs of society.

T.19 Due to increased numbers of people there will have to be changes in transportation patterns. It will no longer be feasible for people to each travel 20 miles per day. Alternatives will probably be centered around reducing short-range travel time by living and working within walking distances.

T20 New cities will probably spring up in uninhabited areas. Through development of recreational, cultural, and educational facilities most parts of America can be as desirable as the costal areas are now. Similar changes will occur in the rest of the world.

T21 Current trends toward a four day work week will probably develop into more flexibility in work schedules. The main result will be more leisure time or at least more concentrated blocks of leisure time. The recreation industry will probably expand to fill the expanded market. Educational planning will also have to allow education for leisure. Other possibilites are job sharing with two people each doing half a day's work and expanded work study programs.

T22 The current widespread use of credit cards points toward an abolition of money in the future. The credit card can become a substitute for money and also reduce crime. Each adult would have his own card. The card would be presented for payment and checked against his thumbprint for identification via computer scanner. The computer would transfer credits to the vendor and keep track of the purchaser's credit limit. Workers would receive credits from their employers rather than paychecks.

T23 Technological developments will be used to control the environment in such a way as to benefit society without upsetting ecological balances or poisioning the environment. In the future effects of chemicals will be studied throughout the food chain before large scale application.

T24 Trend toward controlling pollution in the food supply. New food sources will be developed, one source will be fish flour.

T25 Advances in medicine will lead to the control of cancer. Trend toward the emphasis on preventative medicine. New paramedical professions will develop to handle increased patient loads. Doctors will probably be part of a medical team. More plans such as the Kaiser medical plan will come into being, but with government support. There will be some form of socialized medicine available in most countries.

T26 Scientists will work with planners to trace environmental effects. The general population will be made aware of the need for intelligent long-range planning.

T27 An increasing variety of life styles and more acceptance of the right to 'do your own thing.' Women's Lib will influence life styles so that there will be less rigidly defined roles for men and women. Child rearing styles will be a matter of choice with many alternatives available. Children can be reared by parents together, the husband, the wife, relatives, professional parents, or a child care center. Each person will have the right to develop intellectually and direct this development toward a career without having to feel limited by his or her sex-role.

T28 Jobs will be restructured so that each worker can feel he is doing a meaningful job. Jobs designed for people of limited intelligence would be difficult to restructure to give a feeling of accomplishment, they could be redesigned to heighten the worker's group loyalties with employer-sponsored recreational benefits. These changes would result from industrial psychologists work to make everyday behavior rewarding rather than frustrating.

T29 Crime will decline. Since money won't circulate, crimes involving cash will be eliminated. Crimes involving theft of objects will be made more difficult through burglar proof locks and design. Crimes of violence will decline because of attempts to reduce frustrations that lead to violence.

T30 Social behavior will become less rigid. People will drop their prejudices and judge others as individuals on the basis of shared interests and life styles.

T.31 Social changes will be individually initiated. Marriage will lose popularity among the young. Those who marry will do so at later stages of life. People will use other means to counteract lonliness. They will probably have more friends, in more places than now. There will be an increase in joining groups to meet others with similar interests. Although there will be more acquaintances made between people, they will not last as long.

T.32 Transportation will be mainly in the form of more efficient ground transportation. Communications will receive much of the benefits of technological improvement. There will be more efficient access to other people and to stored information. Computers will advance in sophistication. Within 30 years, we may actually have computers that are capable of automatically improving themselves. If environmental problems are solved, then we will be entering an era where machines will do most 'work', and man will be free to explore the arts.

T.33 If the affluent society remains such, then environmental problems will be solved through the investment of time and money. Should the problems of an expanding population destroy the affluent society, then environmental problems will be solved only through a decrease in the standard of living. I am hopeful that whatever the course, the environment will improve.

T.34 In a society such as ours, there will be a reduction in the amount of individual 'work'. This will permit more people to spend their time doing what they enjoy doing. For many, this may be non-productive, therefore, there will be an increase in 'public welfare', although it certainly won't be overt as in the present form. Unless we accept this fact, and are willing to subsidize the non-productive, the the percentage of poor will increase, possibly destroying the system. Other events may change this economic trend. World overpopulation could have drastic effects such as a return to individual capitalism. Only if there are enough resources for all will there be a continuation of the trend toward a form of socialism.

T.35 The determinative attitudinal and behavioral trend is toward increasing acceptance of differences although there will also be a trend toward not dealing with those who are different. People will be allowed to behave in their own manner as long as they don't bother others. For example, integrationist blacks and whites will live together, segregationist blacks will live together, segregationist whites will live together, etc. In the developed countries, violence as a means of change will be avoided by most. This trend in attitude will become more popular.

T.36 The requirements for nuclear weapons are computor time and either highly purified U235 or Pu239; or fusionable material such as deuterium and Li6; and a trigger. All of these already are or will become available to even the smallest country and to a great many organizations and even some individuals. Computor time is a cheap, ubiquitous commodity. Two uranium isotope separation processes (the gas centerfuge and the South African process) can produce bomb grade U235 in small, relatively inexpensive plants. The cation exchange method and possibly, the plasma spinner seperate U235 to a purity adequate for a plutonium producing breeder reactor. The chemistry and metallurgy of uranium, plutonium, and fission products are in the open literature. Within the next decade, many nations and perhaps a few organizations will come to realize that they can have A-bombs on a small budget. The methods for producing fusionable material are in the open literature. Two non-nuclear methods have already initiated fusion: lasers and high explosive electromagnetic implosion. In about 30 years (or sooner with some breakthrough such as room temperature superconductivity) any good electrical engineer will be able to build a mini H bomb at a price he personally can afford.

T.36 cont. There is no way of preventing the smuggling and planting of timer detonated nuclear weapons. Wars could become chaotic and protracted, with no safe havens outside of the wilderness, and with no certain knowledge of who is doing what to whom and why. These technological developments could make the nation state obsolete as an instrument of defense. The continuance of political systems of human organization could result in the abandonment of population concentrations and the presence of a dangerously high general radiation level.

T.37 Biological weapons are cheap and can already be produced by suitably educated individuals. Their target area is much less restricted and less predictable than that of small nuclear weapons, hence they have seen relatively little use compared to guns and bombs. Nevertheless, in bloody civilian target wars between small states (such as those that have recently occurred in Africa), they may be used.

T.38 The doubling time of knowledge will continue to decrease and accessability of the knowledge will increase due to commercial plain language user interactive computor data search services.

T.39 In computer hardware, the general trend of an order of magnitude cost reduction every 5 years for a computor of given capabilities will continue. Fourth generation will lead to fifth generation, very large scale integration and higher yield, possibility simplified production methods. Then comes sixth generation - magnetic domain machines - which will be even cheaper, faster, smaller, more reliable, and may have radically different logic structures. We have come only half way to the year 2000 and the near certainties are already difficult to comprehend. Certainly by 2000, every new house will have its own computor and/or a remote terminal to a network of extremely powerful computors.

T.40 In computer software, plain language conversational interactive programming languages will make computors usefull to everyone. Heuristic programming and artificial intelligence, currently just beginning to be commercially successful, will have a broad range of uses. Its growth will be hindered by teachers' unions, medical and psychiatric associations, etc., which threaten their service monopolies. Nevertheless, many children growing up around the year 2000 will look upon computors with which they personally interact as friends and even brothers.

T.41 Commercial, controlled thermonuclear reactions about the year 2000 will provide cheap clean safe energy at a rate limited only by the danger of melting the polar ice caps. At this rate, the 1 part in 7000 deuterium in the oceans will last billions of years.

T.42 Room temperature superconductors are a distinct possibility before 2000. These would greatly help controlled fusion and pocket H bombs, would eliminate ugly wires from the landscape, and would make possible commercial exploitation of the entire solar system with fusion rockets. If the cost of the material is low enough, automobiles would be powered by electricity stored in superconducting coils.

T.43 Cancer cures, artificial or tissue culture organs, aging retardants, intelligence and learning boosters, heriditary defect correction by genetic alteration and all sorts of other medical goodies will come along. The FDA and the medeval medical guilds will slow things up, but sooner or later you can get anything you want at Alices restaurent.

T.44 Such factors as the Vietnam War, the use of psychedelics, police brutality, rising taxes, bureaucratic encroachment on freedoms, exposure of government dossiers, etc., have lead to a general decrease in respect toward the state. Although most visable amoung young people, the effect is not limited to them, e.g.,

T.44 cont. the Wall Street Journal notes 'tax evasion is a fun crime' and their many sympathetic articles toward all sorts of black market entrepenures including psychedelic manufacturers and dealers; conservatives calling for a tax strike and scrapping about 90% of government, the growth of substantial numbers of laisse faire anarchocapitalists even within the Birch Society, most radio stations refusing to go off the air upon receiving the Presidential Emergency Order and refusing to obey the FCC order on drug music, 63% of the taxpayers refusing to answer the foreign bank account question, etc. This attitude will continue to grow and will lead to some interesting results since no government can rule without the sanction and at least passive acquiescence of the majority of its victims.

T.45 Tolerance (not approval) toward individual with differing values will increase as the magnitude of the range of differences and the number of people involved become more apparant. This tolerance will be manifest in interpersonal interactions to a far greater extent than in the law.

T.46 As science and technology clean up the pollution mess, cure cancer and biochemical defects, etc., the high level of current hostility toward science and technology will decline; but a waryness is apt to remain since state schools will not teach people to discriminate between the results of political misguidance of science and technology and its inherent dangers.

T.47 More people will drop out of impersonal institutions or avoid them at a rate limited by state controls (compulsory school laws, laws attacking agoric enterprises, etc.) and their inhibitory effect on the development of more rewarding alternatives. The biggest barrier to the great escape, the mental block against the out of the ordinary,has been broken in many respects for a substantial part of an entire generation.

T.48 Knowledge of the organization of the human organism will increase and be effectively applied through the use of electronic feedback mechanisms. It is already possible to volitionally control 'involuntary' physiological functions, individual muscle fibers, certain aspects of the EEG, etc. Training methods built on this knowledge and advanced instruments will be used to correct sexual malfunctions, providing an astounding range of human adaptability and capabilities. Improved techniques for mentally storing and accessing information could make usual educational techniques futile and damaging by comparison. Governments have exhibited considerable interest in behavior modification machines, however, I coubt that most people are such sheep that they will tolerate the widespread coericive application of behavior modification gagetry.

T.49 The behavioral change with the most far reaching consequences would be a wide scale adoption of libertarianism, but I don't expect this by 2000 ... at least not in the general populace. Geographic and non-geographic communities of libertarians will probably be flourishing by the turn of the millennia, however.

T.50 A trend away from the five day, forty hour work week. This means more recreation, more part time income from personally enjoyed and developed skills, and a greater elective range of behavior possible to everyone, though of course, many people will have become too deeply interred in their ruts to see novel alternatives.

T.51 Social control of progency that goes way beyond dissolution of marriage as an institution. Some means will be provided such as fluoridation of the water supply to inhibit tooth decay, whereby men and women will be rendered impotent. To have a baby will therefore be a conscious act between two individuals who will have to demonstrate commitment to the responsibility involved, and

T.51 cont. competence in child-rearing, before an antidote is supplied by the state. The antidote will be administered to both partners and will take some appreciable time, say 3 months, to take effect. The antidote will be a matched male-female set, thus facilitating childb th only to the couple in question. In this way, not only will some social control be exercised over the magnitude of the population, but it will represent an attempt to restore parental responsibility for children. State institutions will continue to exist which will rear children in the absence of their parents, in the event that parents 'split up' after the birth of a child.

T.52 Automation of information on a large scale - computers in the home, available off the-shelf at TV prices, voting from the home daily on local, state, and national issues, education in the home from predominantly private free-market sources for all levels of competence, all subjects, and different methods. Ability, through link-up with the city library, to obtain any of a wide variety of books, journals, magazines, reports, indexes, and so on. Books as we know them today may be obsolete and stored in museums rather than libraries. A query service, run either by the state or privately, will be in operation where information may be obtained by anyone on general questions, e.g., the availability of certain types of jobs in a certain city, industry, firm, agency, salary range, etc., or transportation schedule information, sales at stores, what bills were passed in Congress (or the equivalent), etc. Other kinds of information, particularly about individuals other than onesself, will not be available generally. Information about the future (forecasts, etc.) on general subjects will be available.

T.53 There will be an international medium of exchange (money) which will be cashless. Together with the trend in information automation, accounts anywhere in the world (especially the US and other advanced countries) can be debited and credited automatically for whatever reason and wherever the individual is, even if he is remote from the transaction. Of course, the problems associated in validation of transactions and identification of the payer/payee will have been solved (numbers, voiceprints, fingerprints). Thus, money as we know it will become numbers in accounts which simply fluctuate. Money will not exist as a physical entity.

T.54 Control of the weather - no moresmog, hurricances, floods, typhoons, heavy rains, or cyclones. Creating rain for parched desert areas may still be a problem, if pumps and canals bring water from elsewhere hasn't solved it. The technology of satellites and computers will solve the problem of identifying weather 'trouble spots' in time for other techniques of weather alteration (or dissipation) to be applied. This will also require international cooperation on a scale unimagined at this time, particularly in areas of funding and desire to affect the weather at certain times.

T.55 Increasing disregard for authority - many government institutions existing today will be dissolved or have sharply reduced jurisdictions and power. Society will be more 'horizontal' and pluralistic. This trend will permeate to the way businesses are run (e.g. managerially-advanced firms) and families hold together especially without the formal and legal ties of marriage. Group and social consensus will become dominant, although I hope alternatives will be available for those who dissent or prefer to do their own thing.

T.56 Increasing dependence on group behavior - the need for self-reliance and independence will decrease. It will be a value that is less held by individuals and by society in general. Power will become diffuse (primarily because privy information will no longer be available but shared equally) and groups of various sizes and types will become more prominent as decisions are reached increasingly

T.56 cont. by consensus. In an increasingly automated world, interpersonal actions and affiliations with groups will become socially desirable and a political necessity.

T.57 Decentralized government, nucleating at the city level or even below. For example, in Soleri's ARCHOLOGY concept, each mammoth building will become a viable political entity with its own mayor, councils, voting, etc.

T.58 Growth of cultural pluralism finding habitation in new polis type communities.

T.59 Growth of global federalisms in business, science, and education.

T.60 Increasing recognition of the 'dead-endedness of the national state and its inability to cope with the world's problems. Erosion of the power and influence of the nation state both through increasing restoration of local sovereignty and the creation of glo al social structures functioning at levels lower than national levels.

T.61 Appearance of 'desovereignized' international areas throughout the world. These may initially be 'de-weaponized' areas such as Antarctica, later the innaugeration of politically autonomous regions reporting only to a global security orgnaization.

T.62 The end of the era of 'National Man'. Individuals will seek identity through vocation, world view, or commitment rather than through place of birth or nationality.

T.63 The growth of 'intermediate technology' in both underdeveloped and developed countries to assure economic autonomy from centralized industrialization.

T.64 Downgrading of centralized authority - political,religious, academic, whatever. This would have such effects as the erosion of credentialism.

T.65 Coercive 'backlash' on the part of centralized authority taking various forms of economic, legal, and social 'excommunication' with possible violence.

T.66 The major dialectical theme emerging is the struggle between authoritarian centralism and diffused pluralism. This struggle redefines the major dialectical theme of the past century, that is, egalitarianism (homogenization) versus elitism (special priviledge). Under the new definition, far right and far left become bedfellows.

0.1 Communications opportunities include keeping in 'touch' literally over great distances. Thus, it will be less painful for man to undertake long trips thru space, relocate in other parts of the world or in other worlds, as he can maintain close contact with whom or whatever he wishes. In his highly mobile life, superior communications systems will provide an umbilical-cord-like function - the nourishment by loved ones when he is far away from them.

0.2 Keeping up with the times will be possible by using personal and/or family, area, business, etc., computers to handle all the data one wishes. Man's personal computer would have full knowledge of his value judgements, interests, business and personal affairs and could function as an alter ego. It would obtain data of interest, make lower level decisions, maintain tickler files along the lines of OLIVER ("Future Shock"). Overchoice brought on by an increase in goods and services available would be tamed by the personal computer. The services of an OLIVER would give man the feeling of being a free agent subject to little control by government or anyone else. Actually, one would be subject to a great deal of control, would realize its necessity, and would hardly be disturbed. His personal computer will handle all the petty details resulting from a highly regulated society and obtain necessary licenses, pay taxes, vote, etc.

0.3 Transportation opportunities are that world-wide and inter-planetary travel will be common. A new type of frontiers-man, the space traveler/settler, will emerge. Personal transportation available to man will allow him to range wider and farther from work/home. Thus, he may not have to move when his business move/changes. Since business will not have to centrally locate to attract workers, the city will decline in importance as a business center.

0.4 New forms of buildings and houses will change the faces of our cities and suburgs - hopefully for the better. Machine systems will keep large areas functioning - water, power, and maintenance services. Houses will be cheaper and thus available to a larger percentage of the population. Space will be limited but people will be use to less space. Advances in communications and transportation will provide the 'space' in the world.

0.5 Man can look forward to a longer life. He will be free from the diseases he fears today -- senility, cancer, mental illness, etc. -- but there may be new diseases which will threaten him even more.

0.6 The intelligent man can look forward to new opportunities in his work and leisure life. Work will provide new challenges, education will be a continuing process, there will be more money available and more things to spend it on.

0.7 There will be a better standard of living for all resulting from the industrailization of underdeveloped countries and the organization of world centers as opposed to national and economic centers. This will free man from a certain amount of nagging concern for the rest of the world.

0.8 There will be opportunities for those prepared for them.

0.9 Computers will generally become cheaper and cheaper providing many opportunities for individuals to use in scientific and eventually in ordinary consumer activities such as a programmed kitchen.

0.10 Life extension drugs (BHT is already being experimented with) and intelligence-increasing drugs (RNA) will become more readily available, almost exclusively on the black market. The FDA and government will continue to attempt to obstruct new drug development, but will be thwarted by a growing black markert.

0.11 There will be opportunities to ease the control the State has over individual lives. For example, tax evasion will become a big-time activity. Black market phony documents will make it easier to travel and work without government interference. At the same time that these opportunities will be working against continuing growth of Big Brother, Uncle Sam will be trying to work the other way. However, it is simple too complex a system for Sam to make it work, and the State will gradually become out-of-control in many areas.

0.12 For those who have imagination, there are many opportunities to make money and keep it away from the State. Agoric enterprises, based on independent subcontractors, will become more popular. Black market opportunities are almost unlimited since anything that people want and the government "forbids" equals a market need to be filled at a profit. The black market will become even more efficient through the use of newly developed technology such as telephone scramblers making wire-tapping useless and obsolete.

0.13 New methods in psychotherapy,mainly special drugs. The chemical basis of schizophrenia is an example.

0.14 Robots, space travel, and communication with beings from other planets.

0.15 Artificial and/or cultured organs, better prosthetics, life support systems, semiautomatic diagnosis, increased intelligence, end of normal old age, senility, and most cancer and cardiovascular disease, substantial life extension by slowing of aging process, elimination or adequate control of most psychoses, beginning work on regeneration such as regrowth of teeth and hair.

0.16 Less sanction of state coercion as exemplified in more tax evasion, black market, business and sumptuary law violation, more tolerance of differing non-coercive values, wider acceptance of libertarianism, some overt extra-territorial and some internal underground libertarian communities.

0.17 Socio-economic opportunities include the growth of the black market, and the spread of agoric enterprises which are muchless subject to government controls and taxes and are more efficient and more responsibe to the individual values of various workers.

0.18 Improved learning and unlearning methods for cognitive, affective, and sensory motor activities.

0.19 Fusion power, possible room temperature superconductors (revolutionizing surface and ocean transportation, economical interplanetary fusion rockets, incredibly compact high power tools, etc.)

0.20 Cheaper and better computers and software (very useful for information correlation and retrieval, education, product design, data processing in experiments, automation, artificial intelligence, and even the first real robots).

0.21 Provacy devices such as telephone scramblers, debuggers, and police agent detectors which will make wiretapping obsolete and greatly facilitate black market activities. Protective devices and private services.

0.22 Biological opportunities include increas life expectancy to a near optimum value and the decrease of anomalous physical and/or mental characteristics.

0.23 Social opportunities include the development of an effective means of voluntary population contol and the introduction of a substitute for destructive conflicts such as war.

0.24 Resource opportunities include converting most of the world's land area into arable land, partial control of weather, means of preventing natural disaster by forecasting and warnings, and new energy sources.

0.25 Mood changing is currently accomplished by altering one's outlook. This may come about synthetically by ingesting, inhaling, or injecting drugs, the alteration of senses in rose-colored glasses, music or sounds, etc., or in a more direct vein by altering the brain itself. This is a matter of location and identification of the areas of the brain where certain moods may be embodied.'

0.26 It will become possible to stimulate the brain directly - hopefully without an operation. Those who control the means for accomplishing this will increase thier influence or security.

0.27 The home computer terminal will probably marry up with pay-TV. It will provide an escape from boredom as well as some useful functions. Individuals who provide programs, hardware and auxilliary materials should achieve greater levels of influence and security.

0. 28 The most significant opportunity for people in the next 30 years will be an increase in educational opportunity. This increase will represent qualitative as well as quantitative changes in education. There will be an increase in government supported schools so that everyone can get at least a junior college level education. Forms of education will change to emphasize current methods now found only in 'free schools'. Computer assisted instruction will also be a part of education. Education will be considered as a continuing process and schools will be open to all members of the community. Schools will emphasize everyday living skills while colleges will concentrate on specialized skills and ideas. The degree will no longer be required for an ordinary job. Job training will take place in other parts of the system.

0.29 Technological change will provide opportunities for new kinds of jobs and new inventions for everyday use. Much technological change will center around communications. Homes will have two-way TV telephones. Computer terminals will be available to the general public. Home video tapes will be used for entertainment and for education. Advances in technology will also lead to pollution control.

0.30 Social change will bring new roles for men and women and new family systems. Communal life styles will be more common. Child rearing will not be limited to the housewife. Both men and women will have the freedom to pursue education and careers.

0.31 An increase in leisure time will be the most challenging opportunity in the future. The problem of how to combat boredom will be more apparent than it is now. Having adequate food, clothing, and shelter and jobs that are rewarding, most of the things people now complain about will not be things to complain about in the future.

0.32 Increased citizen participation and control of government processes, particularly resource allocation decisions of tax monies, and even how much and how collected these monies are. To do this, increasing use of information technology and computers will be necessary, but most importantly, unbiased and accurate information must reach the voters in time for them to make reasoned decisions. At present, even efforts by the media, though well-intentioned, fall short of this mark, We need more Nader's Raiders, Councils on Economic Priorities, environmentalist groups, and concerned individuals who support their statements with well-documented facts.

0.33 Allied with the opportunity for increased citizen participation is the "unbureaucratization" of government. If a government could be made to operate as a business -- with well-defined measures of effectiveness and goals -- so that its several agencies behaved in a manner akin to corporate divisions, then the kinds of things government was in might change (the business wouldn't be "profitable") and the things they elected still to do would be more responsive to the electorate by definition.

0.34 Once we (as nation, state, region, group, or institution) have decided what action we want to take based on a particular notion of an end-state, in turn based on a value set, and laid out the alternative strategies, long-range planning will take on some meaning and be more conducive to action than ever before. Actually, the uncertainty of deciding what value set will give rise to a variety of alternative end-states or futures. Resolving this will mean the involvement of all who will be affected by such planning.

0.35 The increase in R&D expenditures (for both pure and applied research and invention) when such decisions are directed by long-range planning. Society should benefit as much as it can by technological advances while minimizing or avoiding the social costs which often result.

0.36 Education: not the bureaucratic kind which prepares one for elitist values, possible unemployment, and further schisms in society; but more directed towards understanding society, getting along with people, doing your own 'thing' and inculcating into people a realization for continuing education. How better to serve society will be a key motivation.

0.37 Reversion to the intimate 'neighborhood' concept of city and urban planning - malls for shopping free from the automobile, clusters of living spaces with all ammenities close at hand, particularly open spaces and playgrounds, freedom to pay for social services voluntarily according to use, ability for people of differing socio-economic-ethnic backgrounds to live in the same neighborhood.

0.38 Greater participation of private enterprise in the public sector in providing what economists refer to as 'public goods' including both services and products. Examples are mail, protective, and fire services, and 'packages' for waste disposal or recycling, instant parks and playgrounds, and power generation.

A DELPHI EXERCISE ON FUTURE LIFE-STYLES

	5 Years	10 Years	25 Years
1. What will the prevailing type of community be in 5, 10, 25 years hence: urban, sub-urban, small town, rural, other (specify)?			
2. How will most people be supporting themselves (bread/butter sustenance) in 5, 10, 25 years hence: by working for others, by state welfare, by investments, by own business or profession, other (specify)?			
3. What will the prevailing relation between the sexes be in 5, 10, 25 years hence: monogamy, multi-couple, varied sexes and number, two or more of same sex, other (specify)?			
4. What will the predominant family structure be in 5, 10, 25 years hence: nuclear (parents plus children), extended (blood relatives plus children), clan (community of friends and children), children reared by the state, other (specify)?			
5. Will individuals have more or less personal freedom in the following areas:			
privacy:			
mobility:			
expression:			
environment:			
relationships:			
6. From which will the greatest threat to the quality of life come in 5, 10, 25 years hence: (assign weights 0 - 5; 5=greatest, 0=no threat)			
war/weapons:			
famine:			
pollution:			
technology:			
manipulation:			
7. How will children be educated 5, 10, 25 years hence: state schools, private schools, self-education, apprenticeships, other (specify)?			
8. Which of the following will carry young people's interest in 5, 10, 25 years hence: (assign weights 0 - 5; 5=greatest,0=none)			
careers:			
marriage:			
society:			
individuation:			
survival:			

DELPHI EXERCISE ON FUTURE LIFE-STYLES:FIRST ITERATION

1. Prevailing Community Type: Whereas the urban/suburban pattern will most probably dominate for the next ten years, most of the respondents feel that the urban/suburban patterns will be replaced in 25 years. Which of the following community patterns will predominate in 25 years (check one):

   _____ 1 Megopolis

   _____ 2 Small urban-like communities separated by rural open space

   _____ 3 Communication linked, geographically dispersed communities

   _____ 4 Present urban/suburban patterns

   _____ 5 Other (specify)

2. Bread/Butter Sustenance: Whereas in the next decade, the predominate mode of support will probably be similar to present patterns with most people employed by working for others, most respondents feel that alternative patterns will prevail in 25 years. Which of the following employment patterns will predominate in 25 years (check one):

   _____ 1 Working for the State/Government

   _____ 2 Some combination of Welfare and working for the State/Government

   _____ 3 Working for the private sector

   _____ 4 Other (specify)

3. Prevailing Relation between the Sexes: The present pattern centered in monogamous marriage will probably predominate for the duration of the seventies. When will the predominate relation between the sexes become some form of multi-couple arrangement (check one):

   _____ after 1980

   _____ after 2000

   _____ never.

4. Predominate Family Structure: Whereas the prevailing pattern of nuclear family (parents plus children) will continue to predominate in the next decade, most respondents feel alternative patterns will prevail after that time. In 25 years the predominant family structure will be (check one):

   _____ 1 clan (several nuclear families bonded by selection not blood)

   _____ 2 nuclear family with children reared by the state

   _____ 3 clan but with children reared by state

   _____ 4 other (specify)

5. Personal Freedom: Most respondents feel that individuals will have more or less freedom as indicated in the following table:

	in 5 years	in 10 years	in 25 years
privacy	less	less	more
mobility	more	more	more
expression	more	more	more
environment	less	less	more
relationships	more	more	more

5. Continued: If you disagree with any entry in the table of personal freedom on the previous page, circle it and give your reason for disagreement in the space below:

6. Greatest Threat to Quality of Life: Most respondents feel that the greatest threats to the quality of life may be ordered as shown in the table below:

	in 5 years	in 10 years	in 25 years
First	manipulation	manipulation	manipulation
Second	pollution	war/weapons	war/weapons
Third	war/weapons	pollution	pollution

If you disagree with any entry, strike out and write in the threat you feel belongs. Give your reason for the substitution in the space below:

7. Education of Children: Most children will probably continue to be educated in state supported (public) schools throughout the next decade. In 25 years most children will be educated by (check one):

_____ 1 State supported schools

_____ 2 Self (including machine and other aids)

_____ 3 Other (specify)

8. Predominate Interest of Young People: Whereas career and marriage are the predominant interest of young people in the immediate past, in the future young people will order their interests as given in the following table:

	in 5 years	in 10 years	in 25 years
First	individuation	individuation	individuation
Second	survival	survival	survival
Third	society	society	society

If you disagree with any entry in the table, strike out and write in the interest you feel belongs. Give your reasons for the substitution in the space below:

III (3) Bibliography

1.5 Terminology and Literature

The matter of terminology necessarily intrudes at this point and it is important to distinguish certain constructs before proceeding. A great many terms have already been proposed and are being used to designate "study of the future." In addition to futuristics, futurology, and futures research, the terms futuribles, prognostics, futurism, futury, and futuremics have been introduced. Each has its proponents and private community of users. Some of these and many others are now receiving more precise definition;(39) ultimately definition will be settled by need and usage. But study of the future has several distinct levels and the profusion of terms can be turned to a symbiotic advantage in distinguishing them. Three distinct levels of the subject area are immediately identifiable: 1) the sociological phenomenon of concern with, orientation toward and study of the future; 2) the specific products generated in studying the future - the scenarios, alternatives, forecasts, predictions, plans, etc.; and 3) the formal structure, that is, the assumptions, theories, and methodologies for researching the future. For these three levels, we adopt respectively the terms futurism, futuristics, and futurology More specifically, we make the following definitions:

> Futurism: A social movement and attitude of future orientation giving rise to a futures business, professional futurists, and institutionalization of change. It is based on the assumption that the future can be guided or controlled by human choice and places hope in the developability of an important role for anticipatory action in solving crises when the dynamics of world systems are understood.
>
> Futuristics: The study of the probabilities and implications of alternative conceivable and possible futures. Specific images and scenarios of future possibilities, specific forecasts, assessments, and plans. The practice of any activity that generates images of the future, predicts or shapes the future.
>
> Futurology: The subject of how the future is studied. The dynamics of technological and social change; the roles of causality, finality, determinism, teleology, volition, etc. in the processes of change; the nature of time, the modelling of change; the design of methodologies for forecasting, imagining, assessing, and planning alternative futures.

There are certain objections to using these terms. For example, futurism may be confused with the mechanistic movement in the arts that took place in the first decade of this century. Futurology has overtones of occultism to some and pomposness to others. None the less, these three levels of the subject need to be distinguished. The difference between futuristics and futurology is more than the difference between the applied and theoretical aspects of a subject. The higher level view of studying the consequences of the study of possible, probable, or preferable futures cannot be made through adding the 'applied' or 'theoretical' modifier. Other definitions and terminology are introduced throughout the text as their need occurs and the most important terms are summarize in the glossary of Appendix A.1.

The literature of futurism, futuristics, and futurology at this stage in their development is primarily in the form of research reports and journal articles. Despite the flood of book titles containing the word future (e.g., the Future of "X" or "X" and the Future), the subject itself is not sufficiently defined to command a futures section in the card catalogs of most libraries. A recent search in an excellent public library located Jouvenal's The Art of Conjecture under prophecy and mysticism in the philosophy section; Kahn's and Weiner's The Year 2000 in the history section; Teilhard's The Future of Man under religion; and Gabor's Inventing the Future and Fabun's Dynamics of Change under technology in the science section. This is not a reflection of incompetence on the part of librarians or their retrieval techniques. Rather, it illustrates the chaotic status of futures research in its embryonic form. The 'hardness' of the literature of a subject indicates its degree of formulazation. In its early stage of growth, the literature appears as working papers, research reports, and lecture notes of authors associated with diverse disciplines and skills. When their papers are published, they appear in the journals to which these pioneers have access.

For this reason, many relevant futures papers appeared in journals such as Daedalus, Science, The Scientific American, The American Scholar, Saturday Review, The American Scientist and Technology and Culture before the advent of The Futurist, the first journal devoted to futurism, futuristics, and futurology beginning regular publication in February 1967. Since then several other journals have begun publishing articles devoted to forecasting, planning, and assessment of futures. (12) (13) (14) Similarily, bibliographies and glossaries of futures literature are beginning to appear. (40,41) The difficulty with this profusity for the new student of change is its lack of structure. The tares are mixed with the wheat. In such situations, a new textbook provides its authors the opportunity to promulgate their own assessment of what's worth reading and what may be ignored. In accepting the role of significator of futures literature, we have tried to limit the references to the literature found at the end of each chapter according to three criteria: relevance, availability, and readability. In addition, we have directed the readers of this text to fields not normally cited in engineering practice. It is our belief that the future engineer must become cognizant of and actively engaged with many areas outside a narrow band of technical competance if there is to be a future for engineering.

The first five references listed under the bibliography at the end of this chapter provide a cross section of the many diverse approaches to futurism, futuristics, and futurology. Jantsch's Technological Forecasting in Perspective was one of the first books to appear summarizing in one place the many organizations, individuals, and techniques actively employed in futures research. It contains an annotated bibliography of over 400 items international in scope. Although much of the futuristics reported in Jantsch has now been revised, it is a useful source book of early efforts. The second reference, Mankind 2000, is an edited collection of papers presented at the First International Futures Conference held in Oslo in September 1967.

Contributors include a large number of active futurists including those from Europe, the Soviet Union, and Japan whose work is not as yet available in English sources. The next three references listed are each different in style, content, and approach. Ferkiss' Technological Man is a broad social commentary on technological change. It is invaluable for its well documented bibliographic sources, its broad span of attention to the many facets of society, and its unbiased attitude toward futures research. McHale's The Future of the Future results from many years concern and documentation of global utilization of resources. McHale's viewpoint is primarily that of a designer and his text is richly illustrated with displays of data focusing on the ecological context. Ayre's text, Technological Forecasting and Long-Range Planning, is the most technical of the five. It contains excellent expositions of forecasting methods such as morphological analysis and trend extrapolations although his choice of examples (as well as his citation of literature) is sometimes too specialized. Ayre's style and viewpoint more closely match the traditional technical language of the engineer than do any of the others.

In addition to these general references, we already cited the works of Jouvenal (6), Kahn and Weiner (7), Teilhard (8), Gabor (9), and Fabun (10) as indicative of futures literature scattered throughout a library. These authors represent individual and pioneering efforts in futuristics and futurology. Jouvenal's L'Art de la Conjecture, first published in 1964, represents the economic and social forecasting methods studies by his institute, SEDEIS, in Paris which published Futuribles until 1965. Herman Kahn of the Hudson Institute, primarily known for his work On Thermonuclear War, has been one of the pioneers in war gaming techniques and decision-making strategies for military agencies. Teilhard de Chardin was the Jesuit priest-scientist who's poetic writings appeared only after his death in 1955. His

synthesis of scientific and religous views of the future has caught the attention of a wide spectrum of the public as well as the professional community. Denis Gabor, professor of physics at the Imperial College of Science and Technology in London, is one of the first futurists to advocate human choice as a major determinant of the future. He challenges the great "Trilemma" of nuclear war, overpopulation, and leisure which threatens our survival with the admonition to "invent the future" we choose. Don Fabun, the publications editor of Kaiser Aluminum and Chemical Corporation, is a perceptive journalist who has synthesized a massive bulwark of technical data and translated it into a form that is both accurate and artistic. Other major pioneers contributing to futurism, futuristics, and futurology cited in the following chapters include Fred Polak who has done much to articulate the need for positive images of the future; Olaf Helmer, the originator of the "Delphi" forecasting technique; Lewis Mumford, the consistant yet hopeful critic of technology; John Platt who has championed the mutative "Step to Man;" Ossip Flechtheim, editor of the German journal Futurum who advocated teaching of futurology in schools and universities as early as 1945; and Edward Cornish, president and one of the founders of the World Future Society.

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