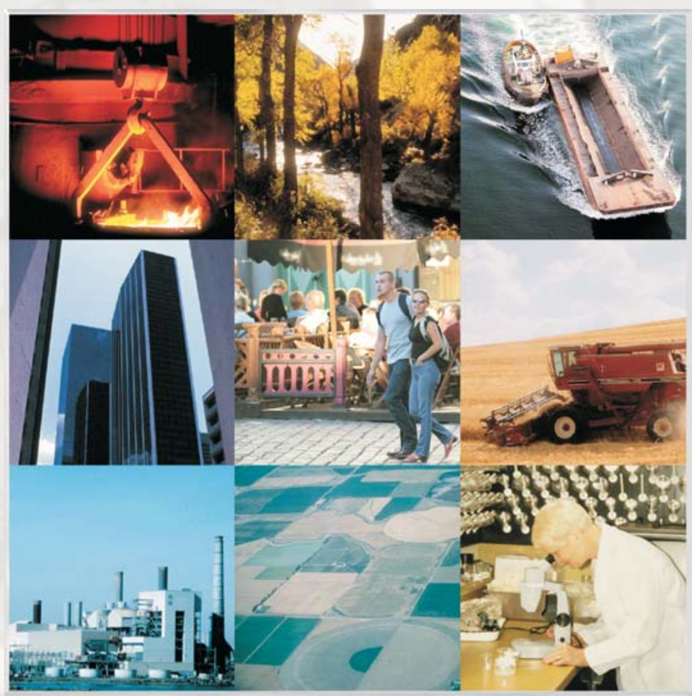
TECHNOCRACY

TECHNOLOGICAL CONTINENTAL DESIGN



Functional Governance For North America

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Technocracy Inc.

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Preface

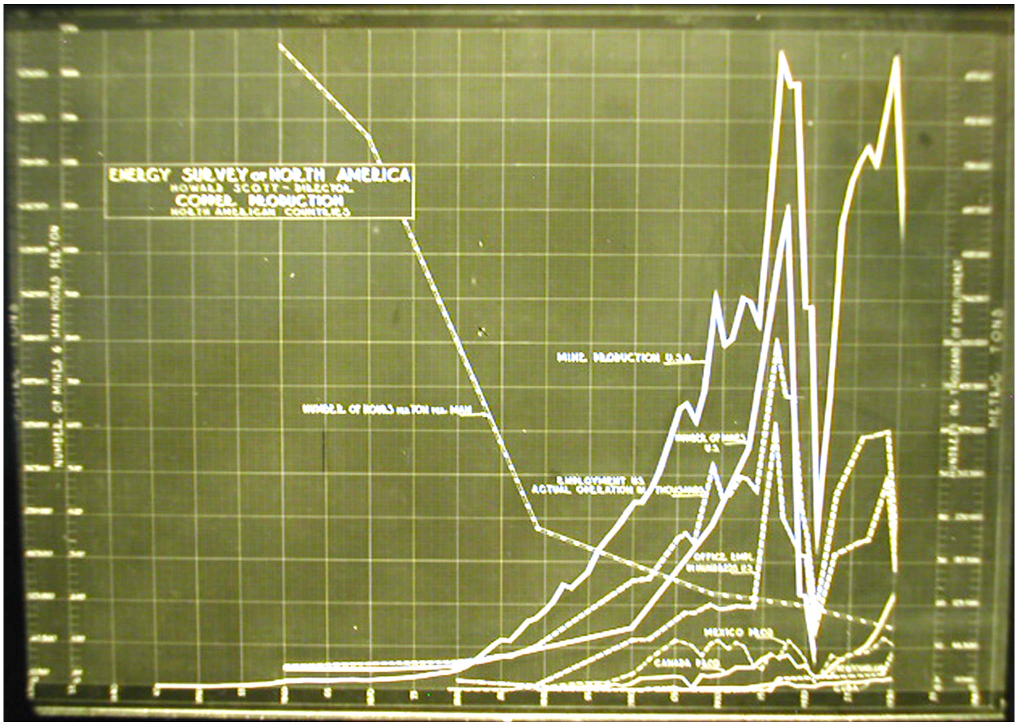
Technocracy Inc. is a non-profit membership organization incorporated under the laws of the State of New York. It is a Continental Organization. It is not a financial racket or a political party.

Technocracy Inc. operates only on the North American Continent through the structure of its own Continental Headquarters, Regional Divisions, Sections, and Organizers as a self-disciplined, self-controlled organization. It has no affiliations with any other organization, movement or association, whether in North America or elsewhere.

Technocracy points out that, although the use of the natural resources of North America has been wasteful to the extreme, there remains *sufficient* ***amounts with a few exceptions, to accomodate the needs of our population for some time to come. Those resources that have been depleted, for example, could be obtained through barter. One situation that will have to be rectified is to rebuild the installations or factories that produce some of our consumer goods. In recent years, business enterprise found it to be more profitable to take advantage of the near-slave wages elsewhere in the world and moved the factories to other countries.***

Technocracy finds that the production and distribution of physical wealth on a continental scale for the use of all continental citizens can be accomplished only by a continental technological accounting of technology — a governance of function — a Technate.

Technocracy declares that this continent has a rendezvous with Destiny; that this continent must decide between survival and chaos within the next few years. Technocracy realizes that this decision must be made by a mass movement of North Americans who are capable of operating a technological mechanism of production and distribution on the continent when the present Price System becomes incapable to operate. Technocracy Inc. is notifying all intelligent and courageous North Americans that their future rests on what they do today. Technocracy offers the specifications and the blueprints of continental physical operations for the production of abundance for every citizen.



A Magic Lantern glass slide of one of the many charts produced in the 1920s for The Energy Survey of North America (1918-1924).

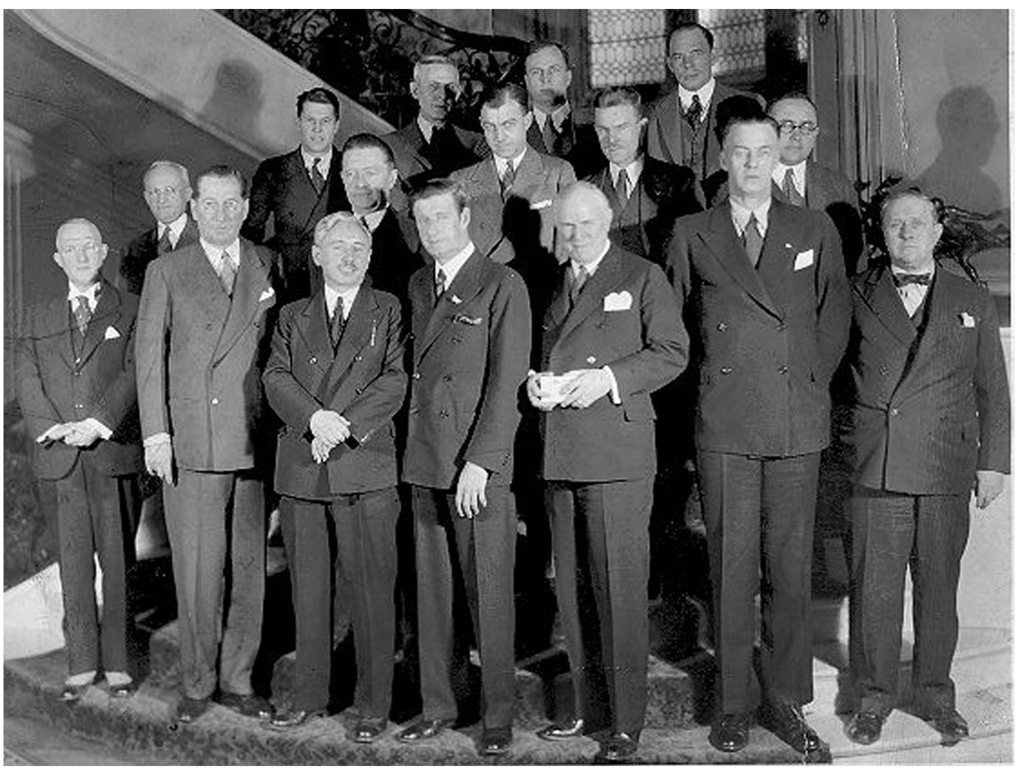


Photo commissioned by Columbia University's Publicity Department to announce that Howard Scott (front row 2nd from right) and M. King Hubbert (behind and to the left of Mr. Scott) were continuing the Energy Survey North America.

Introduction
How to Use This Book

This book is by no means an exhaustive examination of the topic of Technocracy. Technocracy, as a study, encompasses nearly all human fields of study and endeavour, from hard sciences such as physics, chemistry, biology, and geology, to applied sciences, such as engineering, medicine, and architecture, to the humanities, psychology, and sociology, as well as other fields, such as economics. To learn all the data and subsequent conclusions that Technocracy has researched in its time would be impossible for any single human being to accomplish in one lifetime.

It is Technocracy's mandate, however, to educate the citizens of North America about its research and conclusions to the best of its ability to do so. Therefore we provide you with many avenues in which to learn about Technocracy. The primary and best way to do this is to take Technocracy's Study Course. This is a 22-lesson plan covering the basics of all the science and engineering, and subsequent social design, so that the student has a sufficient understanding of Technocracy to be able to relate it to others in turn. This is not as dry as it may seem; given the participatory nature of the Study Course, it can be as entertaining as is it informative.

For some, however, access to a Study Course is unavailable or there is not one scheduled when the prospective student is available from their duties with work, school, or family. There are also those who would prefer, for their own reasons, not to commit to the 22-lesson plan of the Study Course. For these people we offer this book, *Technocracy: Technological Continental Design*, as a brief overview of the topics discussed in the Technocracy Study Course. It is not a replacement and will undoubtedly leave you with many questions yet unanswered, but it is a start. Hopefully, it will provoke you into investigating Technocracy's analysis and synthesis in more depth, so that you may be certain for yourself of the validity of Technocracy's conclusions.

The book is divided into several parts, designed to give you easy access to the information you desire. The first chapter deals with how to study the topic of Technocracy. This is an often overlooked aspect of Technocracy, but one that is critical in order to understand it. Because Technocracy deals with many of the functions now performed by today's governments, Technocracy is often viewed as being similar to one or many of them. This is not a wise mode of thinking, however. Technocracy is, and has been since its inception, a scientific and completely objective analysis of North America's problems, and a thoroughly scientific method of solving them. It has no basis in politics, philosophy, religion, or morality. It is an attempt to solve the problem of distributing the physical wealth created by modern technology to the citizens who operate that technology, in a manner no different than solving the problem of crossing a river. Technocracy's proposals are the "how-to" for building a bridge across the river of our social problems. Chapter One will guide you on how to analyze Technocracy's proposals with an objective eye, and show you that its conclusions are not the subject for debate or argument, but rather verification or invalidation.

Chapter Two deals with some of the science that is behind Technocracy's analysis. Not only will you become familiar with the individual sciences themselves, but with the unique way in which Technocracy has put them together in order to better understand our situation. You will become aware of the important role that energy plays in all of nature, and how its importance has become critical to our survival as a technological civilization. This will be important later on when you see how we can measure our standard of living by looking at the amount of extraneous energy we consume, extract, and waste.

If you are not generally familiar with the topic of science, this chapter is a light enough read that will prepare you for understanding such a complex topic as Technocracy. If you are familiar with science, or one or two branches of it, then this chapter will show you which branches are critical to understanding Technocracy and how Technocracy has employed them for its analysis.

You should be reminded, however, that this chapter, like the rest of this book, is no substitute for taking the Technocracy Study Course for a complete understanding of how Technocracy functions. It should be emphasized that these are merely overviews of the topics discussed.

Chapter Three begins Technocracy's analysis of our civilization using its unique, objective, and scientific approach. Discussed will be our current political and economic systems, well known alternatives, and the consequences of a high rate of energy conversion under scarcity conditions. The primary thesis of this chapter is that the citizens of North America no longer live in the long lamented condition of scarcity, except through our own attempts to artificially maintain it, and that doing so will continue to create increasing instability in our economies which began with the Great Depression and haven't really stopped since. Only by abandoning the conventions that make us slaves to the scarcity of money and profit will we be free to enjoy the technological abundance that awaits us.

Chapter Four shows the fundamental operating characteristics of a high-technology society. It will show what is needed to operate a technological civilization of abundance, and how to begin to organize the industrial infrastructure into a self-disciplined, functional operating unit, designed for the purpose of providing each citizen with his or her share of North America's technologically created wealth in goods and services.

Chapter Five continues with Technocracy's synthesis in showing the techniques used to achieve a maximum standard of living for all, while minimizing labor and wastage of resources, natural and otherwise. These techniques will allow our society to fully harness our productive capacity, thus enjoying far more wealth than is currently experienced by the majority of people. Also shown is how labor-saving machinery can finally be put to full use once the fear of losing one's income is eliminated, and human potential is freed to accomplish its natural capacities.

Appendix 1 contains many frequently asked questions by people interested in Technocracy. If there is some aspect of the design or analysis that you are still puzzled about, the answer may very well be here. If you cannot find the answer to your question here, or elsewhere in this book, contact your local Technocrats for the answer.

Appendix 2 contains charts and graphs that contain data that support the text but are not critical for understanding it. These charts will help give a clearer understanding of the operation of our our current society.

Appendix 3 is a glossary of terms that you may refer to should you come across a word that you are not familiar with. Many of these words are new to most people, or are used in new ways, and it is important that clarity of definition is maintained, as discussed in Chapter One.

Chapter One: Technocracy Study

ABOUT THE TECHNOCRACY STUDY COURSE

People have been requesting information about Technocracy, and study groups have been formed for the purpose of studying Technocracy and its underlying principles.

Technocracy is dealing with social phenomena in the widest sense of the word; this includes not only actions of human beings but also everything that directly or indirectly affects their actions. Consequently, the studies of Technocracy embrace practically the whole field of science and industry; biology, climate, natural resources, industrial equipment—all enter into the social picture. No one can expect to have any understanding of our present social problems without having at least a panoramic view of the basic relations of these essential elements of the picture. All things on the Earth are composed of matter and therefore require a knowledge of **chemistry.** These things move, and in so doing involve **energy.** An understanding of these relationships requires a knowledge of **physics.** Industrial equipment, as well as the substances of which living organisms are composed, is derived from the Earth. This requires a knowledge of **geology** and earth processes. Humans are organisms and derive their food from other organisms. Hence, a knowledge of **biology** is necessary.

The purpose of the Study Course is not to give to any person a comprehensive knowledge of science and technology. The purpose is to present an outline of the essential elements of these various fields in a unified picture as they pertain to the social problem. Neither are the lessons a textbook. They are a guide to study. The materials to be studied are to a great extent already well written about in various standard and authentic references and texts in the field of science.

If one is sincerely interested in learning what Technocracy is about, we do not know any way that this can be achieved other than by mastering the basic material contained in these references or its equivalent from other sources.

THE TECHNOCRACY STUDY COURSE

The scope of materials in the course of studies is so broad that it is doubtful that any group will have among its members a single person competent to discuss all topics. It is quite probable, however, that there may be individual members who are engineers, physicians, and people with training in other technical branches. The procedure, therefore, recommended for conducting the course is that of the seminar method — wherein each member of the group is a student, and none is the teacher. Under this method there should be a permanent presiding officer, but discussion leaders should be chosen from among the group with topics assigned on the basis of making the best uses of the talent afforded by the group. Thus, for the matter and energy discussions, use should be made of members with training in physics, chemistry or engineering. For the biological discussions, use should be made of physicians or of people having training in biology. For the mineral resources, people with a knowledge of geology should be the preferred leaders.

The above suggestions are offered only as guides. If special talent in the various fields should not be available, then any suitable leader can direct the discussion, using the outline and references as sources of information. ***The important thing is to get a comprehensive view of the problem as a whole rather than of its parts as unrelated scraps of knowledge.***

The important thing is to get a comprehensive view of the problem as a whole rather than of its parts as unrelated scraps of knowledge.

ABOUT THIS BOOK

If for some reason it is either not feasible or desirable to participate in such a study course, this manual should serve as the next best text to get an overall understanding of Technocracy. This book, while smaller and less detailed than the Study Course text, contains most of the primary concepts of Technocracy's analysis and design. Those elements that are most important are given additional attention, such as Energy Accounting; however, for a full discussion of them the student will have to look elsewhere.

This book is also better suited to individual study than the Study Course, although either could be used as such. Using it as a guide to further study would be recommended, as many topics are only lightly touched upon. It may also serve as a low-content introduction for those not wishing to invest a lot of time in their initial investigations of Technocracy. By giving a simplified overview of Technocracy concepts, one may better understand how it differs from conventional social solutions, as well as many of the techniques and benefits that are unique to Technocracy. Indeed, this may well be the book's most successful role.

INTRODUCTION TO SCIENCE

SCIENCE:	**The method of the determination of the most probable.**
FACT:	**A close agreement of a series of observations of the same phenomena. All observations must be capable of confirmation.**
DEFINITION:	**An agreement, wholly arbitrary in character, among people.**

The following topics are essential to understanding the approach that Technocracy has taken; namely one that is scientific and objective. Even if you are already familiar with these concepts, it may be advisable to read through this quick overview of them to better keep them in mind as you advance through the remainder of the text.

AN INTRODUCTION TO SCIENCE

Persons have come previously to Technocracy for one or more of many reasons such as entertainment, instruction, etc. Some have come from a sense of duty that compels their supporting that in which they honestly believe, and many others have come out of sheer curiosity. We are well aware that the type of material presented in the general lectures you have heard, or in our literature, has not been adequate, either in form or substance, to afford a full understanding of just what our work is. For those interested in learning more, the course of study is necessary. Many of you will be entering the field of science for the first time.

The immediate activity of Technocracy directs itself toward two general ends: first, the analytical purpose that inquires into fundamental relations among the various parts of a price economy and that discloses the reasons for the collapse of such a system in any civilization that converts energy at a high rate; second, a synthesis of purpose that designs an accounting system that will successfully operate just such a high-energy civilization. We shall study the soil in which Technocracy's roots are spread -- science itself. What then is this thing called science? How does it differ from everything that is not science?

A FACT

Though there are a number of current definitions in dictionaries and various writings, we prefer to treat the matter at greater length. At the end of this study, we want you to have fairly clear answers to your questions, a fairly clear idea of what is meant by a scientific mind, a scientific viewpoint, and a scientific approach to a problem. We shall commence by investigating the meaning of a common word: fact. This word should have a familiar sound. We've been using it most of our lives, but if we were to ask two people picked at random to define the term, we would probably get rather dissimilar explanations. To a scientist, **fact** has a specific, rigid meaning.

A fact is the close agreement of a series of observations of the same phenomenon. Please memorize this definition, in essence if not in exact words. It is important as the starting point of the following studies.

Consider this example: we find a strip of steel and undertake a determination of its length. The investigator lays a scale parallel to the unknown length and measures it. The scale is read at, say, 10.0 centimeters, but our investigator does not accept as a fact the probability that the strip is 10 centimeters long. The measurement is repeated, taking care that the work is well done, with no errors that might formerly have been overlooked. Perhaps a more accurate scale is used, one with a vernier; let us say that the investigator reads the length to be 10.0 centimeters. In such a simple measurement as that of linear distance to one or two decimal places, probably two observations would be an extensive enough series to establish the fact that the length is so many centimeters, but if accuracy to the fifth or sixth place were required, our scientist would employ instruments more refined than the simple scale and, undoubtedly, would make more than two determinations.

The most probable value for the velocity of light is 2.997925 plus or minus 0.000002 x 10 to the tenth power centimeters per second, which is something over 186,000 miles per second. Undoubtedly it took many observations to establish this fact. Once an apparatus is set up, successive determinations can be made rather quickly.

In the definition just given, the word "observation" is used in a broad sense. It means, of course, direct observation by our various sense organs, and it includes observation through an interpreter, as it were. In many cases the phenomena we are examining lie outside the field of our direct perception, and we must then devise ways of causing them to produce effects that lie within that field. For example, we are directly aware of electromagnetic radiation having any wavelength between approximately 0.4 and 0.7 micron. (A micron is 10,000th of a centimeter.) We see this as light. We observe radiation (protected against ordinary light) shorter than 0.4 micron, as ultraviolet light, or X-rays. How do we observe radiation with the wavelength of 3/4 mile, which is unrecordable by photographic processes? That particular wavelength is in the range of marine signals, and we could detect it on a ship's wireless.

We have said a fact is a close agreement of a series of observations of the same phenomena. Now, what about those 'facts' that cannot in any manner be observed by humankind; those that, because of their remote or occult character, not only lie outside the field perception but refuse to exhibit themselves even through their most ingenious apparatus? It is implicit in our definition that there are no such 'facts.' Whatever such remote things are, they are not facts.

An important point to keep in mind is that it is absolutely essential in scientific work that all observations must be susceptible to confirmation. They must be so carried out that they may be repeated at will, or, if they are not repeatable, they must be of such a nature that we can substantiate them if we care to do the requisite work. We make a careful distinction between verifiable and nonverifiable observations because from the former come facts. While from the latter come -- well, what? Perhaps many devious and wonderful things, but we shall not scrutinize such "things" in the Study Course. We assure you that none of them is within the scope of science. Science is built upon facts as we now understand them. Science is nothing more than a system of facts and principles elaborated from facts, It is indispensable, therefore, that we check the verifiability of observations before we accept them as a valid basis for fact.

Suppose we came upon a document signed by a dozen names and properly notarized. The document states that the undersigned have just returned from some unheard of planet, Venus, where they erected a monument. We would have the perfect agreement of a series of observations of an event, and the statement cannot by any means be disproved, but even nonscientists would be more than likely to reject that this as a fact unless it were verified.

If you are offended by such a puerile illustration, here is another nearer home. Slightly more than 100 years ago a book was published, purporting to be a translation of the engravings on a number of gold plates, or tablets, dug out of a hill near Palmyra, New York. After the translation was made, the plates were reburied in another secret place. At the beginning of said book, preceding the translated text, appears the written testimony of eight men, saying that each of them has seen and handled the plates, that the plates were heavy, had the appearance of gold, and were covered with a curious inscription. These men were all devoutly religious, and they called upon their God to bear witness. The testimony is a very impressive document. Clearly, the existence of the gold tablets cannot be reestablished today since they have disappeared. Therefore, their existence is not a fact even though more than a hundred thousand people believe that it is. Only when, and if, the plates reappear, as all Mormons expect them to do some day, and are placed in a museum conceivably accessible to all of us, only then will their existence become a fact.

Assuming you have never visited Sydney, Australia, how do you know there is a city by that name? You may have heard people mention it, or have seen the name on maps, but perhaps something is being put over on you; perhaps it is all a great hoax. When Napoleon's chief spy, Karl Schulmeister, was working himself high in the ranks of the Austrian Secret Service, he received almost daily a copy of a Parisian newspaper. He said an agent of his smuggled it across the border. Naturally, the Austrians got a lot of information about conditions in France. The truth was that the newspaper was printed solely for Schulmeister and the Austrian generals, and each edition consisted of only one copy. It was all false, all exactly what Napoleon wanted his enemies to believe. Might it not be the same with Sydney? The reason each of you believes in the existence of this place is because you know that knowledge of it is the kind that can be verified. You know many persons must have checked its reality by going there. You know that if worse came to worst you could go there yourself. This, then, is a fact, one that like all facts of science can be reestablished by anyone.

The students of science in our schools have laboratory courses in which they actually do check the work of others in simple experiments. This is done partly to develop their manual dexterity and experience in that sort of thing, but mostly it is done to make them aware of the knowledge that all observations may be so checked.

DEFINING WORDS

About all we have done so far in this discussion is to give you a definition and to explain exactly what was meant by it. Why this insistence on exact meaning? We promised to tell you about science in general, and then proceed to split hairs about something so small as would surely make little difference in the composite whole. This brings us to another point. Scientists always know exactly what they are talking about. That sounds like a boast, but it is really quite the opposite. It is just that scientists pay attention to the exact definition of terms; they should never use a term beyond its definition, and they should never use an undefined term at all. Many, quarreling with the latter, will say that one must use undefined terms somewhere, but we have a way out of that difficulty which will be indicated in a moment. Now, contrast a rigidly defined term with the expressions used in fields other than science, such as in finance, politics, law, etc.

Suppose you were reading an article on economics and came upon the word "price." Now, everybody is credited with knowing the meaning of the word "price," but you, being a particularly inquiring individual, insist on an exact definition. You would discover that most economists, when they bother to elucidate their terms at all, attach a different meaning to the word "price." Some define it as the measure of the ratio of the scarcity of money to the scarcity of any commodity. Others make no mention of scarcity whatever. Still others introduce psychological and social factors. Invariably you will find that a definition when given is followed by great amounts of explanatory and qualifying material. This means the definition represents what is in the author's mind, not what is in the minds of all users of the word. For example, the **Encyclopedia Britannica** starts off by regretting there is no exact meaning for the word and presently works into the definition: "Price is value expressed in terms of money." Then follows the qualifying material that says, in effect, this does not mean values are determined independently of or prior to the determination of their prices, or that values of goods and money are determined separately. Some sort of an exchange is necessary, after which the values thus determined appear in the guise of money prices.

We are also told that the abstract notion of exchange value is a generalization of the simple idea of price. They who find this less than clear than they hoped would naturally try to discover what is meant by value, since price is expressed in terms of it. They would discover there are three conceptions of value: exchange value, subjective value, and imputed price. They would read the opinion that "value" is the greatest philosophical achievement of the 19th century, but nowhere would they find a statement of what it is. They would be gratified to learn there exists, however, if not an exact meaning, at least a theory of values, a theory that requires consideration of the following points: What is the nature of value? What are the fundamental values, and how are they to be classified? How may we determine the relative values of things, and what is the ultimate standard of value? Are values subjective or objective? What is the relation of values to things or of value to existence and reality?

It is not necessary to belabor the point on the matter of price. A term whose meaning has not been specified by general agreement among men and women is unsuited for the rigorous transmission of intelligence from person to person. In this connection, we shall take up another problem. A hunter is standing near a large tree, and a squirrel is hanging onto the opposite side of the tree. The hunter now moves in a circle completely around the tree until he regains his starting position, but at the same time the squirrel also moves around the tree in the same direction and in such a manner that it always faces the man and so the tree is always between it and the hunter. Now, the problem is this: Does the hunter go around the squirrel? The correct answer is not "yes," and it is not "no." The correct reply requires an exact definition of the verb "go around." If we define "go around" as meaning that the hunter is first south, then west, then north, then east, and finally south of the squirrel, he obviously does go around it. But if we agree that "go around" shall mean first opposite the squirrel's belly, then its right side, then its back, then its left side, the answer is just as definitely "no." Here again we see the necessity for an exact definition. It is harmful to the integrity of our thinking to use words loosely. Lack of careful definition sires more illegitimate offspring. Many problems outside science would vanish into thin air if definitions were exact.

Before we leave the subject, let us ask if anyone can define a term used in connection with measuring the strip of steel -- the word "centimeter." How long is a centimeter? It is useless to say it is the 100th part of a meter; that, in effect, is saying it is twice one-half centimeter. One merely asks: "How long is a meter? Is there possibly an exact definition of length not in terms of other units of length?" Yes. In the International Bureau near Paris is a certain bar of metal -- one only. We understand it is an alloy of platinum and iridium. On this bar are two marks, and a centimeter is defined as one-hundredth the distance between these two marks when the bar is at 0 degrees Centigrade. This is an example of the prosaic, matter-of-course way scientists have of going about things. If they cannot define a term in terms of other terms, they define it in terms of an object or system of objects in the external world. That is how we avoid using undefined terms. We trust the distinction between a definition and a fact is clear. You will have many of both in your studies.

A definition is an agreement, wholly arbitrary in character, among people; while a fact is an agreement among investigations carried out by people.

It is a definition that a centimeter is one-hundredth the distance between certain marks on a certain bar at a certain temperature. It is a fact that a particular strip of steel is 10 centimeters long.

Footnote: In 1960 the meter was redefined as 1,650,763.73 wavelengths in vacuum of the orange-red spectral line emitted by atoms of krypton-86. Finally, in 1983, the meter was defined as the length of the path traveled by light in vacuum during a time interval of 1/299,792,458 of a second.

Chapter Two: Science

THE POSTULATES OF SCIENCE

So far we have been talking about fairly fundamental things. Just how fundamental, you may ask, and is there anything more fundamental? Let us see if we can go deeper yet. Let us try to strike the very foundations of science. Science is a fair palace of lofty dimensions. Does it rise out of the massive earthrock itself, or is it erected upon sand and apt to crumble completely should the unshored plain ever shift? You see, even if we fail to take you to the heights of science -- an excursion that would occupy several hundred lifetimes -- at least we start you at the bottom. So let us descend toward that bottom to existing propositions from which it may be deduced. See if we can at any depth discard the relatively fundamental and deal with the absolutely fundamental.

The quality of agreement has been used to describe the intrinsic character of both facts and definitions. However, there are agreements in science other than those of fact or definition. These are called postulates, three in number, and it is these postulates that are the foundations of science. A postulate is a curious mixture. It assumes the nature of a fact in that it is a statement of fact, but it differs from a fact in that the observations supporting it are not confirmable. A **postulate** assumes the nature of a definition in that it is an agreement among people, but it differs from a definition in that it concerns no trivial matter of nomenclature. A **definition** is a mere shortcut in the language. Power may be defined as the time rate of doing work. We could go through all scientific literature, cross out the word "power," substitute the phrase "time rate of doing work" and entirely eliminate a definition from the vast amount of material the mind must handle. Definitions that can be done away with this easily cannot be the fundamental things we seek. But, however complex, there is no more essential manner of stating a postulate; and there are no already existing propositions from which it may be deduced.

The first postulate states that the external world actually is. In other words, a chair, a pencil, a city, the mountains, rivers, oceans, continents really do exist. We can at once go to work on them without having to establish their existence.

The second postulate states that nature is uniform. This means we do not have to flounder about in a world wherein a sack of flour suddenly transforms itself into a fish, and that into an automobile, and that into an oil well. The second postulate is our protection against chaos.

The third postulate states that there are symbols in the "mind" that stand for events and things in the external world. The total sum of all such symbols in all minds, after eliminating duplicates, would be the sum total of that kind of knowledge for us; and the sum total of all things and events meant by these symbols, provided the symbols should ever become complete in number, would constitute the entire physical world. This means, in effect, that the mind itself is uniform. Mathematicians will note that the third postulate establishes a one-to-one correspondence between all that is in our minds and all that is in the external world. A corollary of this is that there is nothing in all the world that has the a priori quality of being unknowable.

All scientists are agreed that, so long as they shall live, they shall not ever question these postulates or require any proof thereof. They are the rules of their game, and they are no more concerned with the rules of other games than a bridge player is about baseball rules. Is science built upon a firm foundation? Yes. It stands properly ordered and rock solid upon the enduring base of its postulates. Take note: science is forever impregnable against any attack originating outside its postulates. The criticisms of metaphysicians, of philosophers, of mystics, are irrelevant here; they are invalidated at their very source by so originating. And bear in mind that it does not become scientists to discuss questions of ultimate truth, nor ultimate reality, chemistry or anything else ultimate. Discuss them as novelists or theologians, if you like, but not as scientists.

THE POSTULATES OF SCIENCE

A postulate partakes of the nature of a fact but differs from a fact in that the observations supporting it are not confirmable.

1st Postulate: The external world actually is.
2nd Postulate: Nature is uniform.
3rd Postulate: There are symbols in the mind which stand for things and events in the external world.

Technocracy's Postulate: That the phenomena involved in the functional operation of the social mechanism are metrical.

SCIENCE

So far no mention has been made of any of the sciences themselves, not even so that you may know what they are about. We have not spoken of heat, sound, electricity, hydraulics, etc., which are branches of physics, or of biology or chemistry and their branches. Why not? Simply because there are no sciences. There is only one science. It makes little difference what you call it. Call it the science of existence, or the science of the world, or just plain science. It is only elementary phenomena we can identify as belonging exclusively to one or another of the name labels that a hundred or so years ago were thought to distinguish one science from another. When we reach phenomena of any complexity -- and you need not be told that most of the world is extremely complex -- we find the facts of one name label mixing with those of another to such an extent that it is mere sophistry to think they should be treated separately.

Suppose we bring together two substances: carbon dioxide and water. Nothing much happens, as you know from your experience with charged water. Bring them together on the leaf of a plant in the presence of chlorophyl, and still nothing much happens, but allow sunlight to fall on the leaf, and these two simple substances will be synthesized into additional plant tissue: cellulose. Here we have light, chemistry, and botany, all in one reaction.

Consider deep ray therapy where advantage is taken of the fact that malignant tumor cells have three to four times the electrical condenser capacity of benign tumor cells. Here we have electricity, short-wave radiation, and human pathology becoming one problem. Diathermy and radio surgery are other examples of the connection between medicine and what were once called extra human phenomena.

Consider photophoresis, where a particle of gold or selenium or sulphur suspended in a strong stream of light moves toward the source of light, even though that source is directly above the particle. Thus we establish a liaison between light and that elusive thing, gravitation.

Consider the photolytic cell where an electrode of lead and one of copper oxide are immersed in a solution of lead nitrate. No current flows in the dark, but if light is allowed to strike the inner face of the copper oxide electrode, a strong although not a steady current is produced. Here we have chemistry, electricity, and light functioning together. The wedding of biology and chemistry is expressed in the word biochemistry. If you undertake the study of chemistry, you will reach something called physical chemistry, which might just as well be called chemical physics. The chlorophyl of plants mentioned a moment ago and the hemoglobin of your blood have very similar chemical structures. Your blood contains the same salts as sea water and in virtually the same proportion, not so much the sea of today as that ancient Cambrian Sea that existed before there were warmblooded animals. Do you see that there can be no frontiers within science, that there is only one science?

SCIENTIFIC PREDICTION

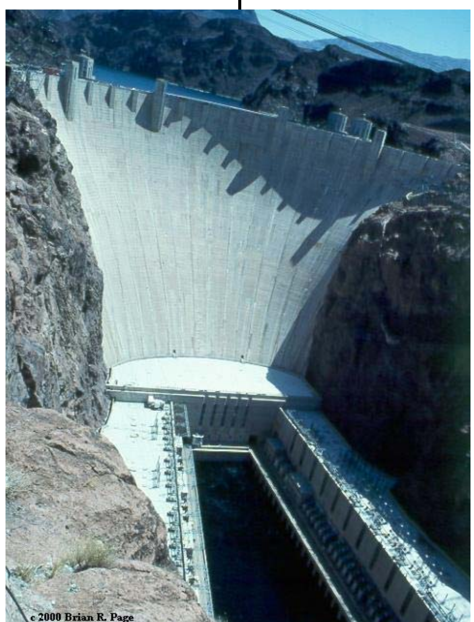
The two aspects of Technocracy, **analytic** and **synthetic,** are characteristic of the whole field of science. The collecting of facts of all available kinds, by carefully repeated observations in all parts of the world by all types of interpreting apparatus, is clearly of an analytic nature. What do we do with these facts as they are collected? Is our work finished when we make a report in literature and then neatly file it on a library shelf? The high-energy civilization about us should demonstrate to anyone that this is not so. Facts are powerful tools in our hands; they are continually in use. They are good tools, but when we again consider the definition, we will see that no fact is absolutely certain since it has been established by inductive methods. Fifty observations may have agreed very closely, but we cannot say positively that therefore the next fifty will so agree. We can say only that it is probable that they will. Thus, the vast store of facts collected in scientific literature serves as a basis for determining what is most probable. The mechanism of scientific progress is this: we start with any phenomenon we care to, from a simple electrical effect in the laboratory to a high-speed diesel engine. We say, "On the basis of what we have observed, such and such a modification will probably produce such and such a result." Then it is tried if the probability is great enough. Sometimes it works and sometimes not, but out of the times it does work comes our intricate civilization with all its marvelous technical accomplishments.

Science is, in a dynamic sense, essentially a method of prediction. It has been defined as the method of the determination of the most probable.

In tossing a coin, how does one know how many times heads will turn up? How does a demographer (or a life insurance actuary) know how many people will die next year? How does a geologist know where to drill for oil? How does the designer of a building determine how many elevators will be required? How does the weather bureau predict what the weather will be tomorrow? How can the astronomers predict to within a second an eclipse of the sun 150 years hence?

These are all illustrations of scientific predictions. Some of these predictions, as you well know, are more exact than others, but they are all based on the same fundamental principles of reasoning from the basic facts. When more facts are known, more accurate predictions can be made. That is what is meant by the most probable; not that by this method one knows exactly what will happen, but by its use one can determine more nearly what will happen than by any other method.

Machines must be operated in accordance with their design. If you wish to speed up your automobile, you must press the accelerator pedal. No abstract considerations enter into this operation such as; "Is it ethical to speed up an auto this way?" or "Is this the best of all possible ways of doing it?" The machine simply is built to accelerate in response to this one operation. This is a useful lesson to digest. No machine, no group of machines, may be properly operated except as specified by their design. North America's misused factories and its mishandling of food supplies while many of its citizens remain undernourished are results of trying to operate a Price System by other criteria.



ENGINEERING

Engineering is a frequently used term and some brief explanation of it should be offered. In the light of what has just been said, you can see that a scientific laboratory is not always a single building on a college campus. More often the dimensions of a laboratory coincide with the boundaries of a city or a nation. Suppose you have the problem of transporting a liter of sulfuric acid from one side of the room to the other. The best solution would be to pick up the bottle and carry it across. Suppose, however, you are confronted with the same problem on a larger scale. You receive a 10,000-gallon tank car of sulfuric acid on a railroad siding and want to use the acid on the second floor of your plant. Now you must consider a number of things that did not enter into the smaller problem. What material will you install to convey the acid? Finally, do you buy in large enough quantities to warrant the erection of a sulfuric acid manufacturing plant on your own premises?

This is the engineering side of chemistry. On the basis of established facts, the solution that is probably the best must be found for each question, the same as with other kinds of scientific work. Laboratory electricity is the production of electrical energy in a voltaic cell. Electrical engineering is the production of electrical energy by a waterfall, and the transportation of it a hundred miles at a hundred thousand volts.

Please recognize that we are still within the field of science and remember, no frontiers are set up anywhere in this field. There is only one science, and there is no essential difference between science and engineering. The stoking of a Bunsen burner, the stoking of a boiler, the stoking of the people of a nation are all one problem.

Since we are to begin studies in this field, let us recapitulate the several pieces of equipment we have for the job.

First of all, there are five senses through which to perceive the external world.

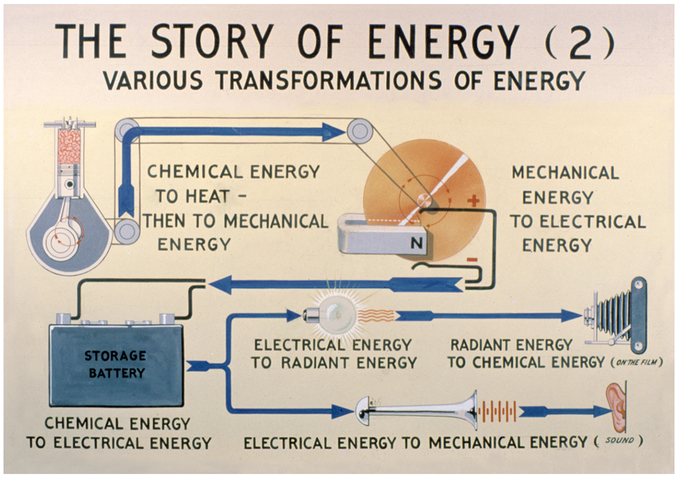
Next, we have a mind to reflect upon what is perceived, but it is now a critical mind, unwilling to accept knowledge until inquiry is made into the sources thereof. Let us emphasize the fine, incomparable quality of that mind that is about to withhold judgment on something until the source-observations have been verified. This critical mind is aware of the uselessness of thought unless thought is clothed in exact terms. With this in mind, a simple experiment performed with the hands and viewed with the eyes weighs heavily while the testament concerning unconfirmable observations by however many persons -- even though that testament may be preserved between the finely tooled covers of a rare book -- weighs much, much more lightly than a feather.

We are continually aware that science is more than a dry catalogue of facts; it is a dynamic and powerful tool before which most problems shall some day yield.

This, then, is the equipment we carry as we approach the physical world, that actual, uniform world our postulates give us. We should not find it burdensome.

MATTER

The earth and everything upon it is composed of matter. Matter occurs in three principal physical states: solid, liquid, and gas. Examples of solids are rocks, wood, ice. Examples of liquids are water, gasoline, alcohol. Examples of gases are air,



illuminating gas, water vapor or steam.

All events on the face of the earth involve in one manner or another the movement or change in the relative configuration of matter. The rains and the flow of water, the winds, the growth of plants and animals, as well as the operation of automobiles and factories, are a part of the movement of matter. Matter moves from one place to another, from one physical state to another, and from one chemical combination to another, but in all these processes the individual atoms are not destroyed; they are merely being continuously reshuffled.

The Laws of Thermodynamics

1) The total energy of a closed system plus the surroundings is constant. Energy can be neither created nor destroyed. This is the Law of Conservation of Energy.
2) The entropy of an isolated system always increases. That is, energy will always flow from high states (such as hot) to lower states (such as cold).

WORK AND ENERGY

Our next problem is to investigate the circumstances under which matter moves or undergoes physical and chemical transformations. To do this, it is necessary that we become familiar with our system of measurement and what work is.

When a force acts upon a body and causes it to move, work is said to be done. A unit of work is defined to be that point of application to move a unit of distance in the direction in which the force acts.

Now let us consider a related but more general physical quantity, namely, **energy.** If anything has the capacity to perform work, it is said to possess energy. The amount of its energy is measurable in terms of the amount of work it can perform. Hence, energy is measurable in units of work -- ergs, joules, foot-pounds, horsepower-hours, kilowatt-hours, etc.

We have learned that matter on the earth is not destroyed, and that movements and changes of matter involve work or energy. There is an exact relation between work and heat; namely, that when a given quantity of work is converted into heat, the same amount of heat is always produced. In a weight-and-flywheel experiment, if no friction were involved and hence no heat produced, the loss of potential energy by the falling weight would be completely compensated for by the gain in kinetic energy of the flywheel. After the falling weight had reached its lowest point, it would be relifted by the flywheel, which would slow down and lose kinetic energy as the lifted weight gained potential energy. Furthermore, the gain in potential energy would be exactly equal to the loss in kinetic energy and vice versa.

Hence, we arrive at the conclusion that, in any purely mechanical system involving no friction and hence no heat loss, ***the sum obtained by adding all the potential energies and all the kinetic energies simultaneously is a constant.***

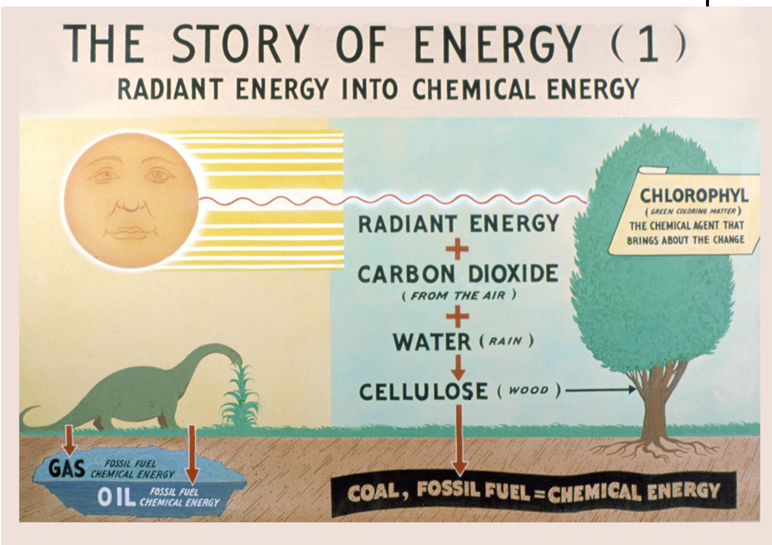
THE LAWS OF THERMODYNAMICS

While energy may be converted from one to another of its forms, it is never destroyed (First Law). Also, there is a fundamental tendency for all other forms of energy to change into heat and for all bodies to come to the same temperature (Second Law). When a difference of temperature exists, it is possible to convert heat into work, but if no temperature difference exists, no heat can be converted into work even if, literally, oceans of heat exist.

Engines do not create energy but instead merely take energy in a form available for doing work and convert a part of this into useful work. All of this energy is finally degraded into the unavailable form as waste heat. One remarkable engine is the human body.

THE FLOW OF ENERGY ON THE EARTH

We have seen that all movement of matter on the face of the earth involves a corresponding change of energy. We have also seen that while energy may be manifested in various forms, such as heat, chemical energy, potential energy, kinetic energy, etc., and may be changed from one of its various forms to another, none of it is ever lost, but that all of it tends to be dissipated into waste heat. Engines, as we have seen, whether animate or man-made, do not create energy but merely utilize a supply of available energy for doing work. The available energy used by various engines usually occurs in two forms:



mechanical energy, as in the case of waterfalls or wind; and chemical energy, as in the case of fuels and food.

Solar radiation impinges upon the earth as a short-wave-length radiation and thereafter undergoes a series of energy changes, each one of which, in accordance with the Second Law of Thermodynamics, is at a lower scale of degradation than that preceding it. Finally, it is put back into space as radiation. ***During and as a consequence of this process, the winds blow, rivers flow, plants and animals grow and propagate their kind, and most of the other events on the face of the earth take place.*** Since the total flow of energy on the earth is practically a constant, it follows that there is not likely to be any cessation or diminution of this process for a long time to come. While the total flow of energy on the earth's surface is essentially constant, the resulting picture, in terms of the configuration of the earth's surface and of plant and animal life, is continuously changing. This change is itself unidirectional and irreversible; that is to say, it never repeats itself.

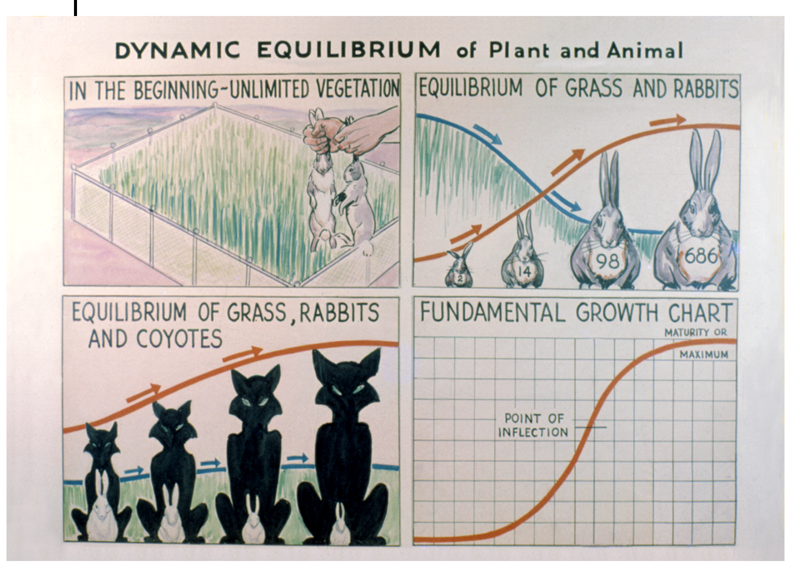
DYNAMIC EQUILIBRIUM AMONG ENERGY-CONSUMING DEVICES

We have seen that every sort of mechanism, both inanimate and organic -- plant, animal, and steam engine -- is an energy-dissipating device. Plants require solar energy; animals require chemical energy in the form of food derived either from plants or other animals; steam engines require the chemical energy of fuel. It is important to note here that particular kinds of energy-consuming devices can, in general, make use of energy only when it occurs in certain forms. Thus, a steam engine cannot utilize the energy contained in a waterfall; neither can a horse operate on the energy contained in coal or gasoline. Certain animals, the herbivores, can utilize only the energy contained in a limited variety of plants; other animals, the carnivores, utilize only energy occurring in the form of meat. Most plants can utilize only the energy of light radiation. All of the energy used by every kind of energy-consuming device on the earth is, as we have pointed out, derived almost without exception initially from the energy of sunshine. The energy of sunshine is a vast flow of energy. **The existence of plants and animals is dependent upon a successful competition by each of the different species for a share of this total flow. An illustration will perhaps make this clearer.**

All plant and animal species are in a perpetual state of competition for larger and larger shares of the total flow of energy from sunshine. The number of individuals of a particular animal species that can live in a given area is dependent in part upon the rate at which energy occurs in that area in a form suitable for use by that species, in part upon the number of competing species for energy in the same form, and in part upon the rate at which this same species becomes food and therefore serves as the energy supply for still other species.

Under the strenuous competition for existence, a state of balance, or dynamic equilibrium, develops in a given area between the various plant and animal species. This state of balance is precarious and subject to disturbances by a change of weather conditions and hence, of food supply, or it can be disturbed by numerous other factors.

The human species, as we have seen, exists as a part of this dynamic "web of life."



ENERGY IN HUMAN HISTORY

The history of the human species since prehistoric times is distinguished chiefly from that of other animal species in that during this period human beings have been learning progressively how to deprive a larger and larger share of the sun's energy from other animals and direct it into their own uses. This has resulted in the ascendancy of humankind and has wrought unprecedented havoc among the other organisms of the earth.

The use of a simple tool, such as a club, gave human beings a decided advantage in the struggle for existence. By increasing their food supply, a larger supply of the total flow of the sun's energy was made available for their use. The discovery of the use of fire, probably their first use of energy other than food eaten, gave them another decided advantage, tending to both increase their length of life and to enlarge the area they could inhabit. The use of both the club and fire tended to increase the human population of the earth.

Large-scale industrial growth requires that there be readily available a suitable ensemble of mineral resources.

Previously we have seen how the degradation of solar radiation in processes occurring on the earth's surface has resulted in the various forms of movement that matter on the earth's surface is continually undergoing. We have pointed out that the various life-forms are in competition with one another for shares of the solar energy. Furthermore, we have seen how the human species, by learning to use fire, to domesticate plants and animals — and by developing tools and weapons, first of stone, wood and bone, and later of metals -- has been able to disturb the biologic equilibrium and gain for itself a disproportionate share of this solar energy as compared with other species. At first thought one might conclude that this would result in an improved human standard of living and general well-being — and in some cases this was true — but by and large the improvement as regards the individual does not seem to have been great.

EARLY STAGES IN THE USE OF EXTRANEOUS ENERGY AND THE BEGINNING OF HUMAN INDUSTRY

Initially there was rather slow and tortuous evolution of the human species in the struggle for energy. Then with learning to use the energy contained in coal, there seemed to be a quickening of the tempo of human affairs. Coal provided heat for domestic purposes and for glassmaking. After 1745 coal was made into coke for the smelting of iron. The increasing uses for coal created a greater and greater demand for more coal. The increased rate of mining operations caused mining to be carried on at greater depths with consequent pumping problems of continuously increasing magnitude. The use of as many as one hundred horses working on treadmills created costs of upkeep for the horses that threatened to overbalance the proceeds from selling the coal. It was imperative that a better and cheaper method of pumping be devised.

MODERN INDUSTRIAL GROWTH

Those who attempt to follow the industrial development that has taken place in the Western World since the year 1700 by taking into account all of the separate inventions and technical developments that have occurred in the various fields of industry soon find themselves hopelessly involved. Order, however, readily emerges from this chaos when one considers that all of this industrial activity has been based, for the main part, upon the use of a few relatively simple substances, chiefly, the few industrial metals — iron, copper, tin, lead, zinc, etc. — as the essential materials for machinery, and the use of a basic sources of energy, chiefly the mineral fuels, coal, oil, and natural gas, and of lesser importance, water power.

INDUSTRIAL GROWTH CURVES

The most accurate quantitative picture of the rate and magnitude of our industrial growth, however, could be obtained by plotting **growth curves** of the production of these primary metals and of energy.

These show in quantitative terms what the leading facts of our industrial expansion have been. Human beings learning to convert to their own uses the vast supply of energy contained in fossil fuels -- coal and oil -- has opened up a totally new and unparalleled phase of human history. It has been estimated that the effect of this upon the biological equilibrium of the human species has been such that the human population on the globe has more than quadrupled since the year 1800. Areas like the British Isles, which under a pretechnological state of the industrial arts were able to support only from 5,000,000 to 8,000,000 people, now have populations of approximately 59,500,000 (1999) or a population of more than 600 persons per square mile.

It has been shown that this industrial growth has been characterized in the initial stages by a compound interest type of expansion of about seven percent per annum in the United States. It has also been shown that not only is it impossible to maintain such a rate of expansion for more than a few decades but that in the United States this period of most rapid growth has passed; and that already, more or less unconsciously, we have entered well into the second period of growth — that of leveling off and maturation.

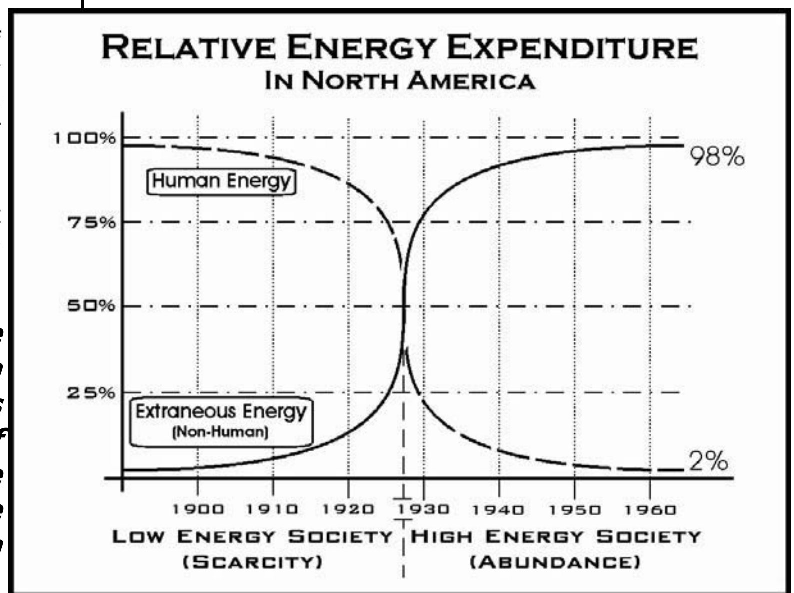
It seems at present that the days of great industrial expansion in North America are over, due to physical limitations, unless new and as yet untapped sources of energy become available. We have been told repeatedly that new industries have been and will continue to be sufficient to maintain the industrial growth as older industries slacken. Consideration of the graph of total energy that represents the motive power of all industries, new and old, indicates that up to the present such has not been the case, and there are no prospects that this will be so in the future.

The chart adjacent represents the one most fundamental change in human industrial and social development. This phenomena results in the foreclosure of the past and demands that changes be addressed for the future. The significance of the period approximately at the turn of the 20th century illustrates that, for the first time in the history of mankind, the use of extraneous energy surpassed and has increasingly negated the need for human and animal labor.

MINERAL RESOURCES

In the United States in 1987, 52 percent of all revenue freight hauled by Class I railroads consisted of "products of the mines." This classification included only mineral products before manufacture. If the same products after manufacture had been included, the total would have been approximately 70 percent. Thus, modern high-energy civilizations (notably industrial North America), as contrasted with all previous ones of a low-energy character, may truly be called mineral civilizations

In all earlier civilizations the rate of energy consumption per capita per day has been low, in the order at most of 2,000 or 3,000 kilogram-calories of extraneous energy. In the United States in 1972 this figure had reached the unprecedented total of 235,000 kilogram-calories per capita per day. The significance of this can be best appreciated if we consider that this figure is responsible for the railroads, the automobiles, the airplanes, the telephone, the telegraph, radio and television, electric light and power; in short, for everything that fundamentally distinguishes our present state of civilization from all those of the past and from those of such countries as India and China at the present time. ***Stated conversely, if we did not convert energy from a variety of resources such as oil, natural gas, coal, hydro, solar, uranium ore, wind or geothermal at this or a similar rate, our present industrial civilization would not exist. Ours is a civilization of energy.***



Inspection of growth curves shows us something that is rather startling; namely, that most of this industrial growth in the United States has occurred since the year 1900. Stated in another way — if from those curves we compute the amount of coal or iron that has been produced and used since 1900, we could find this to be greatly in excess of all the coal and iron produced prior to that time.

MORE ABOUT GROWTH CURVES

The industrial growth of North America, and to a limited extent East and West Europe, has undergone a phase of development totally unlike that of any previous period in the world's history. Industrial growth has followed the now familiar S-shape curve, beginning with the period of most rapid growth and gradually reaching maturity and leveling off.

It was by no means accidental that this spectacular industrial growth should have occurred mainly in North America rather than in Asia or South America, for the simple reason that large-scale industrial growth requires that there be readily available a suitable ensemble of mineral resources, principally coal and iron, together with the accessory minerals yielding copper, lead, zinc, and the ferroalloys.

Chapter Three: Analysis of the Price System

DEFINITION OF A PRICE SYSTEM

The fundamentals of any Price System are the mechanics of exchange and distribution effected by the creation of debt claims or the exchange of property rights on the basis of commodity valuation irrespective of whether property in that system is individually or collectively owned.

Hence, any social system whatsoever that effects its distribution of goods and services by means of a system of trade or commerce based on commodity valuation and employing any form of debt tokens, or money, constitutes a Price System. Except for a possible remote and primitive community, none other than Price Systems exist at the present time.

TECHNOLOGY AND THE PRICE SYSTEM

In the foregoing we have discussed the basic matter and energy relationships to which all events upon the earth, both organic and inorganic, must conform. We have learned in this manner that out of all conceivable things we might imagine to happen upon the earth, only those are possible for which the total matter involved is neither increased nor decreased, and for which the energy transformations are of such a nature that the occurrence does not amount to one kind or another of a perpetual-motion mechanism.

While this kind of analysis has long been fundamental in engineering when dealing with simple, small-scale problems, **it has not been extensively recognized that the same technique is applicable and of fundamental importance to the far more intricate problems of the operation of a human social complex.** In engineering, for example, it has long been known that if a steam engine operating at the absolute temperature T, and a condenser at the temperature T_2, the maximum possible fraction of the heat Q, taken from the boiler that can be converted into work is given by $(T_1,-T_2,)/T_1= Q_1$.

This fact establishes an objective standard of performance. If the performance of the engine is much poorer than this, then it is known that a better engine can be built, and how much better.

A similar analysis may be made with regard to a human society operating within a given geographical area. When the material and energy resources available to that society are known, the maximum rate of operation of a social mechanism in that area can be established to a reasonable approximation. If the observed operation is at a greatly inferior level to that which in this manner is known to be possible, then we know that there is room for substantial improvement. Furthermore, as in the case of the steam engine, faulty operation implies faulty design of the operating mechanism that can be corrected only by an improved design that omits the faulty characteristics of a social mechanism.

In reviewing world resources, we know today that many areas of the globe are so deficient in material and energy resources essential to a large-scale industry that their populations are effectually doomed to a low energy standard of living unless — and until — technological advances render presently unknown resources available. We have learned that the North American Continent is not so handicapped, and in regard to climate, soil, biological, mineralogical and energy resources, it is the most endowed continent on Earth. **In fact, it has the resources, the trained personnel, and the technological knowledge necessary to provide every human inhabitant with an optimum physical standard of living at a small and continuously decreasing labor requirement per individual.** Yet, if we consider the poverty and squalor that is allowed to exist, the waste and destruction of resources, the destruction of products and maintenance of enforced scarcity both by government and by private industry, and the large underemployment statistics, we must conclude that the actual operation of our social mechanism is vastly inferior to its presently known potentialities.

Hence, we have a clear case of a mechanism whose actual operation is so far below that which is possible as to constitute both a social and technological scandal. That this should not be surprising when it is considered that the fundamental elements of design and operation of our social structure grew up thousands of years ago to meet the needs of an agrarian economy, whereas the transition from such an economy to our present state of technological advancement has occurred principally within the last century, and so far as growth is concerned, since the year 1900. It is inconceivable that the institutions and customs that evolved to meet the needs of a society composed of hunters, peasants, sheepherders, warriors, priests, petty merchants, and usurers should be adequate for the needs of a society operating billions of horsepower of prime movers with its consequent array of high-speed transportation, communication, and productive equipment.

THE FLOW OF MONEY

Money, bank deposits, bonds, and various other forms of negotiable paper are all generically the same; namely, debt. In 1933 the total long-term and short-term debts of the United

States were estimated at 238 billion dollars. Only about 9 billion dollars of this were represented by actual money in the form of gold, coins of various metals, U.S. currency, and various kinds of bank notes. While at year-end 1947 the total long and short-term debts in the U.S. were estimated by the U.S. Dept. of Commerce at $417 billion, only about $25 billion of this was in the form of U.S. currency (coins and bills ranging from one dollar to $10,000 denominations). As of Sept. 30, 1987, the total U.S. debts outstanding, including governmental, corporate, mortgage, and consumer, had reached $10,100 billion (Federal Reserve Board), and the currency in circulation had risen to $217 billion (U.S. Treasury Dept.).

For our purposes the significant thing about money in this broader sense is that while it has the property of being created out of nothing or contracted into nothing in a manner quite unlike the physical operation of our industrial apparatus, it constitutes **the mechanism of control** over the latter. It remains now to consider the manner in which money or debt operates as an industrial control device.

PURCHASING POWER

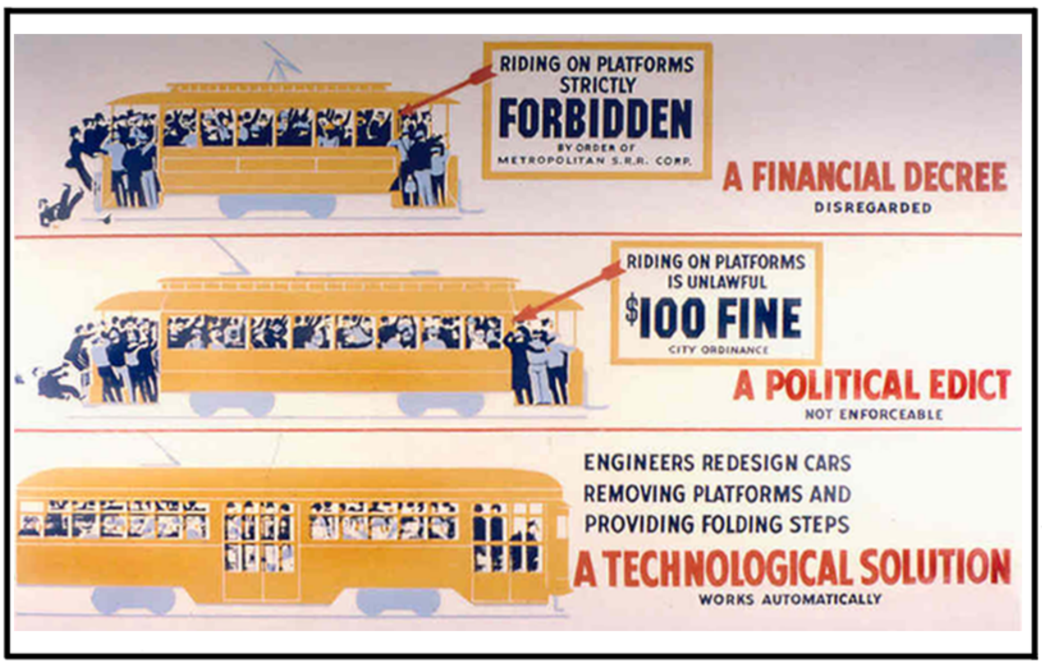
Under a Price System, the rate of flow of money from the consumer to the retailer of goods and services **acts as an industrial control mechanism.** If individuals and corporations are allowed to save, the requisite purchasing power to buy the existing products of industry can only be maintained when money is being paid back to the consumer through the construction of new plant or other capital goods at a rate equal to that at which money is being lifted from the purchasing power for consumers' goods through individual and corporate savings.

OPERATING CHARACTERISTICS UNDER THE PRICE SYSTEM

Under Price System operation and control, it is becoming increasingly difficult, in accordance with the accepted rules of the game, to maintain industrial operation within the limits of social tolerance. The operating characteristics of industry, when at its best under a Price System control, are still inefficient.

Attention is called to the fact that business is engaged, not primarily in the making of goods, but in the making of money. If in the course of making money the manufacture of goods happens to be indulged in, to the businessman that is a mere incident rather than a matter of primary importance. From a social point of view, however, the only matter of consequence is the fact that somehow or other in the process, goods are manufactured and distributed for human needs.

It is the Price System itself and not the individual human being that is at fault. In this system, human beings are obliged to act in accordance with its dictates with rather sorry results. Consequently, no amount of doctoring of symptoms while leaving the fundamental causes of the disease intact will be of any appreciable avail. One does not eliminate bootlegging while prohibition in conjunction with a thirsty public exists; **thereby, bootleggers are created.** Abolish prohibition and bootleggers largely disappear. One does not abolish or prevent war by pacifistic speeches, or by other means either, so long as foreign trade and the manufacture of munitions of war remain profitable. Neither does one abolish disease while poverty, malnutrition and other disease-breeding conditions continue unaltered, nor so long as the economic well-being of the medical profession depends upon the prevalence of disease in profitable amounts. Nor is crime (including illicit drugs) ever abolished, either by coercive measures administered by officials whose activities are only slightly, if any, less socially objectionable than those whom they seek to suppress, or by any amount of moralistic railing or inculcation of doctrines of "brotherly love" so long as there continues to be offered a standing reward to all those who will "victimize" society successfully. Granted the offer of the reward, socially objectionable activities follow as a consequence; withdraw the reward and these activities automatically disappear. It is the Price System itself — the rules



whereby the game is played — and not the individual human being that is at fault.

THE NATURE OF THE HUMAN ANIMAL

We have dealt with the fundamentals of the scientific basis of the phenomena that make up our complex social activities. We have discussed the animal that we may summarize as follows: analysis of the existing social habits comprising our Price System mode of control. ***We have no physical barriers, aside from human apathy, to the attainment on this Continent of an average physical standard of living that would be the highest we have ever known.*** We have shown likewise that our social activities, as controlled by existing social habits that we term "the rules of the game of the Price System" are rapidly forcing us to an impasse, due to the fact that these habits were largely acquired during a stage of relatively primitive technological development that was characterized by low-energy rates of operation and scarcity in general. In the presence of the technological mechanism that has evolved into a high-energy operation with — for the first time in human history — the potentialities of plenty, the Price System rules of enforced scarcity are found to be no longer adequate.

Since it is human beings and their habits with which we are now obliged to deal, it is well that we inquire somewhat more deeply than previously into the nature of this human animal before proceeding further.

There is probably no field of scientific investigation in which more resistance has been encountered than in those domains that have affected the superstitions people have entertained about themselves. The history of science is littered with burnings at the stake, heresy trials, imprisonment of scientists whose works have contradicted, or otherwise cast doubt upon, popular superstitions.

Most of the fundamental advances in human knowledge have been opposed because these advances have contradicted what people have thought they knew about themselves. Little by little, as scientific knowledge has advanced, human ignorance and superstition have retreated; until now, for the first time, we are able to view fairly objectively the fundamental nature of this human animal that we may summarize as follows:

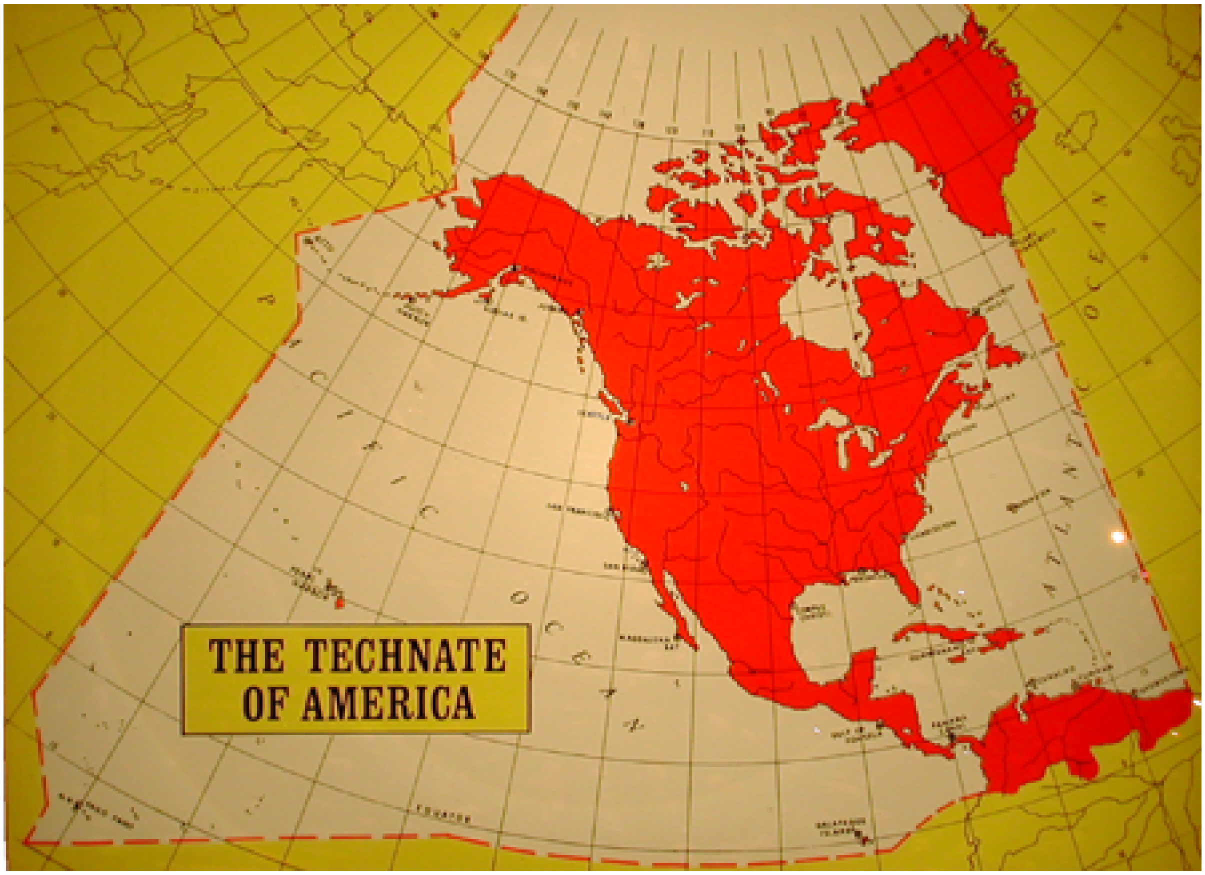
(1) The human animal is composed of chemical atoms that are derived from the ordinary inorganic materials of the earth and that ultimately return to the place from where they originated.

(2) The human being is an engine taking potential energy in the form of chemical combinations contained in food and converting this potential energy into heat, work, and body tissue. The thermodynamic processes involved, while more complicated in detail, are in exact accordance with the laws of thermodynamics and are in no essential particularly different from the corresponding processes in man-made engines.

(3) The human animal responds largely to its external environment through the mechanism of the conditioned reflex which is a purely automatic but tremendously complex, nervous control mechanism. These conditioned reflexes are, however, subject to control through the device of manipulating an individual's environment. Individuals' present conditioning is the result of all of their own past experiences. The more nearly the environment of a large number of people is kept identical, the more nearly is human behavior similar. This is the reason for the great similarity among individuals of various groups: college students, policemen, politicians, Rotarians, farmers, and soldiers. In other words, within the limits allowed by their physiological differences, human beings respond similarly to a like external environment. If these conditioned reflexes are amply upplied with the basic biological necessities—food, necessary amounts of clothing and housing, and gregarious and sexual outlets — they will behave in a manner that will not upset either their conditioned responses or their conditioned inhibitions. They will literally face bullets in preference to social disapprobation.

(4) There are basic physiological differences among individuals that are partly inherent and partly acquired through differences in diet, secretions of the endocrine glands, genetics, etc. It is these basic physiological differences among various human beings that upset all philosophic theories of equality and hence any governmental theory of democracy. In any group of human beings having practically the same external environment, certain individuals always tend to be dominant, and others with regard to these are submissive and constitute the followers. If there were only two people on an island, one of them would be No. 1, and the other would be No. 2. If this spontaneous natural order of priority is inverted by an artificial means whereby the submissive type is made superior to the dominant type, a socially unstable situation is created.

(5) Human social habits and institutions tend to remain stable or else to change extremely slowly except in the case of a rapid change of the external environment, especially when this latter affects the basic biological necessities. When human beings are fed, clothed, and housed in a manner compatible with good health, are not obliged to do an uncomfortable amount of work, and are permitted normal social intercourse with their friends, social habits and customs tend to become crystalized about this particular mode of procedure. Let any change of environment develop in such a manner that the biological necessities can no longer be met by activities according to the old habits, and these latter will be rapidly abandoned. Social stability, on the other hand, is restored when a new set of social habits and customs are formed that so conform to the dictates of the new environment as to satisfy the basic biological necessities.



THE TECHNATE OF NORTH AMERICA

The area defined as the Technate of North America covers 20% of the land area of the world but has only 9.1% of the world's population. It is the minimum area necessary to ensure maximum defense for this Continent. This area contains the full range of climatic conditions and has all the resources to provide an abundant standard of living — the highest in the world — for its entire population. It has the world's greatest array of technological equipment and the largest per capita energy conversion. Technocracy proposes that this area be consolidated into one organic, functional unit with a technological accounting system. This is the mandate for survival for the people of the nation and this Continent!

Chapter Four: Technocracy: The Design

In the preceding material we learned that the events occurring on the earth are events of matter and energy, and that they are limited by the fundamental properties of matter and energy. In addition to this we have noted some of the more important characteristics peculiar to organisms, and singling out one particular organic species, humankind, we have followed its rise to supremacy during the past several thousands of years.

We have observed that this rise of the human species and the corresponding adjustments, both up and down, of the other species or organisms have been due almost entirely to the fact that the human species has progressively accumulated new and superior techniques by which a progressively larger share of the total available energy could be converted to its uses.

We have seen that the greater part of this advance, in actual physical magnitude, has occurred since the year 1900, although this progression has been slowly underway since times prior to the records of written history.

It is due to the progress of these last few decades that, for the first time in human history, whole populations in certain geographical areas have changed over from a primary dependence upon agriculture for a livelihood to a primary dependence upon a technological mechanism constructed principally from metals obtained from the minerals of the earth and operated in the main from the energy contained in fossil fuels preserved within the earth.

Hence, this technological development has come to be localized in those geographical areas most abundantly supplied with the essential industrial minerals, such as the ores of iron, copper, tin, lead, zinc, etc., and the fossil fuels, coal and oil. We have observed further that the Continent of North America ranked first among all the areas of the earth in its supply of these essential minerals with Europe second. Consequently, this technological development had reached its greatest heights in the areas bounding the North Atlantic with the production or rate of conversion of extraneous energy per capita having reached a far greater advancement in North America than in Europe.

THE ARRIVAL OF TECHNOLOGY

Also, we have reviewed some of the paradoxes and problems that have arisen in North America due to the conflict between the physical realities of this technological mechanism and the social customs and folkways handed down from countless ages of low-energy agrarian civilizations.

We now turn our attention to the problem of the elimination of this conflict, but before proceeding further we want to clarify entirely just what the conflict is.

In the past, we operated more or less as **independent productive units.** The industry of the whole population was agriculture and small-scale, handicraft manufacturing. The interdependence among separate productive units was slight or so loosely coupled that the opening up or shutting down of one unit was of slight consequence to the others. This was because any given essential product was not produced by one or two large establishments but by innumerable small ones. The total output of that product was the statistical result of all the operations of all the separate, small establishments. Consequently, the effect of the opening or closing of any single establishment was negligibly small as compared with the total output of all establishments. The probability that a large fraction of all establishments of the same kind would open and close in unison was also negligibly small.

In the past, **human labor,** while not always the sole source of power, was so essentially a part of the productive process that, in general, an increase in the rate of production took place only when there was also an increase in the number of man-hours of human labor expended. During periods in which there was no technological improvement, this relation between production and man-hours was one of strict proportionality.

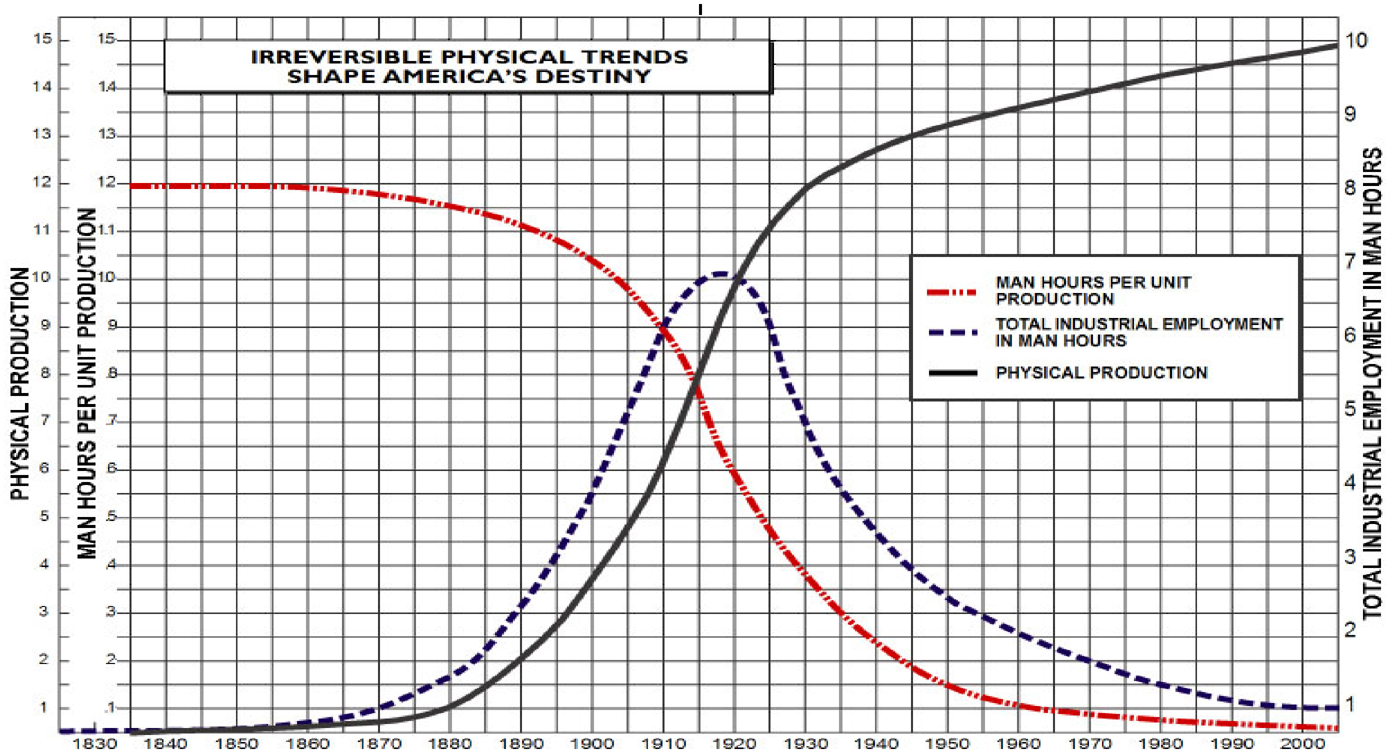
In the past, there was **individual ownership** of small units so that the exchange of goods on a barter or simple hard-money basis resulted in a stable operation of the productive mechanism. Individual wealth could be, and was, acquired in recompense for diligence, thrift, and hard labor.

Those were the days of the spade, the wooden plow, homemade clothing, the oxcart, and, more recently, the horse and buggy.

Today all that has changed.

As time progressed, the population grew and production increased. Productive units that began as small handicraft units were enlarged; new ones were established; some of the old ones dropped out. The average rate of output per establishment became so great that the total number of establishments of each given kind required for the total production began to decrease until today, for a large number of essential products, only a dozen or so establishments can produce at a rate equal to the consuming capacity of the entire population. In some instances one single plant at full-load operation can produce at such a rate.

While this trend has advanced further in some industries than in others, it is present in all industries, including even the most



backward of them — agriculture. Since the cause for this development, namely technological improvements that still exists in full force, there can be no doubt that this trend will be continued into the future.

When, however, all products of a given kind come to be produced by only a small number of productive establishments under the ownership and control of even a smaller number of corporate bodies, as is the case today, and when the financial restrictions that bear upon the one bear also upon the others, the probability that all will increase or decrease production in unison with the amplitude of the oscillations approaching that from capacity output to complete shutdown amounts almost to a certainty.

Any distribution of goods and services, based upon the man-hours of human participation, can lead only to a failure of the distributive mechanism and industrial stagnation.

Since the amount consumed over a period of a few years is, in general, equal to or less than the amount produced in that time, these oscillations in the productive process and the forced restrictions upon production can result only in a restriction and curtailment of consumption on the part of the public. When this curtailment becomes so severe as to amount to privation on the part of a large proportion of the population, the controls causing the restricted production will have long since passed their period of social usefulness and will be rapidly approaching the limits of social tolerance.

In the present, as contrasted with the past, the great majority of the population is in a position of absolute dependence upon the uninterrupted operation of a technological mechanism. In the United States today there are 62,000,000 (23%) people who live in rural areas as compared with 54 million people in 1971, whereas almost 211,000,000 (77%) live in towns and cities as compared with 150 million people in 1971. (1999 population in the United States: 273,000,000.) These latter are strictly dependent for food, water, clothing, shelter, heat, transportation, and communication upon the uninterrupted operation of the railways, the mines, factories, farms, etc. Even the farmer of today would be in dire straits were gasoline, coal, factory-built tools, store-bought clothing, and even canned foods not available.

In all preceding human history, until around the year 1920 in industrial North America, an increase in production was accompanied by an increase in the man-hours of human labor; today, we have reached the stage where an increase of production is accompanied by a decrease in man-hours per unit of production.

This is due to the facts that the motive power of present industrial equipment has become almost exclusively kilowatt--

hours of extraneous energy, and that we have learned that in repetitive processes it is always possible to build a machine that will perform the given function with greater speed and precision and at lower unit cost than it is physically possible for any human being to do.

Every time new equipment is devised or old equipment redesigned, the newer operates faster and more automatically than its predecessor and since, as yet, the accomplishments in this direction are small compared with the possibilities, it is certain that this trend also will continue into the future.

In the remote past, the rates of increase of population and production were negligibly small; in the recent past, the rates of growth of both population and production have been the greatest the world has ever known. In the present and in the future, the rates of growth of both population and industrial production will approach zero as the leveling off process continues.

In the past, when human-hours of labor formed an essential part of wealth production, it was possible to effect a socially tolerable distribution of the product by means of a monetary payment on the basis of the hours of labor expended in the productive procedure. Both Adam Smith (in 18th Century Britain) and Karl Marx (in 19th Century Germany) unequivocally stated that human labor and toil are the source of all goods, all wealth, and based their capitalistic and socialist versions of the Price System on that "fact," which they assumed to be eternal and universal.

At the present and in the future, since the hours of labor in the productive processes have already become unimportant and shall become increasingly less important with time, ***any distribution of goods and services, based upon the man-hours of human participation, can lead only to a failure of the distributive mechanism and industrial stagnation.***

THE TRENDS

Now it is this complex of circumstances that forms the basis of our problem and also of its solution. We have the North American Continent with its considerable natural resources. We have on this Continent a population that is more nearly homogeneous than that of any other Continent. This population has already designed, built, and now operates the largest and most complex array of technological equipment the world has ever seen. Furthermore, this population has a higher percentage of technically trained personnel than any major population that has ever existed. It has the highest average consumption of extraneous energy per capita the world has ever known. Its resources were once so ample that there seemed to no insurmountable restrictions on the standard of living due to resource depletion. We can no longer assume that to be correct because of the tremendous wastage demanded by Price System operations.

As for production and population, the physical maximum of production will be set by the maximum physical capacity of the public to consume, which is contrary to the credo of the economists, is definitely limited and finite.

We have also seen that it is possible to approach that maximum only by a continuation of the processes that now so markedly differentiate our present from the past; that is, by an increased substitution of kilowatt-hours for man-hours, by a continuous technological improvement of our equipment toward greater efficiency, by a continued integration of our productive equipment from smaller into larger units and under unit control and operation, and by an improvement of the operating load-factor, approaching the ultimate limit of 100 percent.

These are the trends and there is no possible way of reversing them. Since each has its own limits — essentially those stated above — it follows that in time we shall approach those limits. But as and when we do approach them, the very requirements of the operation of our industrial equipment will dictate a directional control and a social organization designed especially to meet these particular needs.

From such a state of operation the unavoidable byproducts will be the smallest amount of human labor per capita, the highest physical standard of living, the highest standard of public health and social security any of the world's populations has ever known.

THE SOLUTION

The above is our social progression and the goal almost reached. Whether we as individuals may prefer that goal or some other is irrelevant, since we are dealing with a progression that is beyond our individual or collective abilities to arrest. Since this progression unavoidably conflicts with our horse-and-buggy ideologies and folkways, it is not surprising that restrictive and impeding measures are attempted; but as to the final outcome one has only to recall the similar restrictive measures that were attempted with respect to the introduction of the use of the bathtub and of automobiles, as well as with respect to most of the other major innovations of the past. Invariably the old idealogies of the past fade out of use and new ones, conforming more nearly to the new physical factors, take their places.

The conflict that we are now in the midst of is precisely of this sort — a conflict between physical reality and the antiquated ideology of a bygone age. In the case of the automobile, the ultimate solution came by abandoning the attempts of suppression and by devising control measures to fit the physical requirements of the thing being installed. Since the horse and buggy was physically different from the automobile, it is obvious that traffic measures and road design adequate for the former would be inadequate for the latter, and no solution was possible that was not formulated in recognition of this fact.

So today, with the operation of our technological mechanism, the control measures that must and will be adopted are those that most nearly conform to the technological operating requirements of that mechanism.

These requirements can be known only by those who are intimately familiar with the technical details of that mechanism — our technically trained personnel; though prior to there being a general recognition of this fact, we may expect to witness performances on the part of our economists, lawyers, politicians, and businessmen that will parallel the performances of all the witch doctors of preceding ages.

It was a recognition of the fact that we are confronted with a technological problem that requires a technological solution that prompted the scientists and technologists who later organized Technocracy Inc. to begin the study of the problem and its solution as early as the year 1919.

Out of that study a technological design expressly for the purpose of meeting this technological problem has been produced. An outline of some of its principal features is presented in what follows.

PERSONNEL

First, required resources must be available; second, the industrial equipment must exist; and third, the population must be so trained and organized as to maintain the continuance of the operation within the limits specified.

This brings us to the question of the design of the social organization. To begin with let us recall that the population falls into three social classes as regards their ability to do service. The first is composed of those who, because of their young age, have not yet begun their service. This includes the period from infancy up through all stages of formal education. After this period comes the second, during which the individual performs a social service at some function or other. Finally, the last period is that of retirement, which extends from the end of the period of service until the death of the individual. These three periods embrace the activities of all normal individuals. There is always another smaller group that is not performing any useful social service at a time when it normally would be because of ill health or some other form of incapacitation. Therefore, the social organization must embrace all those of both sexes who are exempt from the performance of some useful function.

We emphasize the fact that these groups of a population are not something new; they exist in any society. We have deliberately left out certain groups that ordinarily exist: those who perform no useful social service though able to do so and those whose services are definitely socially objectionable. ***It is the group that is giving service at some socially useful function that constitutes the personnel of our operating organization.***

What must this organization do?

It must operate the entire physical equipment of the North American Continent. It must perform all service functions, such as public health service, education, recreation, etc., for the population of this entire area. In other words, it has to operate and perform every functional job that exists.

What other properties must this organization have?

It must see to it that the right persons are in the right place. This depends both upon the technical qualification of the individual as compared with the corresponding requirements of the job and also upon the biological factors of the human animal discussed previously. It must see to it that these persons must be the type who, in an uncontrolled situation, would spontaneously assume that position among their coworkers. There must be as near as possible no inversion of the natural "peck-rights" among the workers.

It must provide ample leeway for the expression of individual initiative on the part of those gifted with such modes of behavior, so long as such expression of individual initiative does not occur in modes of action that are themselves socially objectionable. It must be dynamic rather than static. The operations themselves must be allowed to undergo a normal progressive evolution, including an evolution in the industrial equipment, and the organizational structure must likewise evolve to whatever extent becomes necessary.

The general form of the organization is dictated by the functions that must be performed. Thus, there is a direct functional relationship between the conductor and the engineer on a railway train, whereas there is no functional relationship whatever between the members-at-large of a political or financial organization. The major divisions of this organization, therefore, would be automatically determined by the major divisions of the functions that must be performed. The general function of communications, for instance; mail, telegraph, telephone, television and radio automatically constitutes a functional unit.

OPERATING EXAMPLE

Lest the above specifications of a functional organization tend to frighten one, let us look at some of the functional organizations that exist already. One of the largest single functional organizations, before deregulation took place, was that of the Bell Telephone system. What we refer to here in particular is that branch of the Bell system personnel that designed, constructed, installed, maintained, and operated the physical equipment of the system. The financial superstructure--the stock and bond holders, the board of directors, the president of the company and other similar officials whose duties were chiefly financial — was distinctly not a part of this functional organization, and technically their services could readily have been dispensed with. This functional organization did comprise upwards of 800,000 people. It is of interest to review what its performance was and something of its internal structure, since relationships found in organizations of this immensity will undoubtedly be found in the greater organization whose design we are anticipating.

What were the characteristics of this telephone organization?

(1) It maintained in continuous operation what was probably the most complex interconnected array of physical apparatus in existence.

(2) It was dynamic in that it continually changed the apparatus with which it had to deal and remolded the organization accordingly. Here we had a single organization that came into existence as a mere handful of personnel in the 1880s. Starting initially with no equipment, it designed, built, and installed equipment and replaced this with still newer equipment until it spanned most of the North American Continent as a single network, and maintained interconnecting long-distance service to almost all parts of the world. All this was done with rarely an interruption of 24-hour-per-day service to the individual subscriber. In the meantime, the organization had grown from zero to 800,000 people.

(3) That the right people must have been placed in the right job is sufficiently attested to by the fact that the system worked. The fact that an individual on any one telephone in a given city could call any other telephone in that city at any hour of the day or night -- and in all kinds of weather -- with only a few seconds of delay, or that a long-distance call could be completed in a similar manner across the entire Continent in a mere matter of a minute or two, is ample evidence that the individuals in whatever capacity in the functional operation of the telephone system must have been competent to handle their jobs.

Thus, we see that this functional organization, comprising 800,000 people, satisfied a number of the basic requirements of the organization whose design we contemplate. It is worthwhile, therefore, to examine somewhat the internal structure of this organization.

What was the basis on which it was decided that a telephone circuit would be according to one wiring diagram and not according to another?

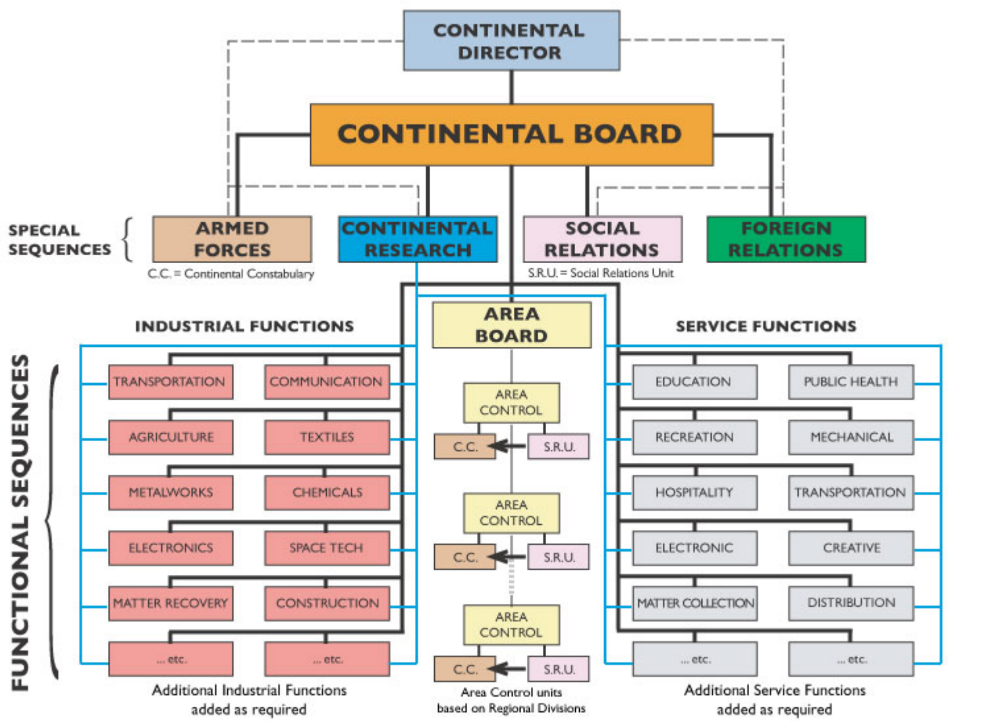
The fitting of the person to the job was not done by election or by any of the familiar democratic or political procedures. Employees got their jobs by the nomination of their peers and through appointment by their superiors and were promoted or demoted by the same process. The people making the appointment were invariably those who were familiar both with the technical requirements of the job and with the technical qualifications of the person. An error of appointment invariably showed up in the inability of the appointee to hold the job, but such errors could promptly be corrected by demotion or transfer until one found a job that one could perform. The appointive system pyramided on up through the ranks of all functional sub-divisions of the system, and even the chief engineers and the operating vice-presidents attained and held their positions also by appointment. It is here that the functional organization came to the apex of its pyramid and ended where the financial superstructure began. At this point also the criteria of performance suddenly changed. In the functional sequence the criterion of performance was how well the telephone system worked. In the financial superstructure the criterion of performance was the amount of dividends paid to the stockholders. Even the personnel of this latter were not the free agents they were commonly presumed to be because if the dividend rate was not maintained, there was a high probability that even their jobs would be terminated.

The other question that remains to be considered is that of the method of arriving at technical decisions regarding matters pertaining to the physical equipment. If the telephone service is to be maintained, there is an infinitely wider variety of things that cannot be done than there is of things that can be done. Electrical circuits are no respecters of persons, and if a circuit is **dictated** that is contrary to Ohm's Law, or any of a dozen other fixed electrical relationships, it will not work even if the chief engineer himself requests it. It might with some justice be said that the greater part of one's technical training in such positions consists in knowing what not to do, or at least what not to try. As long as telephone service is the final criterion, decisions as to which circuits shall be given preference are made, not by chief engineers, but **by results of experiment.** Through experiment the circuit that gives the best results will be used. A large part of technical knowledge consists in knowing which of two things will work the better on the basis of experiments already performed. In case such knowledge does not exist already, it is a problem for the research staff and not for the chief executive. The research staff discovers which mode of procedure is best, tries it out on a small scale until it is perfected and designs similar equipment for large-scale use. The chief executive sees that these designs are executed.

Such are some of the basic properties of any competent functional organization. ***It had no political precedents. It was neither democratic, autocratic nor dictatorial.*** It was determined by the requirements of the job that had to be done and, judging from the number of human beings performing quietly within such an organization, it must also have been in accord with the biological nature of the human animal.

NOTE: Before deregulation, the Bell Telephone System gave excellent and efficient service — about the best we could expect of a Price System operation. We didn't own our phone; we rented it. Since deregulation, we have had confusion about which company operates what. This is what happens when an attempt is made to manipulate the functioning of technology so that it spreads the profit among more investors.

ADMINISTRATION CHART OF THE NORTH AMERICAN TECHNATE



ORGANIZATION CHART

On the basis of the foregoing we are now prepared to design the social organization that is to accomplish the objectives enumerated before. This organization must embrace every socially useful function performed on the North American Continent, and its active membership will be composed of all the people performing such functions in that area. Since there does not exist in this area any sequence of functions that is independent of or can be isolated from the remaining functions, it follows that in order to obtain the highly necessary synchronization and coordination between all the various functions, they must all pyramid to a common head.

The basic unit of this organization is the **Functional Sequence.** A Functional Sequence is one of the larger industrial or service units, the various parts of which are related one to the other in a direct functional sequence.

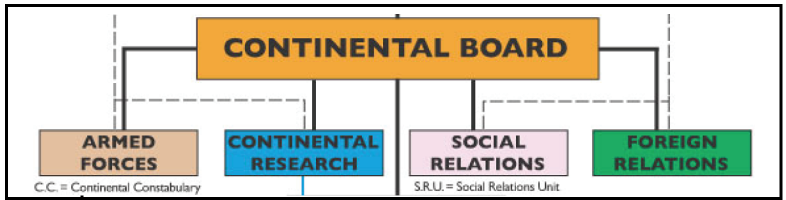
Thus, among the major ***Industrial Sequences*** we have transportation (railroads, waterways, airways, highways, and pipe lines); communication (mail, telephone, telegraph, radio, television, and satellite technology); agriculture (farming, ranching, dairying, etc.), and the major industrial units such as textiles, iron and steel, etc.

Among the **Service Sequences** are education (this would embrace the complete training of the younger generation), and public health (medical, dental, public health, and all hospitals and pharmaceutical plants, as well as institutions for the incapacitated).

Due to the fact that no Functional Sequence is independent of other Functional Sequences, there is a considerable amount of arbitrariness in the location of the boundaries between adjacent Functional Sequences. Consequently, it is not possible to state **a priori** exactly what the number of Functional Sequences will be, because this number is itself arbitrary. It is possible to make each Sequence large with a consequent decrease in the number required to embrace the whole social mechanism. On the other hand, if the Sequences are divided into smaller units, the number will be correspondingly greater. The total number actually used will probably be somewhere between 50 and 100. In an earlier layout the social mechanism was blocked into about 90 Funtional Sequences, though future revision will probably change this number somewhat.

The schematic relationship showing how these various Functional Sequences pyramid to a head and are there coordinated is illustrated on the Schematic Administration Chart of the North American Technate. At the bottom of the chart, on either side, several Functional Sequences are shown schematically. In the lower left-hand corner three of the industrial sequences are shown, and in the lower right-hand corner are three of the Service Sequences. The size of the chart prevents showing all Functional sequences in either group. On a larger chart the additional Functional Sequences would be shown laterally in the same manner as those shown here. Likewise, each of the Functional Sequences would spread downward with its own internal organization chart, but that is an elaboration that does not concern us here.

SPECIAL SEQUENCES



There are five other Sequences in this organization that are not in the class with the ordinary Functional Sequences that we have described. Among these is the **Continental Research**. The staffs described earlier are primarily operating and maintenance staffs whose jobs are primarily the maintaining of operation in the currently approved manner. In every separate Sequence, however, Service Sequences as well as Industrial Sequences, it is necessary to maintain an alert and active research for the development of new processes, equipment, and products in order that stagnation may not develop. Also, there must be continuous research in the fundamental fields of science — physics, chemistry, geology, biology, etc. Likewise, there must be continuous analysis of data and resources pertaining to the Continent as a whole, both for the purposes of coordinating current activity and of determining long-time policies as regards probable growth curves in conjunction with resource limitation and the like.

The requirements of this job make it necessary that all research in whatever field be under the jurisdiction of a single research body so that all research data are at all times available to all research investigators wishing to use them. This special relationship is shown graphically in the organization chart. The chief executive of this body, the Director of Research, is at the same time a member of the Continental Control and is also a member of the staff of the Continental Director.

On the other hand, branches of the Continental Research parallel laterally with every Functional Sequence in the social mechanism. These bodies have the unique privilege of determining when and where any innovation in current methods shall be used. They also have the authority to cut in on any operating flow line for experimental purposes when necessary. In case new developments originate in the operating division, they still have to receive the approval of the Continental Research before they can be installed. In any Sequence a person with research capabilities may at any time be transferred from the operating staff to the research staff and vice versa.

Another all-pervading Sequence that is related to the remainder of the organization in a manner similar to that of Research is the **Sequence of Social Relations.** The nearest present counterpart is that of the judiciary. That is, its chief duty is seeing to it that everything as regards individual human relationships functions smoothly.

While the function of Social Relations is quite similar to that of the present judiciary, its methods are entirely different. None of the outworn devices of the present legal profession, such as the sparring between scheming lawyers or the conventional passing of judgment by "twelve good men and women true." Questions to be settled by this body would be investigated by the most impersonal and scientific methods available. As will be seen later, most of the activities engaging the present legal profession, namely litigation over property rights, will already have been eliminated.

Another of these special Sequences is the **Armed Forces.** The Armed Forces, as the name implies, embraces the ordinary military land, water, and air forces but, most important of all, it also includes the entire internal police force of the Continent, the Continental Constabulary. This latter organization has no precedent at the present time. At present the internal police force consists of the familiar hodge-podge of local municipal police, county sheriffs, state troopers, and various denominations of federal agents, most of the former being controlled by local political machines and racketeers. This Continental Constabulary, by way of contrast, is a single, disciplined organization under one single jurisdiction. Every member of the Constabulary is subject to transfer from any part of the country to any other part on short notice. While the Continental Constabulary is under the discipline of the Armed Forces, it receives its instructions and authorization for specific action from the Social Relations and Area Control.

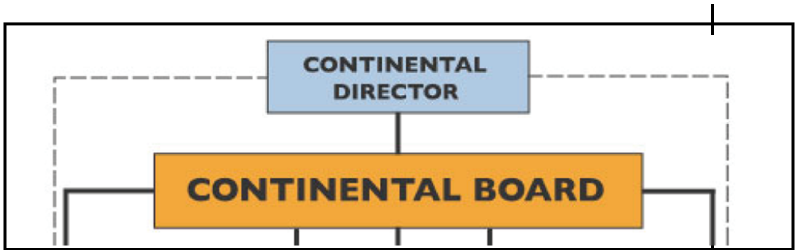
This Sequence — the **Area Control** — is the coordinating body for the various Functional Sequences and social units operating in any one geographical area of one or more Regional Divisions. It operates directly under the Continental Control. The **Foreign Relations** occupies a similar position, except that its concern is entirely with international relations. All matters pertaining to the relation of the North American Continent with the rest of the world are its domain.

The personnel of all Functional Sequences will pyramid on the basis of ability to the head of each department within the Sequence, and the resultant general staff of each Sequence will be a part of the Continental Control—***a government of function.***

THE CONTINENTAL CONTROL

The Continental Director, as the name implies, is the chief executive of the entire social mechanism. On the Director's immediate staff are the Directors of the Armed Forces, the Foreign Relations, the Continental Research, the Social Relations, and Area Control.

Next downward in the sequence comes the Continental Board, composed of the Directors of the Armed Forces, Foreign Relations, Continental Research, Social Relations, and Area



Board, and also of each of the Functional Sequences. This superstructure has the last word in any matters pertaining to the social system of the North American Continent. It not only makes whatever decisions pertaining to the whole social mechanism that have to be made, but it also has to execute them, each Director in his or her Sequence. This latter necessity, by way of contrast with present political legislative bodies, offers a serious curb upon foolish decisions.

So far nothing has been said specifically as to how vacancies are filled in each of these positions. It was intimated earlier that within the ranks of the various Functional Sequences, jobs would be filled or vacated by appointment from above. This still holds true for the position of Sequence Director. A vacancy in the post of Sequence Director must be filled by a member of the Sequence in which the vacancy occurs. The candidates to fill such position are nominated by the officers of the Sequence next in rank below the Sequence Director. The vacancy is filled by appointment by the Continental Board from among the persons nominated.

The only exception to this procedure of appointment from above occurs in the case of the Continental Director due to the fact that there is no one higher. The Continental Director is chosen from among the members of the Continental Board by the Continental Board. Due to the fact that this Board is composed of only some 100 or so members, all well aware of their colleagues' relative competencies, there is no one better fitted to make this choice than they.

The tenure of office of every individual continues until retirement or death, unless ended by transfer to another position. The Continental Director is subject to recall on the basis of preferred charges by a two-thirds decision of the Continental Board. Aside from this, he or she continues in office until the normal age of retirement.

Similarly in matters of general policy, the Continental Director is the chief executive in fact as well as in title. His or her decisions can be vetoed only by two-thirds majority of the Continental Board.

It will be noted that the above is the design of a strong organization with complete authority to act. All philosophic concepts of human equality, democracy, and political economy have upon examination been found totally lacking and unable to contribute any factors of design for a continental technological accounting. The purpose of the organization is to **operate** the social mechanism of the North American Continent. It is designed along the lines that are incorporated into all functional organizations that exist at the present time. Its membership comprises the entire population of the North American Continent. Its physical assets with which to operate consist of all the resources and equipment of the same area.

REGIONAL DIVISIONS

It will be recognized that such an organization as we have outlined is not only functional in its vertical alignment but is geographical in its extent. Some one or more of the Functional Sequences operates in every part of the Continent. This brings us to the matter of blocking off the Continent into administrative areas. For this purpose various methods of geographical division are available. One would be to take the map of North America and amuse oneself by drawing irregularly shaped areas of all shapes and sizes and then giving these areas names. The result would be equivalent to our present political subdivisions into nations, states or provinces, counties, townships, precincts, school districts and the like -- a completely unintelligible hodge-podge.

A second method, somewhat more rational than the first, would be to subdivide the Continent on the basis of natural geographical boundaries such as rivers, mountain ranges, etc., or else to use industrial boundaries such as mining regions, agricultural regions, etc. Both of these methods are objectionable because of the irregularity of the boundaries that would result, and also because there are no clean-cut natural or industrial boundaries in existence. The end-product, again, would be confusion.

A third choice remains: that of adopting some completely arbitrary rational system of subdivisions so that all boundaries can be defined in a few words and that every subdivision can be designated by a number for purposes of simplicity of administration and of record keeping. For this purpose no better system than our scientific system of universal latitude and longitude has ever been devised. Any point on the face of the earth can be accurately and unambiguously defined by two simple numbers, the latitude and longitude. Just as simply, areas can be clocked off by consecutive parallels of latitude and consecutive meridians. ***It is the latter system of subdividing the Continent on the basis of latitude and longitude that we shall adopt.***

By this system we shall define a **Regional Division** to be a quadrangle bounded by two successive degrees of latitude & longitude. The number assigned to each Regional Division will be that of the combined longitude and latitude of the point at the southeast corner of the quadrangle. Thus, the Regional Division in which New York City is located is 7340; Cleveland, 8141; St. Louis, 9038; Chicago, 8741; Los Angeles, 11834; Mexico City, 9919; Edmonton, 11353, etc. In this manner all the present political boundaries are dispensed with. The whole area is blocked off into a completely rational and simple system of Regional Divisions. The number of each division not only designates it but also locates it.

REQUIREMENTS

Now that we have sketched in outline the essential features of the social organization, there remains the problem of distribution of goods and services. Production will be maintained with a minimum of oscillation, or at a high load factor. The last stage in any industrial flow line is use or consumption. If in any industrial flow line an obstruction is allowed to develop at one point, it will slow down and, if uncorrected, eventually shut down that entire flow line. This is no less true of the consumption end. If the production is to be non-oscillatory and maintained at a high level so as to provide a high standard of living, it follows that consumption must be kept equal to production, and that a system of distribution must be designed that will allow this. This system of distribution must do the following things:

(1) Register on a continuous 24-hour-per-day basis the total net conversion of energy, which would determine (a) the availability of energy for continental plant construction and maintenance, (b) the amount of physical wealth available in the form of consumable goods and services for consumption by the total population during the balanced-load period.

(2) By means of the registration of energy converted and consumed, make possible a balanced load.

(3) Provide a continuous inventory of all production and consumption.

(4) Provide a specific registration of the type, kind, etc., of all goods and services, where produced and where used.

(5) Provide specific registration of the consumption of each individual, plus a record and description of the individual.

(6) Allow citizens the widest latitude of choice in consuming their individual share of Continental physical wealth.

(7) Distribute goods and services to every member of the population.

On the basis of these requirements, it is interesting to consider money as a possible medium of distribution, but before doing this, let us bear in mind precisely what the properties of money are. In the first place, money relationships are all based upon "value," which in turn is a function of scarcity. Hence, as we have pointed out previously, money is not a "measure" of anything. Second, money is a debt claim against society and is valid in the hands of any bearer. In other words, it is negotiable; it can be traded, stolen, given or gambled away. Third, money can be saved. Fourth, money circulates and is not destroyed or canceled out upon being spent. ***On each of these counts, money fails to meet the requirements as the medium of distribution.***

Suppose, for instance, that by means of money we attempted to distribute the goods and services produced. Suppose that it were decided that 200 billion dollars worth of goods and services were to be produced in a given year, and suppose further that during that time 200 billion dollars were distributed to the population with which to purchase these goods and services. Immediately the foregoing properties of money would create trouble. Due to the fact that money is not a physical measure of goods and services, there is no assurance that prices would not change during the year, and that 200 billion dollars at the end of the year would be adequate to purchase the goods and services it was supposed to purchase. Due to the fact that money can be saved, there is no assurance that the 200 billion dollars issued for use in a given year would be used in that year, and if it were not used this would immediately begin to curtail production and to start oscillations. Due to the fact that money is negotiable and that certain human beings, by hook or crook, have a facility for getting it away from other human beings, this would defeat the requirement that distribution must reach all human beings. A further consequence of the negotiability of money is that it can be used very effectively for purposes of bribery. Hence, the most successful accumulators of money would be able eventually not only to disrupt the flow line but also to buy a controlling interest in the social mechanism itself, which brings us right back to where we started from. Due to the fact that money is a species of debt, and hence cumulative, the amount would have to be continuously increased, which, in conjunction with its property of being negotiable, would lead inevitably to concentration of control in a few hands and to general disruption of the distribution system that was supposed to be maintained.

Money in any form whatsoever is completely inadequate as a medium of distribution.

Thus, money in any form whatsoever is completely inadequate as a medium of distribution. Any social system employing commodity evaluation (commodity valuations are the basis of all money) is a Price System. Hence, it is not possible to maintain an adequate distribution system in an economy with a Price System control.

THE MECHANISM OF DISTRIBUTION

We have already enumerated the operating characteristics that a satisfactory mechanism of distribution must possess, and we have found that a monetary mechanism fails dismally on every count. ***A mechanism possessing the properties we have enumerated, however, is to be found in the physical cost of production -- the energy degraded in the production of goods and services***

In earlier lessons we discussed in some detail the properties of energy, together with the thermodynamic laws in accordance with which energy transformations take place. We found that for every movement of matter on the face of the earth, a unidirectional degradation of energy takes place, and that it is this energy loss incurred in the production of goods and services that, in the last analysis, constitutes physical cost of production. This energy, as we have seen, can be stated in invariable units of measurements — units of work such as the erg or the kilowatt-hour, or units of heat such as the kilogram-calorie or the British thermal unit. It is therefore possible to measure with a high degree of precision the energy cost of any given industrial process, or for that matter, the energy cost of operating a human being. This energy cost is not only a common denominator of all goods and services but a physical measure as well, and it has no value connotations whatsoever.

The energy cost of producing a given item can be changed only by changing the process. Thus, the energy cost of propelling an average car a distance of 20 miles is approximately the energy contained in one gallon of gasoline. If the motor is in excellent condition, somewhat less than a gallon of gasoline will suffice; hence, the energy cost is lower. On the other hand, if the valves become worn and the pistons become loose, somewhat more than a gallon of gasoline may be required and the energy cost increases. A gallon of gasoline of the same grade always contains the same amount of energy.

In an exactly similar manner, energy derived from coal or water power is required to drive machinery; hence, the energy cost of the product would be the total amount of energy consumed in a given time divided by the total number of products produced in that time. Energy, likewise, is required to operate the railroads, telephones, telegraphs, television, and radio. It is required to drive agricultural machinery and to produce the food that we consume. ***Everything that moves does so only with a corresponding transformation of energy***.

Now suppose that the Continental Board, after taking into due account the amount of equipment on hand, the amount of new construction of roads, plant, etc. required for the needs of the population, and the availability of energy resources, decides that for the next two years the social mechanism can afford to expend a certain maximum amount of energy (equivalent to that contained in a given number of millions of tons of coal). This energy can be allocated according to the uses to which it is to be put. The amount required for a new plant, including roads, houses, hospitals, schools, etc., and for local transportation and communication, will be deducted from the total as a sort of overhead and not chargeable to individuals. After all of these deductions are made, including that required for the education and care of children and the maintenance of hospitals and public institutions generally, the remainder will be devoted to the production of goods and services to be consumed by the public-at-large.

Next, suppose that a system of record keeping is instituted whereby a consuming power is granted to the adult public-at-large in an amount exactly equal to this net remainder of energy available for the producing of goods and services to be consumed by this group. This equality can be accomplished only by stating the consuming power itself in denominations of energy. Thus, if there is available the means of producing goods and services at an expenditure of 100,000 kilogram-calories per person per day, each person would be granted an income, or consuming power, at a rate of 100,000 kilogram-calories per day.

INCOME

Further details must be added to satisfy the requirements we have laid down. First, let us remember that this income is usable for the obtaining of consumers' goods and services. That being the case, there is a fairly definite limit to how many goods and services single individuals can consume, bearing in mind the fact that they live only 24 hours a day, one-third of which they sleep, and a considerable part of the remainder of which they work, loaf, play, or indulge in other pursuits, many of which do not involve a great physical consumption of goods.

Let us recall that every individual in the society must be supplied, young and old alike. Since it is possible to set arbitrarily the rate of production at quite a high figure, it is entirely likely that the average potential consuming power per adult can be set higher than the average adult's rate of physical consumption. Since this is so, there is no point in introducing a differentiation in adult incomes in a manner characteristic of economies of scarcity. Moreover, from the point of view of simplicity of record keeping, enormous simplification can be effected by making all adult incomes, male and female alike, equal. Thus, all adults above the age of 25 years would receive a large income, quite probably larger than they would find it convenient to spend. This income would continue without interruption until the death of the recipient. The working period, however, after the period of transition probably would not need to exceed the 20 years from the age of 25 to 45 on the part of each individual.

Still further properties that must be incorporated into this energy income received by individuals are that it must be non-negotiable and non-savable. That is, it must be valid only in the hands of the person to whom issued and in no circumstances transferable to any other individual. Likewise, since it is issued on the basis of a budget expenditure covering two years, it must be valid only for that two-year period and null and void thereafter. Otherwise, it would be saved in part and serve to completely upset the balance in the operating load in future periods. On the other hand, there is no need for saving, because an income and social security are already guaranteed independently to each individual until death.

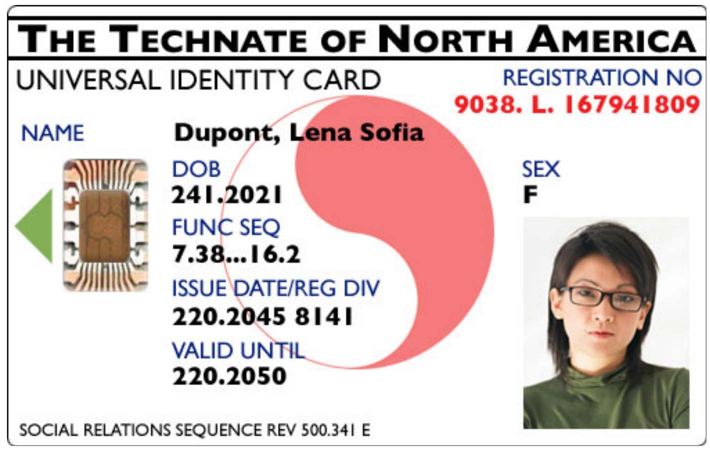
The reason for taking two years as the balanced-load period of operation of the social mechanism is a technological one. The complete industrial cycle for the whole North American Continent, including the growing period of tropical plants, such as Cuban sugar cane, is somewhat more than one year. Hence, a two-year period is taken as the next integral number of years to this industrial cycle. All operating plans and budgets would thus be made on a two-year basis, and at the end of that time the books would be balanced and closed for that period. No debts would be possible, and the current habit of mortgaging the future to pay for present activities would be completely eliminated.

If, as is quite likely, the public find it inconvenient to consume all their allotted energy for that time period, the unspent portion of their allotment will merely be canceled at the end of the period. The saving will be effected by society rather than by the individual, and the energy thus saved, or the goods and services not consumed, will be carried over into the next balanced-load period. This will not, as will be amplified later, throw the productive system into oscillation, because production will always be geared to the rate of consumption and not the total energy allotment. In other words, if for a given balanced-load period the total energy allotment is equivalent to that contained in, say, four billion tons of coal, this merely means that we are prepared if need be to burn four billion tons of coal and distribute the resultant goods and services during that time period. This merely sets a maximum beyond which consumption for that time period will not be allowed to go. If the public, however, finds it inconvenient to consume that amount of goods and services and actually consumes only an amount requiring three billion tons of coal to produce, production will be curtailed by that amount, and the extra billion tons of coal will not be used but will remain in the ground until needed.

ENERGY ACCOUNTING

There are large numbers of different bookkeeping devices whereby the distribution records and the of rate of consumption of the entire population can be kept. In a technological administration, ***Energy Accounting*** is the only efficient method.

The idea of each person on the continent sharing access to production equally and as a right of citizenship gave rise to the question of how this could be accomplished. Before computers and such, a system had been devised that could handle all the information that a continental distribution system required, the Dewey Decimal System. Applying this system to the need specified by Technocracy resulted in a design whereby the information was to have been inscribed on certificates — with a booklet of such certificates given to each citizen — to be automatically completed at the time of each use. Technocracy Inc., to illustrate how such a distribution system would work, has published a booklet called "The Energy Distribution Card." Subsequent developments in technology have superseded the Dewey Decimal System, but these developments have made a continental energy accounting system easier to implement.



(Formerly called the Energy Certificate)

The Energy Distribution Card pamphlet describes the various functions of the energy accounting system of Technocracy in greater detail. The illustration of what the card might look like appears here for reference only. Since all pertinent data would be stored either on a magnetic strip or microchip anyway, the appearance of the card is almost purely aesthetic.

By this system all accounts and records pertaining to consumption are kept by the Distribution Sequence of the social mechanism. The income is distributed to the public in some convenient form, a plastic card, voice print, or some other means of personal identification.

The record of one's income and its rate of expenditure is kept by the Distribution Sequence, so that it is a simple matter at any time for the Distribution Sequence to ascertain the state of a given citizen's balance. This is somewhat analogous to a combination bank and department store wherein all the customers of the store also keep bank accounts at the store bank. In such a case the customer's credit at the department store is as good as his or her bank account, and the state of this account is available to the store at all times.

This personal identification card or device has no counterpart in today's Price System, but the convenience of credit cards or travelers checks is well known; however, "spending," as in the Price System of today, does not correspond to the personal identity technique of the future whereby one can withdraw from the continental inventory according to need or desire.

The significance of this, from the point of view of knowledge of what is going on in the social system, and of social control, can best be appreciated when one surveys the whole system in perspective. First, one single organization is manning and operating the whole social mechanism. This same organization not only produces but also distributes all goods and services. Hence, a uniform system of record keeping exists for the entire social operation, and all records of production and distribution clear to one central headquarters. Tabulation of the information contained in the use of the identity device day by day provides **a complete record of distribution,** or of the public rate of consumption by commodity, by sex, by regional division, by occupation, and by age group.

With this information clearing continuously to a central headquarters, we have a case exactly analogous to the control panel of a power plant, or the bridge of an ocean liner, or the meter panel of a modern airplane. In the case of a steam plant, the meter panel records continuously the steam pressure of the boilers, the fuel record, the voltage and kilowatt output of the generators, and all other similar pertinent data. In the case of operating an entire social mechanism, the data required are more voluminous in detail but not otherwise essentially different from that provided by the instrument panel in the steam plant.

The identity card use gives precise information at all times on the state of consumption of every kind of commodity or service in all parts of the continent. In addition to this there is also corresponding information of materials and rates of operation in every stage of every industrial flow line. There is, likewise, a complete record on all hospitals, on the educational system, amusements, and others of the more purely social services. This information makes it possible to know exactly what to do at all times in order to maintain the operation of the social mechanism at the highest possible load factor and efficiency.

THE DISTRIBUTION METHOD

IT IS

* A Medium of Distribution
* A Continental Accounting System
* Identification and Record of Holder
* Guarantee of Security

IT IS NOT

* A Medium of Exchange
* Subject to Fluctuation of "Value"
* Subject to Theft Or Loss
* Subject to Hoarding or Gambling
* A Means to Wealth Or Prestige
* A Means of Creating Debt

A TECHNOCRACY

The end products attained by a high-energy social mechanism on the North American Continent will be:

(a) a high physical standard of living;

(b) a high standard of public health;

(c) a minimum of unnecessary labor;

(d) a minimum of wastage of nonreplaceable resources;

(e) an educational system to educate the entire younger generation according to their abilities and their interests.

The achievement of these ends will result from a centralized control with a social organization built along functional lines, similar to that of the operating force of any large functional unit of the present such as the telephone system or the power system.

Non-oscillatory operation of high load factors demands not only functional organization of society but a mechanism of distribution that will:

(a) insure a continuous distribution of goods and services to every member of the population;

(b) enable all goods and services to be measured in a common physical denominator;

(c) allow the standard of living for the whole of society to be arbitrarily set as an independent variable;

(d) insure continuous balance between production and consumption.

Such a mechanism is to be found in the physical cost of production; namely, the energy required in the production of goods and services. Incomes can be granted in denominations of energy in such a manner that they cannot be lost, saved, stolen or given away. All adult incomes are to be made equal though probably larger than the average ability to consume.

Such an organization has no precedents in any of the political forms. It is neither a democracy, an aristocracy, a plutocracy, a dictatorship, nor any of the other familiar political forms, all of which are completely inadequate and incompetent to handle the job. It is, instead, a Technocracy, being built along the technological lines of the job in hand.

Chapter Five:
Industrial Design and Operating Characteristics

It appears to be little realized by those who prate about human liberty that social freedom of action is to a much greater extent determined by the industrial system in which individuals are located than by all the legalistic restrictions combined. The freedom of action of pioneers was determined principally by their available mode of travel, which was chiefly afoot, by rowboat, horseback or by animal-drawn vehicles. Their freedom of communication was similarly circumscribed. Their activities in general were accordingly restricted to a relatively small area and to a moderately narrow choice. These restrictions were technological rather than legal. Pioneers could travel only a limited number of kilometers per day, not because there was a law against traveling more than that, but because the technological factors under which they operated did not allow it. The average pioneers traveled by Conestoga wagons, carrying their families' entire possessions, pulled by horse or oxen, covering 20 to 25 kilometers a day.

It is seldom appreciated to what extent these same technological factors determine the activities of human beings at the present time. In New York City, for example, thousands of people crossed the Hudson River daily at 125th Street, and almost no one crossed the river at 116th Street. There was no law requiring individuals to cross the river at 125th Street and forbidding them to cross it at 116th Street. It merely happened that there was a ferry at the former place that operated continuously and none at the latter. It was possible to get across the river at 116th Street, but under the then existing technological controls the great majority of the members of the human species found the passageway at 125th Street more convenient.

Among the social end products that will inevitably result from technological operation of the social mechanism are a high standard of public health, a minimum of unnecessary drudgery, a high physical standard of living, and a minimum wastage of irreplaceable natural resources.

This gives us a clue to the most fundamental social control technique that exists. No other single item exerts more than a small percentage of the influence exerted by the immediate physical environment upon the activities of human beings. ***Leave the physical environment unaltered, or the industrial rates of operation unchanged, and any effort to alter the fundamental modes of behavior of human beings is doomed largely to failure; alter the immediate physical environment of human beings, and their modes of behavior change automatically.*** Human animals accept their physical environment almost without question. They rarely decide to do a particular thing and then find themselves obstructed by physical barriers. Instead, they first determine the barriers and then direct their activities into those paths where insurmountable barriers do not exist. It is these considerations that render the matter of technological design and operation of equipment of the most fundamental significance. There are standards of design and operation that are wasteful of resources and injurious to public health. There are other standards of design and operation that are conducive to the general social well-being and lacking in the socially objectionable elements.

Among the social end-products that will inevitably result from technological operation of the social mechanism are a high standard of public health, a minimum of unnecessary drudgery, a high physical standard of living, and a minimum wastage of irreplaceable natural resources.

A high standard of health will result if all human beings are properly fed, clothed, housed, and have all their other biological needs adequately cared for. A minimum of drudgery will be achieved with all routine tasks eliminated or performed as automatically as possible. Natural resources will be utilized with a minimum of wastage if all industrial processes have the highest physical efficiency, and all products will give the greatest amount of service per unit of physical cost.

It will be recognized that it is precisely these criteria that are implicit in a system of **industrial operation based upon a minimum degradation of physical energy as contrasted with our present Price System based upon a maximum of profit.** It is into these two fundamentally opposed techniques that all the thousand-and-one present-day paradoxes are resolved. Social end products are a dependent function of the industrial mode of operation. The criterion determining the mode of operation happens at the present time to be a maximum of profit under a Price System technique. Granted the continuance of the Price System, all gestures at altering the industrial mode of operation are futile.

It is our purpose now to review several of our major industrial fields and to point out the change in design and operating characteristics that would be instituted under the criterion of a minimum of energy cost per unit of use or service produced.

LOAD FACTOR

One of the first things to be considered in this connection is the matter of operating **load factors.** A load factor of any piece of productive equipment may be defined as the ratio of its actual output over a given time period to the output that would have resulted in the same time period had the equipment been operated at full load throughout the time. If an engine, for instance, which develops 100 hp, operates at full load for 24 hours, it will produce 2,400 hp hours of work. Suppose, however, that the engine is operated only intermittently during that time and actually produces but 600 hp hours of work in 24 hours. The load factor for that period would then be 600/2,400, or 25 percent. The load factor would have been zero had the engine not operated at all, or 100 percent had it operated at full load throughout.

There is a fundamental relationship among production, operating load factors, and the capacity of productive equipment. A load factor of 10 percent merely means that the equipment is producing one-tenth of its productive capacity. Now if this same productive capacity were maintained and the load factor raised to 50 percent, production with the same equipment would be 5 times as great as with a load factor of 10 percent. If the load factor were 100 percent, the production would be 10 times as great.

If we consider just the opposite of the previous formula, then suppose there is no need to increase the production of a given kind of product. In this case the load factor is 10 percent, and that load factor is again raised to 50 percent. If production is not increased, we can achieve this result only by junking four-fifths of the plants engaged in that particular kind of production, or converting them to other uses.

Hence, it follows that a high load factor, no matter whether used for increasing production or for reducing the amount of plant required for a given production, results always in a diminution in the amount of productive equipment per unit produced and results correspondingly **in a reduction of the energy cost per unit produced.**

QUALITY OF PRODUCT

Still another factor of comparable importance to that of the operating load factor is the quality of the product. All products are produced for the purpose of rendering some sort of use or service. The total energy cost of this use or service is the energy cost of producing and maintaining the product.

Take an automobile tire for example. The use of the automobile tire is the delivery of so many kilometers of service. The energy cost of this service per 1,000 kilometers is the energy cost of manufacturing an automobile tire divided by the number of 1,000 kilometers of service it renders. Now suppose the energy cost of making an automobile tire that will give 20,000 kilometers of service is some arbitrary figure, say 100. The cost per 1,000 kilometers would be 5. Consider another automobile tire that will deliver 30,000 kilometers of service, but costs 120 to produce. The cost per 1,000 kilometers of service of this latter tire is only 4. Hence, it is a better tire than the former because its cost per 1,000 kilometers of service is less. Suppose, however, that it were possible to make a tire that would last 100,000 kilometers, but that the cost of producing this tire were 600. Then the cost per 1,000 kilometers would be 6. This tire, therefore, though longer lived, is actually a more costly tire than either of the other two because the cost per 1,000 kilometers of service is greater.

It is always possible to find an optimum quality of product for which the cost per unit of use or service is a minimum, and it is this quality that, according to our energy criterion, is the best. Products either longer-lived or shorter-lived can be built, but they have the disadvantage that the service they render is more costly than that rendered by the product of optimum quality.

Tire	Kilometers of Service	Energy Cost	Cost Per 1000 Kilometers
A	20,000	100	5
B	30,000	120	4
C	100,000	600	6

It is interesting to apply these two criteria, the load factor and the quality of product, to present-day industrial operations. Probably the highest load factor of any of our industrial equipment is that of the central electric power stations. The daily load curve shows a minimum around 1 to 4 A.M., rising to peak in the forenoon. On a national basis, the average load factor in 1999 in the U.S. for all central electric stations was 50 percent. Statistics for 1987 (the most recent reliable information) show the midyear capacity being 714,000,000 kilowatts, and for the whole year the output was 2,571 billion kilowatt-hours, according to Energy Information Administration figures. In other words, more than half the capacity is idle on the average. Utility engineers consider a margin of 20 percent of capacity over the **peak** load as being reasonably safe under present conditions.

Another of our more continuously operated sets of equipment are the long-distance telephone circuits between cities. Before

World War II, the "long haul" trunk lines from New York to Chicago were the busiest on this Continent. Since the 1950s the circuits carrying messages between New York City and Washington, D.C. carry the biggest load.

In our less continuously operated equipment, such as factories, the average annual load factor is around 25 percent (considerably higher in the average oil refinery or steel mill, much lower in canneries and lumber mills and similar batch, intermittent processes). The meat packing establishments of the U.S., for example, normally produce at an annual average of only 10 percent of capacity, according to Department of Agriculture data. The average farm tractor, according to the US Department of Agriculture, is in use less than 600 hours a year (out of the 8,760 hours there are in a year), and the implements it pulls have far less time use per unit.

In the field of automotive transportation, the service rendered is passenger kilometers of transportation. The average passenger capacity of automobiles is about 5. The average number of passengers carried is considerably less than this. The average time of operation per automobile is approximately 1 hour out of each 24, giving an operation load factor of only 4 or 5 percent, or a passenger-kilometer load factor of probably not more than half of this amount. If the operating load factor of automobiles could be stepped up to 50 percent on a 24-hour-per-day basis, the passenger kilometers would be 10 times that of the present for the same number of automobiles -- or else only a fraction as many cars as we now have would be required.

Considering the quality of products, the results are equally bad. Consider razor blades. Suppose that 30 million people shave once per day with safety razor blades, and suppose that these blades give 3 shaves each. This would require a razor blade production of 10 million blades per day, which is the right order of magnitude for the United States. Thus, our razor blade factories may be thought of as producing shaves at the rate of 30 million per day at current load factors. Now suppose we introduce the energy criterion requiring that razor blades be manufactured on the basis of a minimum energy-cost-per-shave. Then the blades, instead of lasting 3 days, would be more likely to last 3 years or longer. Suppose they lasted 3 years. What effect would this have upon our productive capacity in shaves? Technically it is just as easy to manufacture a good blade as a poor one. Thus, the productive capacity at the current load factor would be 10 million good blades instead of 10 million poor ones per day. But 10 million good blades at a life of 3 years each are equivalent to 1,095,000,000 shaves per day, instead of the 30 million now produced by the same equipment. Since the number of shaves per day is not likely to be materially increased with the longer-lived blade, what would happen would be a junking of approximately 99 percent of the present razor factories, thereby eliminating enormous wastage of natural resources.

Low load factors arise from various causes under the Price System. Perhaps the chief cause of low-load factors is the uncertainty of future demand. The individual plant, as we have noted, runs or shuts down in accordance with the orders for goods that it receives. The total purchasing power is sufficient to buy only a small fraction of the goods that would be produced were the existing plant operated wide open. Consequently, the existing plant spends the greater part of its time shut down or else idling at only a small fraction of full load. ***This defect is inherent in the Price System and is a direct consequence of the use of money itself.***

THE CALENDAR

Another prevailing cause of poor load factors is the calendar. With our present calendar, practically everybody works on the same days and is off on the same days. This introduces traffic jams and small periods of peak loads on our transportation system and on our places of recreation, as well as on the industrial equipment. In order to improve the load factor on traffic and in amusement places, it is necessary for these peaks to be eliminated so that the traffic on one day is the same as that on any other, and for the traffic in any hour of the day to be so adjusted that no extreme peak loads occur.

The technological schematic that we have postulated removes the element of overbuilding in productive equipment. A revision of the calendar smooths out the most offensive of the remaining irregularities. The day and the year are major astronomical periods, the significance of which cannot be ignored. The week and the month have no such significance. It is true the month is nominally the period of the moon. Actually, however, our months vary in length from 28 to 31 days, with an average length of 30-and-a-fraction days. The time elapsed

TECHNOCRACY CALENDAR

Day of Year	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
Group I	◎	◎	◎	◎	□	□	□	◎	◎	◎	◎	□	□	□	◎	◎
Group II	□	◎	◎	◎	◎	□	□	□	◎	◎	◎	◎	□	□	□	◎
Group III	□	□	◎	◎	◎	◎	□	□	□	◎	◎	◎	◎	□	□	□
Group IV	□	□	□	◎	◎	◎	◎	□	□	□	◎	◎	◎	◎	□	□
Group V	◎	□	□	□	◎	◎	◎	◎	□	□	□	◎	◎	◎	◎	□
Group VI	◎	◎	□	□	□	◎	◎	◎	◎	□	□	□	◎	◎	◎	◎
Group VII	◎	◎	◎	□	□	□	◎	◎	◎	◎	□	□	□	◎	◎	◎

Technocracy's calendar is based on the day and the year. The year consists of 365.2422 mean solar days. Technocracy's calendar numbers the days consecutively, starting on the vernal equinox from 1 to 364 days, plus 1 zero day (2 zero days for leap years).

Individual's Annual Operating Schedule

41 work periods, 4 days on, 3 days off -- 287 days (165 which are work days) plus 78 days vacation.

from new moon to new moon is 29-and-a fraction days, so that the phases of the moon shift about a third of a month in the course of one year. So little cognizance is now taken of the moon's period that the greater part of the population, if asked at any particular time to give the phase of the moon, would have to look it up in an almanac. Consequently, the only astronomical periods that need be considered are those of the day and the year.

Technocracy's calendar is, accordingly, based on the day and the year. The year consists of 365.2422 mean solar days. The Technocracy calendar, therefore, would consist in numbering these days consecutively, starting on the vernal equinox from 1 to 364 days, plus 1 zero day (2 zero days for leap years). The work period would run for 4 consecutive days for each individual, followed by 3 days off. Every day is a day off for three-sevenths of the members of the working population — all adults between the ages of 25 and 45 who are not off on their vacation.

In the illustration (last page) this is shown diagramatically for 16 consecutive days chosen arbitrarily during the year. The working population is divided into 7 groups, each of which has a different sequence of working days and of days off. The working days of each group are indicated by the circular spaces and the days off by the blank squares. On a basis of 660 annual work hours and 4-hour daily shifts, we arrive at 165 working days, or 41 as the nearest whole number of periods of working days and days off -- a total of 287 days. There remain, then, 78 successive days as a yearly vacation period for each individual.

Within each group there will be different shifts, the number of shifts depending upon the number of hours worked per day by each individual. If, for instance, the working day were 8 hours, there would be three 8-hour shifts. If the working day were 6 hours, there would be 4 shifts of 6 hours each, and if the working day were 4 hours, there would be 6 shifts of 4 hours each. There will be a transitional period involving large-scale reconstruction during which a longer working day of 6 or possibly 8 hours will be retained. Once this period is over, however, with continually increasing mechanization, there is little doubt but that the working day can be cut to 4 hours.

Numerous questions immediately arise regarding what could be done if two people, husband and wife for instance, belonged to separate groups and had their days off on separate days. This need cause no apprehension, because it is a mere administrative detail to transfer a person from one group to another, and since the circumstances under which each group works are identical, there will be, in general, just as many people wishing to be transferred from Group II to Group I as from Group I to Group II, so that such transfers automatically balance in the end.

The effect of this calendar on the load factors of the industrial mechanism would be tremendous. It means that where load factor is a critical concern, almost the same amount of activity would be going on every hour of the 24. Traffic would be about the same every day and every hour of the day. Each day would be a working day for four-sevenths of the working population with a day off for the remaining three-sevenths. Centers of recreation would not be deserted as they now are during weekdays and then jammed beyond capacity the remainder of the time. Ample recreation facilities could be provided so that at no time would playgrounds, swimming beaches, parks, theaters, or other places of recreation be overcrowded.

Consider also what this means to the central power system. In this case there is a daily cycle of lightness and darkness that is unavoidable. This results in a big load being thrown on the power plants at night due to the necessity of lighting. A large part of this load, of course, goes off during the day. If lighting were the only function of a central power system, such oscillation would remain. However, a large part of the function of a central power system is to provide the motive power for industrial equipment. Certain industrial equipment may be intermittent in its operation; slow freight haulage for example. Now if these intermittent industrial operations are so arranged that they go into operation only during the off-peak load of the power plant, this will enable the load of the power plant to be maintained close to 100 percent.

TRANSPORTATION

Consider transportation under such a mode of control. Transportation falls naturally into two major classes, passenger and freight. Passenger transportation requires, in general, speed, safety, and comfort. Freight transportation may be either fast or slow, depending on the nature of the goods being transported. For passenger transportation, the principal modes of conveyance are rail, water, highway, or air. For freight transportation, there may be added to the above modes of conveyance a fifth, pipeline; and perhaps a sixth, wire. The transmission of energy over a high-tension power line and the shipment of coal by freight car are both different aspects of the same thing; namely, the transportation of energy.

In freight transportation, as in all other fields, one of the great problems that would have to be solved is that of which mode of transportation involves the least energy-cost per ton-kilometer. For instance, a shipment of coal; is it more economical of energy to ship the energy contained in coal by freight car, or to hydrogenate the coal and transfer it by pipe line, or to build the power plants near the coal mines and ship the energy by high-tension transmission lines?

There is another major problem in freight handling, and that is the matter of freight classification and individual consignments. At the present time, all freight is shipped to individual consignees with the great bulk of it in small lots. Most of this would be eliminated. The supplies for a city, for instance, would all be shipped in bulk quantities to the warehouses of the Distribution Sequence, all goods of a single kind going together.

The freight handling terminals and the design of the cars themselves would be made such that the loading and unloading of freight could be handled with the greatest dispatch by automatic methods. From these major freight terminals, goods would be moved locally to various centers of distribution where they would be distributed to the population of the immediate vicinity.

In the matter of passenger transportation, the same criteria would be used in the design and operation of passenger equipment as elsewhere. Trains involving the least energy cost per passenger kilometer would be operated. It goes without saying that such trains would be the lightest, the most streamlined, and the most efficiently-powered that could be built. It is still to be determined whether Diesel-electric power units mounted on the trains themselves or whether power derived from stationary central power plants will prove to be the most efficient and hence the preferred mode of propulsion. Various designs of magnetic levitation are now being tried; their practicality is not unknown.

Since by far the greater number of passenger-kilometers of transportation are delivered by automobiles operating on public highways, particular significance attaches to this mode of transportation. To appreciate the importance of automobiles in the national economy, one needs only to consider that in 1987, passenger automobiles in the United States had an installed mechanical horsepower capacity of approximately 24.0 billion hp, trucks had 7.2 billion hp more, and buses 106 million. All the other technological prime mover mechanical and electrical engines and turbines combined amounted to 1.8 billion hp., giving a grand total of more than 33 billion hp (according to the U.S. Bureau of the Census). The grand total in Canada was approximately 3 billion hp in 1987. This compares with a grand total in the U.S. of 11.0 billion hp in 1960; 4.8 billion in 1950: 2.77 in 1940; and 1.66 in 1930. The 1920 total was only 431 million hp, plus 22.4 million in farm work horsepower. The farm horse has since become an extinct species. (See Appendix 2, Chart 4, page 65.)

Now getting back to load factors, we have already remarked that the average load factor of all automobiles is only about 5 percent. This means then that at the present we have approximately 24,000,000,000 installed horsepower in passenger automobiles alone that are operating only about 5 percent of the time. Or it means that if we could step this load factor up to 50 percent, or 10 times what it now is, we could obtain the same number of passenger-kilometers with one-tenth of the automobiles now in operation.

There is a corresponding problem involved in the design and servicing of automotive vehicles. Today there are several separate makes of automobiles being built in the United States. This means that as many different factories have to operate, and that a corresponding number of complete systems of garages and servicing stations must be maintained.

The factors that are uppermost in present-day automotive design are those of flashy appearance and other superficialities that make for ready sales, while it is as carefully seen to that the wearing qualities are kept low enough to insure a quick turnover because of the short life of the product. To this end all sorts of fake devices are used, one of which is fake streamlining.

In the matter of fuel efficiency, an efficient type of internal combustion engine is the diesel, which operates on fuel oil or distillate. In trucks, tractors, and buses, diesels came in at a very rapid and accelerating rate and were much in use. Several manufacturers produce diesel-powered automobiles. While it is true that a part of the lower cost of diesel operation is due to the lower price of fuel oil — and as the demand for this increases, the monetary price will rise — the fact remains that diesels do the same work for **fewer gallons of fuel** than any other engines in existence. However, due to environmental concerns, diesel engines are now much less common. For automobile transportation in a Technate, both energy efficiency and environmental harm would have to be taken into consideration, as well as many other factors, such as fuel availability, renewal, and other safety concerns.

It is interesting to consider hydrogen as a source of fuel. Many environmentalists and other groups are touting hydrogen as a suitable replacement to gasoline for use in automobiles. However, it should be noted that since elemental hydrogen does not occur in any large quantiies naturally on Earth, and only in the form of chemical compounds, that it must be extracted from those compounds (such as water). This process takes energy, and in most cases the energy required to extract the hydrogen is comparable to the energy that would be released in the burning of it. This energy needs to come from some source, and would likely come from the electrical plants that we use everyday, which use other things such as hydrocarbons for their fuel source. Thus, no reduction in the amount of hydrocarbon and other conventional power sources would take place, as the burden of original energy conversion would be placed on these conventional power plants. Thus, hydrogen must be viewed as a method of storing energy, not as an energy source. This does not make such hydrogen fuel cells useless, however, and with the industrial design of a Technate in place, it would likely prove very useful, but this is another discussion.

Under an energy criterion, it follows that all automotive vehicles would be powered with either the most efficient prime movers that could be designed, or suitable storage batteries if overall efficiency could be improved by moving primary energy conversion to more central power sources, unless and until something better can be devised.

The same considerations would apply to all the various trick devices for insuring rapid obsolescence and turnover in vogue today. To care for these and other defects of the function of automotive transportation necessitates a complete revision from the ground up. Consequently, to improve the load factor, it will be necessary to put all automobiles under a unified system whereby they are manufactured, serviced, and superintended by the Automotive Branch of the Transportation Sequence.

This means that there would be only one basic design of the automobile; that is, all automobiles that were built would have interchangeable parts, such as motors, wheels, chassis, springs, etc., except insofar as they differed in those elements of design fitting them for different uses. In these minor differences there would be as many different varieties as there were uses, such as two-passenger and five-passenger capacity, light trucks and similar variations. In accordance with Technocracy's criterion of least energy cost, the vehicles would be really streamlined and powered with the most efficient unit that could be devised.

Regarding use of automobiles, if they were to be used in proportions similar to today, the change of administration would be even more profound. At the present time you buy an expensive automobile and leave it parked the greater part of the time in front of your house as evidence of conspicuous consumption. The automobiles that we are speaking of would have to be kept in operation. This would be accomplished by instituting what would resemble a national "drive it yourself" system. The Automotive Branch of Transportation would provide a network of garages at convenient places all over the Continent from which automobiles could be had at any hour of the night or day. No automobiles would be privately owned. If, say, you wished to use an automobile, you would merely call at the garage, present your driver's license, and a car of the type needed would be assigned to you. When you are through with the car, you would return it either to the same garage, or to any other garage that happened to be convenient, and surrender your Energy Units in payment for the cost incurred while you were using it.

The details of this energy cost accounting for automotive transportation are significant. The individual no longer pays for the upkeep of the car or for its fueling or servicing. All this is done by the Automotive Branch of the Division of Transportation. In this manner a complete performance and cost record of every automotive vehicle is kept from the time it leaves the factory until the time when it is finally scrapped and the metal that it contains is returned to the factory for re-fabrication. Thus, the exact energy cost per car-kilometer for the automotive transportation of the entire country would be known at all times. Similar information would be available on the length of life of automobiles and of tires. With such information in the hands of the research staff, it would become definite as to which of various designs is superior or inferior in terms of physical cost per car-kilometer.

The total cost of automotive transportation includes, of course, the cost of manufacturing the automobile. If, for instance, the average life of an automobile were 300,000 kilometers, the total cost for this 300,000 kilometers would be the cost of manufacturing the automobile plus its total cost of operation and maintenance during its period of service. The average cost per kilometer, therefore, would be this total cost, including the cost of manufacture divided by the total distance traveled, in this case 300,000 kilometers.

Where there are millions of automobiles involved, the same type of computation is used. In this case the average cost per kilometer would be the average cost for millions of cars instead of for only one. This would be the total cost of manufacture, operation, and maintenance of all automobiles of a given kind divided by the total kilometers of service rendered by these cars. Since automotive costs can best be kept low by maintaining high operating load factors, it becomes necessary that all automobiles be kept in as continuous operation as is practicable. In other words, automobiles when away from the garages should be in operation and not parked ostentatiously in front of somebody's house. This can be taken care of rather effectively by charging the individual for the use of the automobile on a mileage-time basis as follows:

(1) If, while the automobile is out, its operation has been maintained at a rate equal to or greater than the national load factor for all automobiles, charge is made on a mileage basis only;

(2) If the load factor of the car while out is not kept equal to the average load factor, the charge is made on the basis of the number of kilometers that the car would have traveled during that time had it operated at a rate equal to the average national load factor for automobiles.

Suppose, for instance, that the average national load factor for all automobiles was such that each car traveled on the average 240 kilometers each 24 hours, or an average of 10 kilometers per hour. Now if a person had an automobile out and he used it an average of 10 kilometers or more per hour, he would be charged for mileage only. If, however, he kept the car 24 hours and drove it only 30 kilometers, he would be charged for 240 kilometers, for that is the distance the car should have traveled in 24 hours.

The simple proviso has the dual effect of improving the load factor of all automobiles and at the same time reducing the average cost per kilometer by making the delinquents pay for keeping automobiles out of service.

It is also entirely possible that autmobiles may no longer be employed as the primary source of transportation. With the advancing technological possiblities that could be accomplished in a modern Urbanate, automobile may not needed at all. The Urbanate’s small size, for one, would make many destinations well within walking distance of each other. For those who prefer or need some form of vehicular transportation, there would be many choices available. Since Urbanates are designed top-down, bicycle paths could be quite extensive. Also, there would likely be installed a form of transportation that might resemble a cross between an elevator and a subway train, that could quickly speed citizens to anywhere in the urbanate within minutes.

Transportation between Urbanates would most often be supplied by high-speed trains, with wider bases and lower centers of gravity to allow much faster speeds than the typical train of today. Advanced waterways systems would allow for very energy-efficient large freight hauling, as well as travelling dormatories of students taking months-long field trips to see the operation of the length and breadth of the Technate. For those with expedient travel needs, air travel would, of course, still be available.

COMMUNICATION

The field of communication includes mail, telegraph, telephone, radio, television, and electronic communications such as the Internet. All of these forms of communication, plus any others that may be developed, are in the domain of the Communication Sequence. Under an energy criterion, the same question arises here as elsewhere; namely, of two equally effective modes of communication, which has the least energy cost per unit? The unit, in this case, is a given amount of data transmitted a given distance.

Technically, there is no question that all communication of the entire Continent could be conducted by telephone if the energy cost indicates that this is not too expensive. We now have dozens of satellites circling the globe, enabling us to communicate in various methods. Cellular telephones, electronic mail, television and radio, along with the Internet, comprise the most used systems. Facsimiles and photographs so true as to be scarcely detectable from the originals are now being sent by wire and satellite and taken for granted in their usage, as is their predecessor, the telephone.

Whether the energy cost of handling the entire communications by telephone or by telegraph is less than by mail, available data are not sufficient to decide. They indicate, however, that the cost by wire would be at least as low as the cost by mail, if not lower.

Suppose the mails are maintained at a considerably reduced volume. One of the great technological improvements in this branch of activity is that of automatic sorting. Few more boring, exhausting jobs existed than those of the postal clerks who spent year after year poking letters into pigeonholes. Today, a letter can be transmitted from one side of the Continent to the other virtually untouched by human hands. One way whereby this could be done would be by uniformly-sized envelopes bearing code addresses of black and white spaces, a different combination corresponding to every different mail distribution center. This would permit sorting by photoelectric cells, which even today are getting better at reading human printing of addresses.

In the matter of radio and television, the same unification of equipment would be effected. Instead of having dozens of different kinds of receiving sets, there would be only one kind for each specific purpose. That kind, within the physical limitations set, would be the best that could be built. The individual radio and television sets would be a part of the Radio and Television Branch of the Communications Sequence, just as the individual telephone used to be a part of the telephone company and not the property of the user.

There has been much talk about "convergence" lately, the tendancy for devices of various types to "converge" their capabilities into a single device. Home computers become better able to receive television channels and watch DVD movies, while other people use small set-top boxes on their televisions to browse the Internet. Cellular phones and personal digital assistants (PDAs) are more commonly adopting the features of the other. With the barriers of price, profit motive, and competition removed, such devices would likely be very highly capable in a Technate, with a single handheld device capable of doing the functions of many different devices. In the home, a central computer terminal hooked into standardized input and output devices (depending on the various needs of the users) could supply the functionality of a home computer, video and music entertainment, video and audio communication, as well as Internet access. Rather than requiring a separate device (such as a TV or telephone) in each room, a simple receiver unit could be placed in the rooms instead, all being managed by the home's central processor and communications device, without any worry of there not being enough service for any one user (someone tying up the phone line, for instance, or the television).

Such a revolution in the freedom of information and art would likely spark a cultural rennaisance as more and more artists become free from tedious labor to persue their passions or past-times.

There is substantial waste involved in our current entertainment venues with the myriad of devices, cassette tapes, video tapes, DVDs, CDs, etc. With a properly designed Urbanate, most of the physical waste involved with these formats would no longer be needed. Virtually all entertainment, from video (movies, series programs, and musicals), audio (programs and music), as well as text (novels) and graphical (pictures and graphic novels), could all be accessible via a central network much like the Internet. All content would of course be free, as artists and such would have no need to "make a living" from their works. Such a revolution in the freedom of information and art would likely spark a cultural rennaisance as more and more artists become free from tedious labor to pursue their passions or pastimes.

AGRICULTURE

When one applies the same criteria to agriculture, just as far-reaching implications are met. Agriculture is the nearest to the primary source of energy, the sun, of all our industries. Agriculture is fundamentally a biochemical industry wherein matter from the soil and the atmosphere are combined with the help of solar and other energy into various use products. Only now are we beginning to appreciate the latitude of usefulness to which agricultural products can be put. From time immemorial, products of the soil have been the source of human food and clothing, but many more products from the soil have been wantonly wasted: wheat straw, corncobs, and numerous other products normally burned or otherwise destroyed.

From a rational point of view, present-day methods of agriculture probably constitute a most abusive use of technology. Land is often cultivated in smaller than optimal areas with inadequate application of the most effective technological methods. Soils are allowed to waste away by erosion and to be plundered of their future usefulness in the same way that other resources are being dissipated.

While it is true that agriculture, as it is practiced on many of our farms today, is largely wasteful, serving the fragmented self-interests of agribusinesses, the same cannot be said of the scientific knowledge of agrobiology.

Soil, as such, is of no importance except as a container of plant foods and as a support for the growing plant. It follows, of course, that any other container for properly proportioned plant foods used in conjunction with a suitable support for the growing plant would constitute an alternative to an agriculture based upon tilling of the soil.

Consider, however, that the soil is still used as the agricultural base. In this case, all soils contain an initial amount of usually improperly proportioned plant foods and will, without other attention than primitive tilling, produce a modicum of various kinds of crops. Since each crop grown extracts a part of the supply of plant food initially present in the soil, it follows that if succeeding crops are produced without a corresponding amount of plant food being added, the soil will gradually be exhausted of its initial supply and become "run down" or worn out. Such a soil can be rejuvenated by merely adding plant foods in which it has become deficient. Hence, it follows that over any long time period there must be maintained an equilibrium between the plant foods added to the soil and those taken out if continued producing power without soil exhaustion is to be maintained.

This brings us to the question of yields to be expected per acre. Modern agrobiologists have determined that where soil utilized as the medium of crop culture, and where crops are grown under ordinary out-of-door conditions, there is a theoretical maximum yield per acre that any crop may be made to approach but none to exceed. This maximum is determined by the amount of nitrogen that may be extracted from the soil per acre. The maximum of nitrogen extraction that may not be

CROP YIELDS

Kind of Crop	Calculated Perultimate Yield*	Known Yielding Power*	Yielding Power in Percent of Perultimate	Average Yield per Acre U.S.** (1999)	Average Yield (1999) as Percent of Perultimate
Corn (bushels)	225.0	225.0	100.0%	133.8	59.5%
Wheat (bushels)	171.0	122.5	71.6%	42.7	25.0%
Oats (bushels)	395.0	245.7	62.2%	59.6	15.1%
Barley (bushels)	308.0	122.5	39.7%	59.2	19.2%
Rye (bushels)	198.0	54.5	27.4%	28.7	14.5%
Potatoes (bushels)	1330.0	1156.0	86.8%	359.0	27.0%
Sugar Beets (tons)	53.0	42.3	80.0%	21.8	41.1%
Sugar Cane (tons)	185.0	180.0	97.2%	36.0	19.5%

*** Source: Reshaping Agriculture, O.W. Willcox (1934), p.66**

**** Source: U.S. Department of Agriculture**

exceeded by any one crop in a cycle of growth is approximately 320 pounds per acre. In order that 320 pounds of nitrogen be withdrawn, it is required that there be present 2,230 pounds of nitrogen per acre. By knowing the amount of nitrogen withdrawn from the soil to produce one bushel of corn, of wheat, or potatoes, one ton of sugar cane or one bale of cotton, one has merely to divide this amount into 320 pounds of nitrogen per acre in order to determine the maximum possible yield of the crop considered. These maximum possible or ultimate yields, together with yields that have been already achieved, are given in the chart on page 42.

The significance of these facts is that American agriculture is operating at an extremely low efficiency. In the light of present technical knowledge in the field of agrobiology, there would be no difficulty at all in stepping up this production to at least 50 percent of the perultimate maximum. Even today almost every year that passes sees new records broken in actual crop yields per acre.

A more fundamental and technological approach in agricultural production is to be found in those cases where the soil is no longer considered necessary as a container for plant food or as a supporter of the growing plant. Such an example is to be found in the case of hydroponics. In this process the plant food is dissolved in water that is contained in a long, shallow trough. Above the water, and supported by wire netting, is a bed of excelsior in which the seeds are planted. The roots extend downward to the water. The excelsior and wire netting support the plants. In this manner optimum conditions can be constantly maintained with almost phenomenal production results.

Further technological control of environmental factors and the speeding up of growth rates and shortening the period required to mature a crop are as yet little touched but offer broad domains for the technologist in agrobiology in the future.

Regardless of whether agriculture of the future ultimately remains predominantly in the out-of-doors farming stage or comes to resemble an agricultural factory, the fact remains that the application of technological methods will revolutionize it to where present methods are truly primitive by comparison.

Suppose that out-of-doors agriculture remains predominant. Large-scale operations require large tracts of land worked by machinery, gigantic in size as compared with any that present-day farmers are able to employ. Land-breaking to depths of two to three feet is not at all impracticable with equipment designed for that purpose. Such deep plowing in conjunction with runoff control of the water supply would practically eliminate drought hazards. Proper fertilization and tilling would do the rest. Only the best land and agricultural climates need be utilized, because with such yields as could be obtained by those methods, little more land than is contained in the state of Illinois would be required for all agricultural produce for the United States.

Little more land than is contained in the state of Illinois would be required for all agricultural produce for the United States.

Needless to say, all present farms and land divisions would be eliminated. Agriculture would be only one division of a vast chemical industry that would convert raw materials of the land into use products and in turn supply to the land its requirements in fertilizers and plant food. Tracts of probably tens of kilometers square would be worked as a unit. Equipment would operate 24 hours per day and be rotated in such a manner that each piece of equipment would be in as continual an operation as possible throughout the year.

The farm population would live in conveniently situated towns from which they would commute to the fields. They would thus combine the advantages of healthful out-of-doors work with those of urban life with its social and educational facilities.

This would, of course, leave vast domains to be reconverted either to grazing or forestlands. ***Forests, national parks, and playgrounds could then be instituted on a scale never known since the country was in the virgin state found by the original pioneers.***

HOUSING

So great is the effect of convention on human animals that it becomes almost impossible for them to detach themselves sufficiently to take an objective view of the subject of housing. Our houses and our buildings and structures generally attain a certain convention and thereafter we tend to accept them without further question. It never occurs to us to ask whether the prevailing custom is better or worse than other possible styles. Our students of architecture spend considerable time studying the architectural details of ceremonial buildings of the past — temples, cathedrals, palaces, and the like. This training, combined with a need for the architects to sell their services, tends to prevent a development in architecture towards making our buildings compatible with our environment.

Price System dictates would frustrate architects who want to apply their knowledge of designing buildings in accordance with the functions they are to perform.

The successful architect of today is either one who has developed an architectural firm that receives commissions for designing large and expensive buildings, such as skyscrapers, hospitals, courthouses, and the like, or else an individual practitioner who knows sufficiently well the pecuniary canons of good taste to receive commissions for the design of residences in the expensive residential sections of our cities and their suburbs.

If architects wish to be really "modern," they then proceed to do something "different." They design houses made completely of glass or metal and hung from a post. Often disregarded is the basic question: "Would it be practicable to house the inhabitants of an entire continent in such structures?"

This brings us to the technological foundation of the whole subject of housing; namely, what are the buildings for? What do we have to build them with? What does it cost physically to maintain them? And how long will they last?

The physical cost in this field is arrived at in the same manner as is the physical cost in any other field. The physical cost of housing 505,000,000 people is the physical cost of constructing, operating, and maintaining the habitations for 505,000,000 people (see population chart, Appendix 2, chart 1). The cost per inhabitant per year is the total cost per year divided by the number of inhabitants.

If housing is to be adequate for 505,000,000-plus people and at the same time the physical cost of housing is to be kept at a minimum, a complete revision of design, construction, and maintenance in the whole field of housing is necessary. It requires that the construction of houses be kept at a minimum cost, that the life of each house be at a maximum, and that the cost of maintaining each house, including heating and lighting, be kept at a minimum. Furthermore, it requires that the materials used be those of which there is an ample supply for the construction and maintenance of approximately 160,000,000 dwellings. This immediately rules out the whole array of "modern" designs of metal houses, where the metal involved is chromium and other similar rare metals that are indispensable as alloys of steel and other metals for industrial uses.

The requirements of low-cost construction makes it necessary to use factory-fabricated types of housing where the individual units can be turned out on a quantity production schedule ready for assembly, just as automobiles are now turned out by automobile factories. There would be a limited number of models, depending upon the type of locality in which they were to be used, their size, and the type of climate. Any of these different models, however, could be assembled from the same units -- wall units, doors, windows, bathroom, kitchen, equipment -- as any other model, the difference being that these standard units are merely assembled in different combinations.

Instead of thousands of separate individual architects designing houses, there would be only a few basic designs, and these designs would be made by the best technical brains that would be available for the purpose. The building would be designed for use, for long life, and for minimum cost of construction and maintenance. Incorporated into the design of the house would be the design of the furniture as an integral part. The houses would not only be heated in winter but also cooled in summer and air-conditioned throughout the year. The lighting would be indirect and with intensity control for the best physiological and psychological effects.

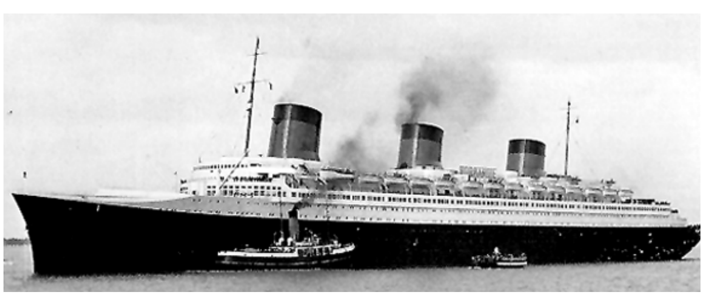
While there is a wide variety of possible materials, the fundamental conditions that must be fulfilled are abundance, low energy cost of fabrication, and high degree of heatproofing and soundproofing qualities, as well as a structural framework rendering it vibration-proof against such impacts as occur in the ordinary activities taking place inside a dwelling. The building should be proof against not only the leakage of heat from the inside out, or vice versa, but also completely fireproof.

The method of heating in such a structure also would be radically different from that now employed. It is quite likely that a thermodynamic type of heating, based on essentially the same principle as our electric refrigerators, would prove to be the most efficient. In this case, however, when the house is to be heated instead of cooled, the cold end of the mechanism would be placed outside the house — probably buried in the ground and the warm end placed inside the house. The fuel, instead of being used to heat the house directly as is done now, would merely be used to operate the refrigerating mechanism that would pump heat into the house from the outside; we know this as a heat pump, and these are in use today. By such a method, theoretical considerations indicate that a house can be heated at only a small fraction of the energy cost of the most efficient of the direct heating methods obtainable.

This method of heating has the additional advantage that, by changing only a few valves, the system could be made to run backwards — that is, to pump heat from inside to outside of buildings and thus act as a cooling device during warm weather, which would be analogous to our present refrigerator, only on a larger scale.

DESIGN

If one lays out the whole scheme of a given function in advance and then works down to the details, the end products of design are radically different from what they would be if one started on the details and worked from them to the more general complex. For example, the steamship **Normandie** was able to break world speed records and to exhibit other points of



functional excellence merely because these high points of performance were written into the specifications before a single minor detail was ever decided upon. The design of a ship to meet these broader specifications automatically determines that the minor details be of one sort rather than a number of others. The specification that the **Normandie** was to be the fastest steamship ever built automatically determined the shape of the hull, the power of the engines, and numerous other smaller details.

Suppose the procedure had been in reverse order. Suppose that some one person decided independently upon the shape of the hull; suppose that a second designed the engines, determining what power and speeds they should have. Let a third design the control apparatus, etc. It is a foregone conclusion that a ship designed in any such manner, if it remained afloat or ran at all, would not break any records.

For any single functional unit, the design specifications for the performance of the whole must be written, and then the details worked out afterwards in such a manner that the performance of the whole will equal the original specifications laid down.

The trouble with design in a social mechanism, heretofore, has been that neither the specifications nor the design has ever gone beyond the stage of minute details. We have designed houses by the thousands, but no one has ever designed a system of housing on a continental scale. We have designed individual boats, automobiles, locomotives, railway cars, and even articulated streamlined trains and individual airplanes, but no one has ever designed a continental system of transportation. Even these latter units are only individual details in the design of a whole operating social mechanism. Even a design that embraced whole functional sequences would be inadequate unless it, in turn, was guided by the super design of the entire social mechanism.

So far, we have been only suggesting some of the changes that would result in a transfer from the present politico-economic Price System mode of social administration over to the functional technological type that we have outlined. ***In such a change no single detail, big or small, would be left untouched.*** There would be a whole reallocation of our industries. Our present centers of trade and commerce, as such, would dwindle into insignificance for the simple reason that trade and commerce would cease to exist. Centers of industry might or might not come to occupy the same places. The entire array of man-made buildings and equipment of the whole North American Continent would have to be junked and replaced by more efficient and better functioning structures and equipment. Along with redistribution of industry would come a redistribution of population. It is not improbable that New York City and other similar localities would be mined for the metal they contain.

New towns and cities would have to be designed as operating units from the ground up, and these designs would again be only details of the super design for the whole mechanism. There are a number of essential design elements that must be taken into account in the design of a town or a city:

1. There must be adequate housing and recreation facilities for the entire population.

2. There must be an adequate distribution system for the supplies that will be consumed by the city, both by the populace individually and by the city itself.

3. There must be an adequate system of waste disposal, sewage, garbage, and the like.

4. There must be adequate facilities for local traffic, pedestrian, vehicular, etc.

5. There must be adequate facilities for local communication.

6. There must be a system of water supply, of heat, gas, and electric power.

7. There must be trunk connections for traffic, supplies, water, energy, and so on, between the city and the world outside.

8. The design must be such as to allow for any probable expansion in the population with a minimum of readjustment.

URBANATES

The most probable design for the cities of a Technate is a concept called **Urbanates**. Urbanates are much different from today's cities. Based on the top-down design methodology already discussed, rather than the haphazard, bottom-up methods used today, Urbanates would be able to encompass far more positive attributes than cities. Urbanates are characterized by the following features:

- Small size (perhaps 20,000-100,000 people)
- Planned, top-down design
- Pre-installed, integrated transportation, utilities, and communications
- Safe, pollution-free environment
- Modular design, allowing for easy repair, replacement, and upgrades of any physical feature

The results of such a design are numerous, but a few would be quick, easy, and comfortable transportation, close proximity to all amenities, no traffic noise or jams, no pollution, seemless integration with nature, and safe, comfortable homes. By being planned from the start, Urbanates do not constantly expand in a random fashion that nessecitates the use of inefficient forms of transportation, such as the automobile. Urbanates would instead employ a functional and convenient form of mass transit that may resemble a cross between a subway system and elevators. Combined with its small size making most destinations within walking distance, transportation in an Urbanate would be quick and worry-free. They would also contain all of the distribution, health care, education, and recreation centers that would be needed and desired by the population of these cities of the future.

It is difficult to specify what exacly an Urbanate will be like until a Technate is actually installed and operational, but it is possible to speculate based on what is known about current and near-future technology. While fascinating, such a topic remains outside of the scope of this publication, but it is encouraged as a supplement to learning it.

STANDARDIZATION

In the field of more general design, standardization of more essential parts will be carried as nearly as possible to perfection. Outside of industrial circles, it is little realized what standardization means. In the maintenance of even the present rate of industrial operation, for example, suppose that every separate manufacturer of electric light sockets produced a different size. If these sizes were as many as a few dozen, almost hopeless confusion would result. Likewise, suppose that every different state in the Union used a different sized railway gauge. This would mean that all trains would have to stop at the state lines and transfer freight and passengers, because a train from Illinois would not be able to run on the Indiana tracks.

These examples are taken merely to show the importance of such progress in standardization as has already been made. Few people realize that our present quantity production in automobiles is rendered possible entirely by the standardization of machine parts. Many automobile parts have to fit with an accuracy of one micrometer (one millionth of a meter). In order that all such parts in a quantity production flow line turning out thousands of units per day may be mutually interchangeable, it is imperative that all these parts be standardized with that degree of accuracy. Most of the difference in cost between a Rolls-Royce and a Cadillac was due to the fact that the Cadillac was produced by standardized quantity-production methods, whereas the Rolls-Royce was produced by handicraft methods where every individual bearing is fitted separately and, in general, parts are not mutually interchangeable. If the Cadillac had been built by the same hand methods employed in the Rolls-Royce, it would not have been better, but it would have had to sell for a price comparable to that of the Rolls-Royce and for the same reasons.

Most of our industrial progress up to the present time has been rendered possible through standardization. The trouble is that standardization has not been carried nearly far enough as yet. There are too many different arbitrary sizes and varieties of what is functionally the same commodity. Take a simple product such as soap. Chemically there are only a small number of separate basic formulas for soap. The number of brands of soap on the market, however, runs into the thousands.

Not only has the achievement of standardization made possible our quantity production methods, but also the lack of standardization has at the same time been in no small part responsible for our low industrial load factors. In many fields, particularly in those of clothing and automobiles, the lack of standardization has been promoted as a highly remunerative racket — the style racket. If styles can be manipulated properly, it is possible to increase the consumption of goods by rendering the styles of the old goods obsolete long before the goods themselves are worn out. Thus, clothing that might last two years is discarded at the end of a single season because it is out of style. Last year's automobile is traded in on this year's new extra-fancy model.

The effect of all this upon the load factors of the industry concerned is to cause it to run with a short spurt at peak production while getting out the new model or the latest style, and then idling or remaining completely shut down for the rest of the year. In men's clothing, for example, with a relatively small variety of stabilized styles and an ample variety of materials and color combinations, clothing could be manufactured, if need be, for a year or even two years in advance and thus completely even out the peaks and troughs resulting from seasonal demands for different kinds of clothing. Overcoats, for example, could be manufactured the year-round with a high load factor but at a rate just sufficient for the annual output to be equal to a single winter's needs.

UNNECESSARY ACTIVITIES

As yet little emphasis has been placed on the fact that by far the greater part of all employees are engaged in one kind or another of financial accounting, such as sales, advertising, or other similar socially unnecessary activities. Even in so industrial a unit as a flour mill, it is common for the number of employees engaged in the purely business operations of the plant to be considerably greater than the number required to operate the flour mill. In our electric light and power systems, the bulk of the employees are the office clerks, the meter readers, and repair workers. Only a small percentage of the total staff is required for the socially necessary industrial function of operating and maintaining the power system.

All this is aside from the unnecessary duplication that exists. One single store, for instance, could supply all the distribution services required by a population of 10,000 or so with only a matter of a couple of dozen employees, whereas in actuality there was in 1986 a total of 1,923,000 retail stores employing 17,845,000 people, serving a total population of 242,000,000 in the United States. This means that there was at that time one retail store employing, on the average, 9 people for every 121 members of the population, or one employee in a retail store for every 14 in the population. (Data from US Bureau of the Census.) The 1984 Census of Canada listed 186,200 retail stores serving the then total population of 25,123,000.

In 1986, there were over 23,000,000 people engaged in retail and wholesale trade in the United States (nearly one-tenth of the population). This is, of course, in addition to the 6,300,000 employees already mentioned whose jobs are largely financial -- trading money, such as banking and finance, insurance, and real estate, rather than industrial or services, such as medical, education, etc. In addition, there were more than 8,000,000 office clerks, typists, and secretaries.

The point of all this is that with a redesign of our social mechanism along the lines indicated, there will be a much larger number of jobs that will cease to exist than of new jobs that will be created. This would not imply then, as it does now, that there would be unemployment. It merely signifies that we are assured of an ample supply of human services for all possible contingencies while operating the mechanism at the highest output per capita ever achieved. In addition, it means that all this will be accomplished simultaneously with a shortening rather than lengthening of the working day.

Appendix 1: Frequently Asked Questions

CONCEPT AND ORGANIZATION

Questions in this section deal with the body of thought of Technocracy itself and with the organization formed to fill the need for disseminating that body of thought to all North Americans.

What is Technocracy?

Technocracy, the word, is derived from Greek language roots to convey the overall concept of "Government by Science." We accept Technocracy to be science applied to the social order. Science concerns itself with the determination of the most probable in any field of knowledge, be it chemistry, engineering, or social phenomena. Technocracy, then, concerns itself with the determination of the most probable in the field of social science — the determination of the most probable state of society. It has to do primarily with that part of the social mechanism relating to the production and distribution of goods and services, but it has many far-reaching implications.

How did Technocracy originate?

Technocracy had its inception in 1919 in New York City in an organization known as The Technical Alliance of North America. This group included in its ranks such people as Thorstein Veblen, a distinguished educator in the field of social science, sometimes called the "stormy petrel of American economics;" Charles Steinmetz of the General Electric company, referred to as "The wizard of Schenectady;" consulting engineer and mathematician, Bassett Jones; physics professor, Richard Tolman; consulting architect Frederick L. Ackerman; and Stuart Chase, popular economist and author. Heading the group as chief engineer was Howard Scott, outstanding consulting and industrial engineer.

The primary aim of The Technical Alliance was to ascertain the possibility of applying the achievements of science to social and industrial affairs. With this in mind, they set about to make a survey of the energy and natural resources of the North American Continent – all the territory included between the Panama Canal and the North Pole. In addition, they studied the industrial evolution that had taken place therein. They showed graphically the operating characteristics of the present industrial system with all its waste and leakage and worked out a tentative design of a completely coordinated system of production and distribution. Of course, they always kept in mind their aim, which was to provide a better standard of living for the people living on the continental area with the least possible waste of nonrenewable resources.

After nearly four years of research, analysis, and synthesis, the Alliance's work was revealed to the public in an article by Charles H. Wood, Associate Editor, of "The New York World", Feb. 20, 1921. Shortly thereafter, for financial and other practical reasons, The Technical Alliance members were forced to suspend work on their Energy Survey of North America.

We present the following important testimony, presented by M. King Hubbert in Washington D.C., April 14, 1943, to the Board of Economic Warfare. To make clear the true story behind The Technical Alliance and the founding of Technocracy Inc.

From the Official Record, Page 8, paragraph 3, in response to a question, M King Hubbert said: "In the Winter of 1931 I came to New York as a member of the staff of Columbia University and quite by accident heard of Howard Scott and some of the things he was talking about. I was introduced to the gentleman, and we had dinner together, and we covered quite an extensive range of subject matter. He was a total stranger to me. I had never heard of him before and what he told me was largely the work of this old Technical Alliance and its implications. I was impressed with it as the most important piece of scientific thinking I had ever heard of, and that impression still stands.

"At my *(Hubbert)* instigation, Mr. Scott rounded up some of these old group members again, and we formed a small informal group that started to review the old work quite informally, no formal organization. That went along quietly until it got out in the newspapers through the Columbia University publicity agent who wanted publicity for the University; so that, in turn, spread around the press for a while, and before long, it looked like a forest fire; so, to protect ourselves legally, and to prevent piracy of the type going on, we *(Howard Scott and M. K. Hubbert)* set up a membership organization in the spring of 1933, the organization (Technocracy Inc.) was incorporated under the laws of the State of New York as a nonsectarian, educational-research membership

Those technocrats you're heard so much about are right here at the **Morrison Hotel today**. Howard Scott (left) is the director; **Dorothy Crozier** is secretary, and M. King Hubbert is **assistant** director. (Chicago American photo.)

organization. The training of public speakers and the formation of study classes on a Continental scale quickly followed.

What are the conclusions of Technocracy?

There are three basic conclusions. The first is that there exists on the North American Continent a physical potential in resources to produce a high standard of goods and services for all citizens, and that the high-speed technology for converting these resources to use-forms in sufficient volume is already installed, and the skilled personnel for operating it are present and available. Yet we have unprecedented insecurity, extensive poverty, and rampant crime.

The second conclusion of Technocracy is that the Price System can no longer function adequately as a method of production and distribution of goods. The invention of power machinery has made it possible to produce a plethora of goods with a relatively small amount of human labor. As machines displace men and women, however, purchasing power is destroyed, for if people cannot work for wages and salaries, they cannot buy goods. We find ourselves, then, in this paradoxical situation: the more we produce, the less we are able to consume.

The final basic conclusion is that a new distributive system must be instituted that is designed to the special needs of an environment of technological adequacy, and that this system must not in any way be associated with the extent of an individual's functional contribution to society.

Could either Canada or the United States operate a Technate without the other?

No, because each nation in itself has deficiencies that in large measure can be met only by joining with the other. Canada, for instance, except for cereal grains, grows very little of its own food, depending otherwise mostly on importations from the climatically better located United States. On the other hand, Canada is far better endowed than the United States with certain essentials that the latter needs to sustain its technological mechanism. Important among these are fuel and energy resources, various metals, and abundant water supply and accompanying hydroelectric power potential.

What are the social implications of Technocracy?

There are many. Take, for instance, the attainment of leisure. For the first time in history, people would be released from drudgery and their creative energies set free.

It would be impossible in a Technate to sue for breach of promise, alimony, breach of contract, damages, or to probate a will, because in a Technate all citizens would have a high, secure, individually chosen standard of living. As practically all crime in the Price System results from attempts of individuals to illegally acquire the property of others in order to alleviate their own insecurity, crime would practically cease to exist in a Technocratic Society.

In a Technate, citizens would be treated as human beings for the first time in their social history. They would no longer be considered mostly as a means of converting raw materials into usable products for the comfort and enhancement of a privileged few but would be freed by a provident technology to enjoy more of those products themselves along with the time to do so. In addition, they no longer would be subjected to the many legalistic prohibitions and monetary restraints that preclude participation in many desired pursuits, as is presently the case.

Is the Technocratic movement a political party?

No, it is not. Technocracy's sole reason for being is to promote its social program for institution when the Price System can no longer operate in North America. To run candidates for political office to advocate adoption of the program would quickly defeat the organization's whole purpose, for they would be unable to introduce any of the program's features on a local basis because of the Continental scope of the program. Technocracy, by remaining entirely free from political entanglements, can promote its social program at the Continental level without being restricted by the national or local boundaries of political limitations.

This is not to say that Technocracy will not consider political action in the future if the need arises, but such action would be only in a referendum calling for the acceptance or rejection of Technocracy's proposals. It is highly improbable that the program would be rejected in the face of badly deteriorated social circumstances that would likely prevail at the time of such referendum.

What would be done with the people whose present jobs, like banking, would cease to exist in a Technocracy society?

Many, of course, would be retired with full consuming privileges, having already passed the Technate retirement age of 45. The rest would be retrained for function in other roles, whatever their talents.

What are you going to do with the people who are not interested in Technocracy?

If the question asks what we intend to do with persons today who are not interested in Technocracy, the answer is "nothing." We are seeking people who are intelligent and open-minded enough to embrace a new idea. However, deteriorating economic and social conditions will force many people not presently interested to look in our direction.

In the Technate, even the people who are not interested in Technocracy will enjoy the same high standard of living and increased leisure along with greater opportunity for cultural activities. Should they still prefer to live somewhere else, there will be no restriction on emigration.

Is not Technocracy very similar to Socialism or Communism?

No, it is not — mainly because it proceeds from entirely different premises than either socialism or communism. Technocracy originated out of a circumstance of technologically produced disemployment. Research indicated that increasing technological disemployment would render impossible the distribution of sufficient consuming power in salaries and wages to buy back the products of increasingly efficient machines. The social program of Technocracy, therefore, is one specifically designed to distribute an optimum of goods and services to all citizens. (The resulting disemployment by technology mentioned above is on the lips of nearly everyone in North America today.)

Socialism and Communism, by contrast, were outgrowths of an environment in which practically all work was done by human muscle power, and wherein it was never possible to produce sufficient goods and services for all citizens. Karl Marx's theories were formulated to overcome conditions as they existed in Europe in the middle of the 19th Century -- far different conditions from those faced in 20th Century North America.

Only Technocracy applies the necessary measures to cope with 20th century technological problems.

Did not Technocracy state in 1937 that the Price System would be over by 1942? If so, why do we still have it? What happened?

What happened is that we have had a World War and a series of smaller conflicts ever since. These have given massive blood transfusions to the ailing Price System and prolonged its life expectancy.

Furthermore, Technocracy did not make the bald, unqualified prediction stated above. Instead, it indicated that if trends continued in the direction they were taking, the Price System would be in ever-increasing difficulty until it reached the point of breakdown. The mounting problems of the present system are plainly evident on every hand.

What can one do as an individual to bring about a better system?

We suggest that the best way to do this is to acquaint yourself as fully as possible on all aspects of the problem, after which an objective solution will commence to suggest itself. While anyone can do this individually and alone if one has the integrity and interest to do so, it seems rather a waste of time to go over ground that has already been covered with the likely result that a similar conclusion would be reached to one that has already been rather widely publicized.

We refer, of course, to Technocracy's social analysis and synthesis. Probably the best move individuals could make would be to join the organization of Technocracy Inc., investigate it from the inside, and prepare themselves in any way practical through the organization's media to inform other North Americans of Technocracy's conclusions. If you feel that the organization does not have the answer, you can drop your membership more easily than you attained it.

What are the duties and obligations of members of Technocracy?

The only requirements for membership are to pay your dues ($15.00 a year) and to abide by the organization's Bylaws and General Regulations. Beyond that, your degree of participation depends upon your personal initiative.

Presuming, though, that you joined the organization because you were convinced that Technocracy holds the only answer to North America's social dilemma, you would wish to learn as much as possible as soon as possible about the organization. By so doing you would be preparing yourself, through whatever personal knowledge or ability you may possess, to further Technocracy's objectives by informing your fellow North Americans about them.

The first step will be to attend a Study Class where, after either learning the rudiments of basic science or refreshing your memory of them, you will learn Technocracy's analysis of the existing society and why the Price System is incapable of solving its problems; the final lessons explain what is necessary for their solution.

Technocracy has room for many talents, such as teaching, speaking, writing, typing, accounting (since we are still in the Price System), printing, and a wide variety of others. The combination of these abilities through the efforts of its various members constitutes the full capability of Technocracy to inform North Americans of "the only organization that is preparing the people of this Continent for social change." A member's most important obligation to Technocracy Inc. is one's sense of realization of that responsibility, coupled with a determination to carry it out.

What do Technocrats mean by social change? Their use of the term seems to differ from that of the popular understanding.

Very much so. Social change is far more basic than the periodic switches from one political party to another, even if these switches are from the far right to the far left; for unless the essential ingredient of social change is introduced by the new administration, nothing more than superficial differences will result.

The essential ingredient to effect social change is a change in the rate of energy conversion, whether this be upwards or downwards. Thus, a society that converts energy at a low rate can have only a low overall living standard, while another that converts energy at a higher rate can have a correspondingly higher standard of living for all its citizens. That this may not actually occur has nothing to do with society's ability to do so; the fault lies in the distributive mechanism.

For all practical purposes we may consider social change to involve an upward adjustment of the ability to convert energy. Historically, from time immemorial until the last couple of centuries, the only significant means humankind had of converting energy was the power of their own muscles. This accounted for about 98 percent of all energy converted; notwithstanding the assistance obtained from such extraneous sources (those outside the human body) as domesticated animals, windmills, and waterfalls. Thus, the general living standard throughout the world in the middle of the 18th century was not substantially different from what it had been four or five thousand years earlier, which suggests that the rate of energy conversion was at its irreducible minimum.

The first significant change upward occurred when the energy of burning coal was harnessed for use through the medium of the newly invented steam engine in the 18th century. Slowly at first, but with rapidly gathering momentum, the trend to the use of extraneous sources of energy — coal, petroleum products, electricity — increased until today in North America an exact reverse of the historic situation exists. Less than two percent of all energy converted for the production of goods and services can be attributed to human muscle power; the balance, over 98 percent, comes from extraneous sources: technological energy, mechanical, electrical, or chemical. Accordingly, we now have the physical ability to produce an optimal amount of goods and services for every resident of the Continent. The fact that they are not receiving it stems from their stubborn retention of that archaic Price System social mechanism that was conceived in natural scarcity and is operable only under those environmental conditions.

What is your symbol called, and what is its significance? Would it, with the gray field, be the flag of the Technate?

The symbol is called the monad and it signifies balance between production and distribution, which is an integral part of the social program designed by Technocracy. Whether it and the gray field will be the flag of the Technate is a matter that will have to be determined by the citizens of the Technate.

THE PRICE SYSTEM

This is a somewhat shorter section than expected, but if repetition is a reliable guide, it answers the main questions that people appear to be concerned about with regard to the present social mechanism.

What does Technocracy mean by a Price System?

Technocracy defines a Price System as any system whatsoever that effects the distribution of its goods and services on a basis of commodity evaluation and that employs any form of debt tokens or money.

By this definition, every major society in the world today employs some form of Price System whether they call it capitalism, communism, socialism, fascism, or by any other label. Whatever their form, all were geared to conditions of natural scarcity and hence are unsuitable for distributing abundance.

What does Technocracy propose to substitute for the Price System?

Technocracy proposes: first, a carefully planned production adjusted so as to maintain as high a physical standard of living for the people of North America as is compatible with the limitations of irreplaceable natural resources; second, a carefully planned distribution based upon the total amount of energy consumed in production. This twofold plan would give to each individual an equal and substantial income.

Does Technocracy envisage the collapse of the Price System in the near future?

Technocracy will not make a flat prediction on this subject. Too many qualifying factors are involved. What we can say is that the problems of the Price System are multiplying daily and more and more people are becoming intolerant of this wasteful and obsolescent method of social operation.

What can we do to stop the terrible waste of our natural resources and still keep the Price System going?

Nothing, because the two go hand in hand. The character of the North American Price System requires that it constantly expand in order to survive, and this in turn requires a mindless drain of resources to satisfy the production needs of the revered Gross Domestic Product. To cut back on the use of resources would necessitate a decline in the GDP and hence in the fortunes of Price System operation.

Conservation of our natural resources to any meaningful extent would soon wreck the Price System. But is that so bad? In view of the alternative? For the first time humankind can look forward to an age of prosperity, but some people still yearn for the past.

A DESIGN FOR TOMORROW

How would a Technocratic society deal with various problems that are so difficult to solve in a Price System? This section outlines some of the ways in which such problems might be quite easily solved when the artificial barriers of finance and politics are removed.

What geographical area would the Technocratic society cover?

The Technocratic society, or Technate, would embrace the entire North American Continent, plus the peripheral islands north to the North Pole, the West Indian archipelago, and those in the Pacific Ocean east of the International Date Line and north of the Equator. In addition, the northern tip of South America would be invited to join, embracing that portion of the southern Continent north of the Amazon River basin.

Why is the Technate restricted only to North America?

For no reason other than that North America is a geographical and industrial unit, whereas the whole world is not. Because of intervening oceans it is not possible to integrate the river systems of the world in the way that can be done for the rivers of a continent, nor can any number of other physical feats be accomplished practically for the same reason. Moreover, it is impractical to attempt to have an impartial, world-embracing governmental control that would deal similarly with all parts of the earth; and especially has this been the case since World War II when most countries of the world have had more than their fill of political and economic interference from the Price System controls of North America. Until this Continent sets its own affairs in order, it is unlikely that any other area of the world would be interested in any proposition that might issue from here.

Apart from the above considerations, there is a further important one: as yet North America is the only land area that, because of its fortunate supply of physical resources and because of its advanced development of the technical arts, has crossed the threshold from an environment of scarcity to one of abundance (notwithstanding certain present manifestations to the contrary) and thus has reached the point where a new distributive mechanism is not only desirable but mandatory if civilization on this land area is to survive.

What do the numbers 12349-1 mean?

The numbers 12349 represent the Regional Division in which Section 1 (Vancouver. B.C.) of Technocracy Inc. is located. A Regional Division is a quadrangle bounded by two successive degrees of longitude and latitude and the number designation is taken from the southeast corner of the quadrangle.

The whole of North America is blocked off by Technocracy into these quadrangles or Regional Divisions. In this rational and simple system of geographical divisions, the numbers for each not only designate it but also locate it.

Would Technocracy put an end to private ownership?

Yes, except for personal belongings; but why let that worry you? You don't own the telephone line service to your house, but that doesn't keep you from using it whenever you wish, except for the cost of those expensive long-distance calls that is a Price System interference to the most efficient use of such equipment.

More people are finding that owning a car or house is more of a detriment than a benefit, considering taxes and maintenance. They look with some envy at apartment dwellers who live as comfortably as they without the usual concerns of house owners; and when it is possible to do so, many of the house owners join the ranks of the apartment dwellers.

Private ownership is a Price System hang-up that will be gladly abandoned by most people when they experience the considerable advantages of being able to use goods and services whenever desired without the bother of owning them.

What does Technocracy propose to substitute for money?

Technocracy proposes to replace money — that, in all its various forms such as coin, currency, bank drafts, checks, et cetera, is a medium of exchange -- with a nonfluctuating medium of distribution. Instead of having an elastic type of "value" as at present, goods in a Technate would possess a measurable energy input and would be distributed on that basis. The total cost of all goods and services produced would be the total amount of energy used in their production. The total purchasing power is a certification of the total net energy consumed; the income of the individual in a Technate is arrived at by dividing the total adult population into the total certification of consumed energy. The cost of any one unit of production, as for instance a pair of shoes, would be the total energy required to produce all shoes, divided by the total number of pairs of shoes; this would give the cost of an individual pair of shoes. This cost would be expressed in some such scientific term of physical measurement as ergs.

Your consuming power, which would be your pro rata share of all the nonhuman energy used in producing goods and services, would be issued in some form of nonnegotiable Energy Accounting. It would be identified only to the person it is issued to and would be usable only by that person. There would be no personal "saving," for the unused remainder of your account would be canceled out at two-year intervals and replaced with a new account.

How would the Technate conduct its international affairs?

International affairs of any nature would be the special concern of the Foreign Relations Sequence. As with all other Sequences, its personnel would be specially trained for their work, having among its staff a selection of personnel who, in total, could speak most of the major languages of the world. In addition, they would be conversant with the history, geography, social mechanisms, and other pertinent characteristics of all countries they would be dealing with; in other words, the balance of the world outside the Technate area. By keeping in constant touch with world affairs, the Foreign Relations Sequence would instantly be aware of an emergency occurring in any area and so would be able to render whatever assistance it required of personnel or supplies. All such assistance would, of course, be given without any strings attached.

In travel abroad, what would be used for money?

Citizens of the Technate who plan a trip abroad would be granted the equivalent of their domestic income in foreign currency, secured by the Technate through foreign credits. Upon their return, travelers would relinquish any foreign money they might have in their possession.

How would we secure the goods that could not be produced in this continental area from other countries?

There would be no international trade for private profit as at present, but there would be an exchange of goods on somewhat of a barter basis — at present, in excess of 40% of world trade is carried out by barter — or there would be direct sale in some instances in order that the Technate might be provided with foreign currency for the use of its citizens in travel abroad. All such matters involving international relationships would of necessity be handled by the Continental Control in conference with the representatives of other countries. The Continental Board would establish the policy to be followed in each instance, and the Foreign Relations Sequence would attend to its application.

What is this blueprint that Technocrats are always talking about?

The Technocratic "blueprint" is a scientific social design to produce and distribute goods and services to all North Americans with the least possible wastage of our natural resources, a minimum of human effort, and a maximum of efficiency. The basic design of the Technate includes an administration chart of industrial and service function, a revised calendar, a new medium of distribution, and a continental hydrology for power, transportation, irrigation, and recreation. Details of this "blueprint" of tomorrow's society are available in the Technocracy Study Course and other literature published by Technocracy Inc.

How could a Technate operate its technology and still have less pollution than there is now?

The industrial mechanism would be operated as close to 24 hours a day, 365 days a year, as possible, and the required production could thus be achieved with less but more efficient technology than at present. Also, goods would be made to last longer (no more built-in obsolescence), and this again would lessen the amount of production equipment necessary. Another prime factor would be the emphasis placed on the Technocratic society on avoiding pollution. With the removal of the Price System, the monetary cost of fighting pollution would be eliminated and would no longer be the problem that confronts industrialists and politicians today.

Why does Technocracy use energy as the means of controlling the flow of goods and services?

Energy was chosen instead of money or price because it possesses the characteristics that a satisfactory mechanism of distribution must possess.

First, money relationships are all based upon "value," which in turn is a function of scarcity. Hence, money is not a "measure" of anything. Second, money is negotiable — it can be traded, stolen, given or gambled away. Third, money can be saved. Fourth, money circulates and is not destroyed or canceled out when spent.

The energy medium would eliminate these drawbacks and institute a balanced system of production and distribution. It would provide a continuous inventory of goods and services while allowing the citizen the widest latitude of choice in consuming his or her individual share of the Continental physical wealth.

After all, the purpose of a medium of distribution is to distribute. This, the Price System, is woefully inadequate to perform in a highly technological age. (Technocracy's pamphlet, ***The Energy Debit Card***, provides details on the new method of operation.)

Would there be a police department in Technocracy?

Because the cause of most crime would be automatically eliminated by the design of the Technate, it is reasonable to expect that the proportion of crime stemming from economic causes (at least 90 percent) would disappear along with the elimination of the cause. The great reduction in crime would be matched by a corresponding reduction in the number of police; however, since some crime not related to economic causes would still exist, police could not be completely dispensed with.

Instead of the rash of local police departments now found across the Continent, there would be just one law enforcement agency, namely, the Continental Constabulary, but it would be a specially trained group of individuals operating under the discipline of the Social Relations Sequence.

How will education be handled in a Technate?

The main immediate benefit for education accruing from a Technate operation would be the removal of those same monetary obstructions that have sabotaged virtually all other functions within the Price System. With these out of the way, the only barrier in any student's path would be his or her own ability to proceed to higher levels of academic attainment.

While earlier stages of education would undoubtedly benefit from an input of new teaching techniques and equipment, it would be at the more advanced levels that students would experience the principal advantages of the Technate's approach to education. Expert counseling advice would be constantly available, and as soon as students showed special aptitudes toward particular careers — medical, engineering, or otherwise — they would be encouraged, henceforth, to specialize their studies in those directions. Then, in the latter stages of their educational periods, they would receive direct on-the-job training from qualified instructors at the very location where they would commence their functional service.

How will agriculture be conducted in a Technate?

Agriculture would be treated as the biochemical industry that it essentially is, involving as it does the synthesizing by solar radiation of elements from soil and air. Being part of the functional sequence devoted to the production of foodstuffs, agriculture would be governed in its operation by the same rules obtaining in the operation of any other industrial sequence, i.e., maximum production at the least possible energy cost, involving the least possible human labor, and with the least wastage of raw materials and natural resources.

Today's small-scale farms would give way to large blocks of land, possibly as much as 25 miles square, that would be cultivated by power machinery developed for large-scale operation. It is probable that the agricultural population employed on these large tracts of land would reside in towns suitably located where they could combine the educational, recreational, and cultural advantages of urban life with their out-of-door agricultural pursuits.

How do the Technocrats propose to come into power?

There is a possible double meaning here. If the questioner is asking how the organization of Technocracy Inc. and its members propose to come into power, the answer is: they don't. Technocracy Inc. is a purely educational-research organization with no assumption of power theory. Even if it did entertain such a theory and were successful in "coming into power," its members, for the most part, would be no more competent than any one else elected to public office to administer the affairs of a nation. Only the qualified, trained personnel who are already operating the physical apparatus of the Continent are competent to administer a governance of function, and such personnel cannot be selected by ballot.

On the other hand, if the questioner is asking how Technocracy seeks to have its program of social operation put into effect, we would point out the following: It is the policy of the leaders of Technocracy not to discuss tactics, because it is impossible to say definitely just exactly what would be done in a situation that is still in the future and in which so much would depend upon the attitudes and actions of others. For the present, we know that we must educate and organize, not to foment a revolution, but to be prepared to keep our industrial mechanism operating when the Price System can no longer operate. Beyond this, all we can say is that as scientifically trained men and women, we would weigh the facts and act upon them as intelligently as possible when the time comes. We can no more predict the actual manner in which the program will be instituted than an army general can predict ahead of time just how he will deploy his men and equipment to win a battle. The circumstances of the time must determine the action.

Does Technocracy have a specific plan to implement when and if the Price System finally and completely breaks down?

Technocracy's specific plan during the transition period is its program of Total Mobilization of men, machines, materiel, and money with national service from all and profits to none. This program would provide a stable framework in which to introduce efficiently and harmoniously the various elements of the Technocratic society itself.

What is your plan to improve the efficiency of the automobile?

In the first place, there would be only one basic design of automobile. All automobiles would have interchangeable parts, such as motors, wheels, chassis, springs, except where they differed in those elements of design fitting them for different uses. In these minor differences there would be as many varieties as there were uses -- two-passenger and five-passenger capacity, light trucks and similar variations. In accordance with Technocracy's criterion of least energy cost, the vehicles would be really streamlined and would be powered with the most efficient unit that could be devised.

Regarding the use of cars, the change of administration would be even more profound. Today, one buys an expensive automobile and leaves it parked the greater part of the time as evidence of conspicuous consumption, but in the Technate all vehicles would have to be kept in operation. This would be accomplished by instituting what would resemble a national "drive-it-yourself" system. The Automotive Branch of Transportation would provide a network of garages from which cars could be obtained at any hour of the day or night.

Are you suggesting that everybody have the same amount of consuming power?

Yes. Why attempt to differentiate between incomes when there is more than enough for everybody? Despite our extensive wastage of resources resulting from Price System operation, it is still possible to provide an optimum abundance to all citizens if careful management is exercised. An abundance cannot be sold — it can only be distributed.

It must not be thought that the extension of equal consuming power to everybody presumes that everyone would receive exactly the same commodities as everyone else; such doling out is indicative of scarcity conditioning. A more analogous circumstance would be that of letting a group of, say, 10 persons spend similarly large sums of money as they wished. It is highly unlikely that they would all buy the same things, or even that their purchases would coincide throughout on any single item.

If they still think they should receive consuming power on the basis of what they earn through work done, they had better be prepared to starve to death, for when over 98 percent of all work is performed by mechanical energy, none of them can really say they earned their living on the basis of their minuscule energy contribution to the total expended.

Why does Technocracy consider its Continental Hydrology plan so important?

Because of the many important roles it would play. Among the first of these would be the provision of abundant hydroelectric power and low energy-cost water transportation of bulk commodities the length and breadth of the Continent through its system of rivers and interconnecting canals. There would also be the advantages gained of raised water tables in the drier portions of the Continent, plus some climate modification.

Technocracy's original design is most probably unworkable now and will have to be reconsidered because of the total lack of an overall plan and the Price System' s myopic view of all resources; that being the maximizing of profits. Nevertheless, North America is endowed with lakes and river systems that could once again be designed to optimize water transportation, fisheries, electric power generation, irrigation, and recreation.

How would a technocratic society select its leaders? How long would these leaders hold office?

Leaders would be selected in much the same way that industry now selects its supervisory staff in the technical phases. This is called the vertical alignment method of promotion and involves recommendation from below and appointment from above with competence being the predominant factor in the choice.

In the Technate, supervisory personnel would ascend through their respective Functional Sequences on the basis of demonstrated competence, reaching whatever plateaus of accomplishment their abilities allowed. The most competent would become Sequence Directors and would represent their Sequences on the Continental Board where they would coordinate the work of all Sequences to achieve maximum efficiency. Their chairman would be the Continental Director, elected by them to that position because there would be no one higher to appoint him or her to the role.

These leaders would hold office until retirement at age 45 or until replaced by someone else within their Sequences for sufficient reason. The Continental Director, elected by a two-thirds majority vote of the Continental Board, would serve in that capacity until retirement unless earlier removed by the Board through a similar vote.

THE TECHNATE

Many People are interested in what style of life might be expected in North America after a Technate is established. Without committing the citizens of the Technate to preconceived patterns, we can give some general impressions of what life in such a society might be like.

How will Technocracy change human nature so as to make the system work?

It won't even try, for it is neither possible, necessary nor desirable that human nature be changed.

What is in the minds of most people when they speak of "human nature" is human behavior. Human behavior, like all other animal behavior, is the result of the reaction of environment upon the inherited mechanism of the individual. Technocracy proposes to regulate this environment in such a manner that the resulting human behavior will be the most desirable; or, to put it another way, Technocracy proposes to change the rules of the game under which human nature operates. Given a decent set of rules, there is every reason to believe that human nature will effect a veritable Renaissance.

Is there room only for engineers in the technocratic organization?

Certainly not. While engineers are vitally important to the operation of our technological mechanism, an analysis of existing society will reveal a broad spectrum of functions that are in no way related to engineering but that nevertheless are indispensable to social operation. Among these, to mention only a few, are doctors, nurses, teachers, and peace officers. About the only type of functions that would be completely eliminated in a Technate that are considered important today would be those related to Price System operation — such as banking or any of the numerous other forms of financial manipulation — and politics. Abandonment of these obstructions to functional efficiency would result in the virtual elimination of one of the most serious side effects, namely, crime, and the elimination of crime would eliminate the need for practically all of the facilities now maintained to deal with crime.

What would be the first chore of Technocrats when they take over?

Technocrats would not "take over" in the usual sense of the term. Instead, the role of Technocracy Inc. is that of an educational and organizing vehicle to make the transition from the present obsolete Price System to a method of social operation in accord with the new age of power and technology.

What would we do with our leisure time?

Learn to live! Since time immemorial humankind has been dreaming of that far off future when people would have all the time they want to do the things they desire, and now that this opportunity is within sight, they seem to be afraid of it. The difficulty is that their fears are based on Price System experience. All too often individuals have either had lots of time but not enough consuming power, or else they have been so busy acquiring monetary consuming power that there is no time to enjoy it.

In a Technate you would have both time and ample consuming power. Thus, unstinted, you could spend much time in travel, in developing hobbies or in any number of other pursuits. Technocracy Inc. does not try to tell people how they should use their free time, but it is interesting to note that when people ask the above question, they are not nearly as concerned about their own ability to use free time as they are about other people's ability to use free time.

If machines are doing all the work, what will people do with themselves?

Machines will be doing most of the work in industrial production, but humans will still be essential in the service functions. In their greatly increased leisure time, people will have an opportunity to engage in a variety of artistic, scientific, and sporting pursuits, as well as to travel much more extensively. A major activity of the Educational Sequence will be preparation for wise use of leisure.

Is there a place for culture in your proposed type of society?

Not only would there be a place for culture, but it would flourish far more than at present. In a society of security, virtual abundance, and leisure, the citizens would have a greater opportunity for pursuit of all the arts, as well as sports and hobbies of various kinds.

Would a Technate feed and clothe the hungry and needy in the rest of the world?

The biggest contribution a Technate could make to the hungry and needy of this world would be to put our own North American house in order and then assist the scientists and technologists of other areas in solving their problems. As our guests, they could learn the latest production processes that we have installed and adopt any method suitable to their conditions.

In the case of a famine emergency, we would, of course, share our bounty with persons in need.

What will be the status of women in Technocracy?

It will be the best it has ever been in human history and accordingly should earn the support of every woman on the Continent, liberationist or not.

For the first time women will receive their consuming power independently of men and in equal amount. No man will be able to win their favors with any sort of purchases. The women, on the other hand, will be unable to sell favors to the men, thus effectively stamping out the world's oldest profession.

Women will be able to decide whether they will fulfill their social functions in the traditional role of housewives, or whether they will seek careers in the Industrial or Social Sequences; should they decide on the latter, they will compete on equal status with men for whatever responsible positions come their way.

Need more be said? Technocracy invites the women of North America to investigate the only organization whose social program guarantees them the fulfillment of many of their long sought dreams.

What will become of children and the home in Technocracy?

Actually, Technocracy does not propose any sweeping changes in the institutions of North American life. It merely seeks to put an adequate economic base under them. It is known that parental care, and especially mother's care, is important in the early development of children. No doubt, citizens of the future will acknowledge this.

Adequate economic security would do much to end any incidents of domestic tyranny with its resultant influence upon the development of child character. In addition to economic security, all children would be guaranteed equal educational opportunity with no limitation whatsoever other than their own ability to compete successfully with others.

Will there be divorce in a Technate?

That will be a matter for the citizens to determine after the Technate has been established. Decisions of this type, which are unrelated to the operation of the Continent's physical equipment, are a matter of public option, the determination of which will be decided by referendum votes.

While in this case it is probable that the decision would be in the affirmative, it is just as probable that the removal of those economic causes that play so large a part in domestic discord will result in a considerably lower divorce rate than now prevails after the initial period of adjustment.

How would a Technate solve the serious problem of drug trafficking?

The drug trafficker in today's society plies his trade to make money and cares not whom he destroys in the process. Removal of the Price System would automatically eliminate the buying and selling of all commodities, including drugs. The Technate would similarly abolish many other antisocial activities related to price and profit.

How will serious offenses be handled? Will there be capital punishment?

We cannot be presumptuous and dictate how the people of tomorrow will handle their social problems whether serious or trivial. What we can say is that elimination of the Price System and installation of a Technate will automatically remove many problems that are natural concomitants of our present method of social operation. For instance, a considerable number of homicides have a direct connection with a monetary motive -- such as violent robbery and the traffic in drugs. Also, the new society would make a much greater effort to discover and rehabilitate socially dangerous people.

In a Technate will there be large cities like New York with its teeming millions, or will there be smaller self-sufficient units?

The centers of population in a Technate would be smaller and more self-sufficient than New York City. Metropolises of trade and commerce, as such, would dwindle into insignificance for the simple reason that trade and commerce would not exist. Centers of industry might or might not come to occupy the same places. Along with redistribution of industry would come a redistribution of population. It is not improbable that New York and other similar localities would be mined for the metal they contain.

What is the greatest obstacle to the advent of Technocracy?

It would be difficult to pick out any single obstacle and label it as the greatest one, for there are several contenders for this dubious distinction.

Certainly apathy rates high. Shortly before his death, Howard Scott, Technocracy's founder and longtime Director-in-Chief, stated that "Never in the history of human affairs has mankind been so unprepared for what it has to face." The saddest part about this lack of preparation is that most people seem not to realize how unprepared they are, nor do they even care.

Another obstacle is the opposition of the corporate owners of wealth who feel their prestige and power threatened by the pronouncements of Technocracy, even though this organization has simply predicted future probabilities on the basis of examination of developing trends. To blame Technocracy in this case is akin to blaming a clinical thermometer for recording fever, or blaming a barometer for forecasting a disastrous hurricane.

In one sense the greatest deterrent is the lack of understanding of its basic principles and of its program. Technocracy is not alone in this. Any new idea is always fraught with misconceptions, but the startling postulate of today becomes the accepted commonplace of tomorrow. Technocracy states its case and bides its time.

How would Technocracy handle the race problem?

Technocracy, being thoroughly scientific, makes no distinction of race, creed, or color. Technocracy's concern for the individual is primarily one of capacity to function. Scientists know that the so-called race problem, like most of our problems, has its roots largely in our present economic setup. When it is no longer necessary or possible for one group to achieve economic security at the expense of another, we shall find that much of the reason for racial antagonisms will have passed away.

What might the level of income be in the planned Technate?

The questioner is obviously trying to relate the standard of living in the Technate — a non-monetary system — to that in the present Price System. Such a comparison is difficult because of the vast change in the whole style of living. The Technocratic society will eliminate the current wasteful methods and poor quality products. The emphasis on conspicuous consumption would also be eliminated.

Technocracy Inc. has estimated that every adult citizen in the Technate would have a material and cultural standard of living equivalent to what would cost at least **$100 per day in the 1950s' dollar, if purchased at present prices.** This includes housing, foods, clothes, health care, education, recreation, travel, etc., all of one's individual choosing. Individual life styles differ even though certain basic essentials are common to everyone.

Only a Technate could provide this optimum abundance — the essentials of life and more — for every citizen regardless of age, sex, race/ethnicity, or of occupational professional status level.

What would be the goals of individuals in a Technate?

Much as they are now once the camouflage of monetary perspectives is removed. A tremendous Renaissance of the cultural arts would be one of the logical results, along with a burgeoning of scientific discoveries and technological innovations.

This is all because in a society where scientific as well as cultural knowledge and competence are the criteria — a condition never before known in history — creativity will naturally be nurtured in every area of human endeavor.

People are not created equal. This being the case, what would a Technate do about such things as personal drive, motivation, and initiative? How would it reward people materially for outstanding effort and achievement?

Since personal drive, motivation, and initiative are individual attributes of widely varying degree, no society can do much for their fostering beyond furnishing a satisfactory environment for their development. Such an environment would accrue naturally from the application of Technocracy's social program.

Far more important to human growth and development than the monetary incentives of the Price System are the natural drives of the instinct of workmanship and the desire for social prestige. In a Technate these could be easily rewarded by promoting functionaries to higher responsibilities that would win the acclaim of their fellow citizens in proportion to the degree of their achievement's merit. Any other form of reward (such as medals or the like) would have to be determined by its citizens after the institution of a Technate.

Can you describe specifically how a Technate would operate?

No, not specifically. All that Technocracy can do and has done is to outline the general requirements of providing a social mechanism with a distributive setup that is equal to the task of distributing an optimum abundance to all citizens. These requirements are subject to modification befitting the particular circumstances that might exist in the future, and these circumstances naturally cannot now be foreseen. Thus, it is not possible to state exactly how any particular aspect of the Technate will operate, except that it is designed to operate within the well established rules of science and the laws of nature.

Would there be any special consideration given to people working in dangerous or unpleasant occupations?

Quite possibly, but the determination of this would have to be made by the citizens of the Technate after it is established. From the present perspective, it can be suggested that should there be any such occupations, the people performing them might be compensated by being allowed longer vacation periods, earlier retirements or possibly even medals of recognition. Obviously, they could not be rewarded by additions to their consuming power or by improvements in their living conditions, for these would already be granted at top level to all citizens.

If a citizen found he didn't like living in a Technate, would he be allowed to leave it for some other part of the world?

By all means. Why keep people here against their will when it would be to the advantage of the rest of the citizens for them to go? We rather doubt, however, whether there will be any marked incidence of such dissatisfaction. More people will probably be wanting to get into rather than out of the Technate.

Some people, like surgeons, are just approaching the peak of their abilities by age 45, and yet they would be retired at that age in a Technate. Does that mean that society would lose the advantage of their advanced knowledge?

Not likely. While there would be no obligation on such people to give of their abilities and knowledge after official retirement, it is altogether probable that they would wish to do so in advisory capacities. As Technocracy has long pointed out, no healthy, intelligent persons would want to remain inactive for long, so what would be more natural than for them to choose to carry on in their retirement the type of work they had previously been performing in fulfillment of their contract of citizenship? If they wished to teach or to conduct basic research, they would be granted every opportunity and facility to do so. It would be their prerogative, of course, to discontinue such work at their own pleasure.

It seems that people will have considerable time to themselves in a Technate, and yet many don't know what to do with the free time they have now. Would any provisions be made to help people make satisfactory use of their free time?

Yes, such provisions would be made. The Education Sequence would, in addition to educating children and training them for their later roles in the various Functional Sequences, assist in numerous ways. It would, in a similar way but with much broader scope, carry on adult education classes as is done today by many schools and universities. These, as is known, teach many hobbies, handicrafts, and other interests. There would, of course, always be individual help when required. The Recreation Sequence would concentrate on indoor and outdoor activities, giving instruction in the popular team games, and also in skiing, skating, hiking and camping, tennis, golf, and so on.

In all training for leisure time activity, the emphasis would undoubtedly be made on personal participation, since such involvement is usually both more satisfying and more healthful than spectator interest.

How would Technocracy handle communications, and what media would be used?

Concerning the media that would be used in a Technate, this depends on what the communications engineers of the future come up with. In all likelihood there will be refinements on already existing forms or improvements thereon, but there might also be innovations of types that we can now hardly even imagine. Who guessed ahead of time what gigantic steps forward would be made in communications by Alexander Graham Bell's invention of the telephone a century ago?

Would the North American Technate isolate itself from the rest of the world?

Certainly not. There might be a short initial period that the Technate might close its doors in order to facilitate housecleaning, but after that it would welcome the interest of other areas. Having set our own house in order, we would be in an excellent position to give assistance by inviting students from other lands to come to North America to see the Technate in operation, and possibly take back some of the ideas for use in their own countries. Tourists, too, would be invited here, and these would undoubtedly gain some impressions that would be of assistance in their homelands. Alternately, tourists from North America would be visiting other land areas; and also, if requested, scientists and engineers from North America would go wherever needed to help in the completion of projects in hand.

This two-way flow of global citizenry hardly supports any notion of isolationism that any person might hold concerning the Technate.

Miscellany

As the title suggests, this section deals with a wide variety of subjects that cannot be definitely categorized under any of the previous headings. In some cases, the questions would fit quite aptly under two or more of the other categories.

Does Technocracy believe in the use of democratic methods?

No, if you mean by this the selection of administrative personnel by use of the ballot.

It is too hazardous in today's highly integrated, technological society to depend on this random method for selecting the specialized type of personnel required. We need instead a selective technique that will have some better chance of ensuring that people with firsthand knowledge of the functions they are expected to administer will be selected. Such a technique exists in the vertical alignment procedure of promotion used by industry for selecting its supervisory staff in the technical departments. It is a technique that has proved remarkably successful despite Price System interference.

A modified application of the vertical alignment promotional procedure will be employed by the Technate for selecting administrators from bottom to top in all functional sequences. The Sequence Directors, heads of their respective sequences, would constitute the Continental Board; and this body would use the only ballot employed at any stage for selecting a chairman or Continental Director from their midst. This would be by virtue of the fact that there would be no one above him or her to appoint the Continental Director to that function.

Will Technocracy take political action?

Technocracy will never take action as a political party running candidates in any election; however, we would favor a national or continental referendum giving approval to the installation of a Technocratic society.

What would become of political government in Technocracy?

It would cease to exist.

What check would there be against the abuse of power?

The idea of abuse of power is a hangover from our thinking in terms of an economy of scarcity. All previous changes in social systems have been the transfer of power from one group to another in such an economy; but power in an economy of scarcity is quite different from functional responsibility in an economy of plenty such as would prevail for the first time in history. Men and women would hold positions of responsibility, not through power inherent in the control of wealth but rather on the basis of competence.

If, in some remote instance, individuals attempted to abuse their power to the detriment of society, they could quickly and easily be removed from their position by a two-thirds majority vote of the Continental Board, whether it be one of the Sequence Directors or the Continental Director. At lower levels of administration, offending individuals could be replaced with someone else by their immediate superior.

What is Technocracy's proposal for operating during a crisis or transition period?

At present it would be impossible to forecast the nature of the precise conditions that would precipitate such a crisis; however, Technocracy points out that the total mobilization of people, machines, materiel, and money must be a first step, with national service from all and profits to none.

What about the individual who refuses to work?

People do not ordinarily refuse performing work they like doing or performing work they have received specialized training in unless, as so often happens in the Price System, artificial obstructions have been introduced. As these would be totally absent in a Technate, any refusal to perform functional service would initially be treated as a medical problem. If a medical examination uncovered either a physical or mental reason for nonparticipation, the subject would be excused from function for as long as necessary without any loss of consuming power. On the other hand, if no medical reason for nonparticipation were discovered, the individual would no doubt become the object of rather severe social disapprobation from his fellow citizens until such time as he decided to cease being a public parasite. Actually, it is not expected that enough such instances will occur to be of any social significance.

What is Technocracy's attitude toward religion and the church?

Technocracy ensures complete freedom of belief and worship to every individual unless, of course, the expression of that freedom involves some practice that is inimical to the social good. For instance, should some sect start promoting and practicing human sacrifice, such practice would certainly be dealt with firmly. In this latter instance, religion is considered as a mode of action, and modes of action call for quite different handling from modes of belief where the greatest possible freedom may be allowed.

There is nothing in the program of Technocracy that would prevent groups of people from joining together in a common project such as the erection of a place of worship. Whoever they might choose as their religious leader would probably be released from other functions to perform full time in that capacity. That person would, of course, continue to receive full consuming power along with all other citizens. The removal of the necessity to finance the minister's services and to pay for the place of worship would lift one of the heaviest burdens that churchgoers must shoulder in the interests of their belief. Technocracy has long pointed out that when the mortgage is removed from the outside of a *church and* the collection plate is removed from the inside, then true religious principles might be practiced.

What is Technocracy's attitude toward immigration?

During the period of readjustment following the institution of a Technocracy, immigration would be prohibited. The future policy on immigration would be determined by a study of the related facts, such as our productive capacity, population growth, etc

Technocracy thinks only of science and technology. Why not also think of living better?

Technocracy is based on science; and science, when properly utilized, is for the benefit of people. Our organization concerns itself with all aspects of humanity's relationship with the environment and other living creatures. The goals of a Technocratic society, therefore, are to use science and technology for the benefit of people. The Technate is designed to provide a maximum standard of living for every citizen of the continent, the widest possible latitude in how to use that standard of living, as well as a balanced and efficient relationship with the ecosystem upon which our survival depends, thus ensuring this lifestyle for the longest period of time possible.

Is there such a thing as optimum-size population?

Under the rules of the Price System game, an ever-increasing population is demanded by those who have special interests and their own private axes to grind, but from the point of view of social well being, it is obvious that if the population is not stabilized, it will expand until finally checked by lack of the means of sustenance. On the other hand, if the population is too small, there will not be enough people to properly man and operate a highly technological civilization. Between these two extremes, there is an optimum population.

We live in a finite world. If we expand our technology to create the abundance of which Technocracy speaks, will this not hasten the end of our finite resources?

Technocrats are not thinking of abundance in terms of the present appalling waste of resources both in production and consumption. The criterion would be serviceability, not vendability. Goods would be made to last instead of to wear out. Also, nonrenewable materials would be carefully conserved and recycled as much as possible. There would be much emphasis, too, on development of plentiful synthetics.

It sounds as though you're up against a pretty big reeducation project. How are you going to do it?

The project is not just that of Technocracy Inc. but of every resident of the North American Continent; so, we suggest you do a little self-reeducating so that you'll be in a position to help with the job.

What do you mean by load factor?

Load factor is the ratio between the extent of actual usage of equipment and the total time that it could be used. Thus, if equipment is running only 12 hours per day for six months of a year, it is operating at just 25 percent of its load factor for that period -- an inexcusably low figure but not at all uncommon in today's Price System society. The private automobile, for example, operates at a load factor no higher than five percent.

The extreme inefficiency of present low load factors is a major reason for many current difficulties, most of which could be overcome by scrapping much equipment and raising the operating load factors on the remainder to the highest possible degree. Rather than suffering loss from such action, the public would experience a considerable gain in services rendered. We could, for example, get just as much service from one-tenth of the existing number of cars on the road if we boosted the load factor on that one-tenth from the present five percent to only fifty percent of potential.

What will Technocracy do about the buildup of carbon dioxide, the so-called "greenhouse effect," and the depletion of the ozone in the stratosphere? What about the poisons in our food and our environment? What about the loss of our arable land due to erosion?

Technocracy itself can do nothing except advise, but with the establishment of a functional government - a Technate - steps would be taken to reduce the problems to a minimum.

Much of the buildup of CO_2 and $N0_2$ is the result of the excessive use of automobiles. The living areas that could be established to fit the needs of the future would reduce the need for automobiles considerably. Within a person's area of function, all of his day-to-day needs, that is, entertainment, service facilities (stores), medical and educational facilities, etc., can be within a short distance by walking, moving sidewalks, escalators, elevators, or whatever other means will be available.

The living areas that could fit the needs of the future, Technocracy has called Urbanates. These Urbanates would use a minimum of land area and so would be constructed in something like condominium style but with a difference: they would be designed for living instead of for profit. They would have a population large enough to justify having a full range of accommodations, entertainment, and recreation, without crowding, for possibly around 14 thousand people. All travel to and from would be by other than surface. Gardens and undisturbed natural areas would surround such Urbanates for a considerable distance.

Our industries must inevitably be largely rebuilt to more efficient standards. Agriculture is one of those industries. We have thought of agriculture in terms of private ownership and profit to the point where the land is showing signs of refusing to tolerate such foolishness. We must use techniques that give us the best assurance for long-term survival in the treatment of our planet. North Americans have the opportunity to make the best available use of what they have and to show the rest of the world a proper example.

It has been said that physical considerations make Technocracy inevitable. Is this a correct statement?

No, it is not. While the need for Technocracy may be rendered inevitable by physical developments, this in itself is no guarantee that the program proposed by Technocracy will thus be automatically invoked. A man may perish of thirst in the desert without having his need for water satisfied, and a civilization may also perish because of the lack of an essential required for its survival.

Technocracy's social blueprint stands ready for use, but it will depend upon the intelligent, decisive action of North Americans for its implementation. There is certainly no inevitability about its adoption, else the organization of Technocracy Inc. and the work it has done to publicize its program would never have been necessary.

Appendix 2: Charts, Tables, and Graphs

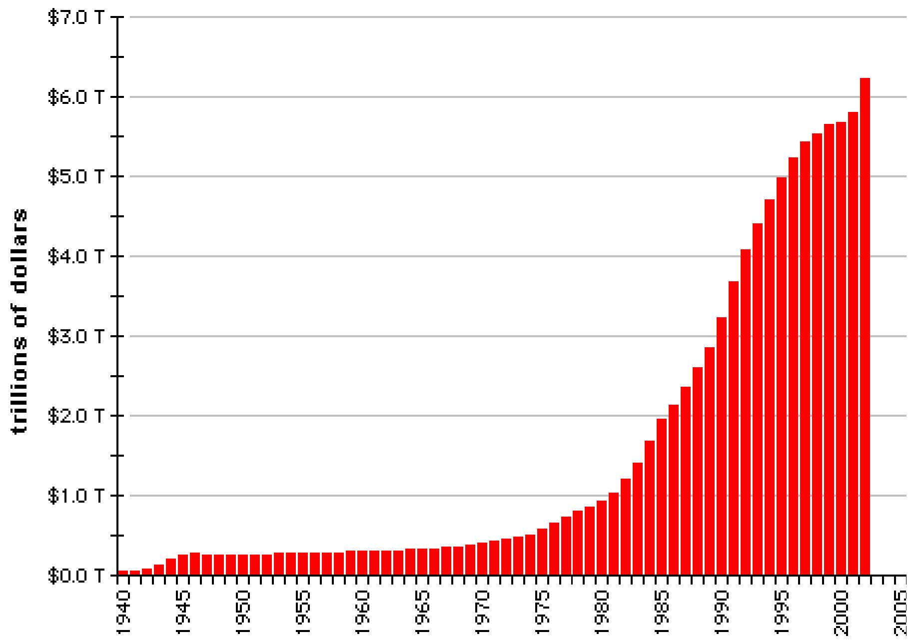
Population

Year 2000

United States	275,562,673
Canada	31,278,097
Mexico	81,163,000
Columbia	29,729,000
Venezuela	18,272,000
Central America	36,592,630
West Indies	29,105,214
Guayana, French Guiana	869,891
Greenland	56,509
Pacific Islands	2,002,467
Continental Total	**504,631,290**
World Total	**6,092,845,211**

Source U.S. Census Bureau

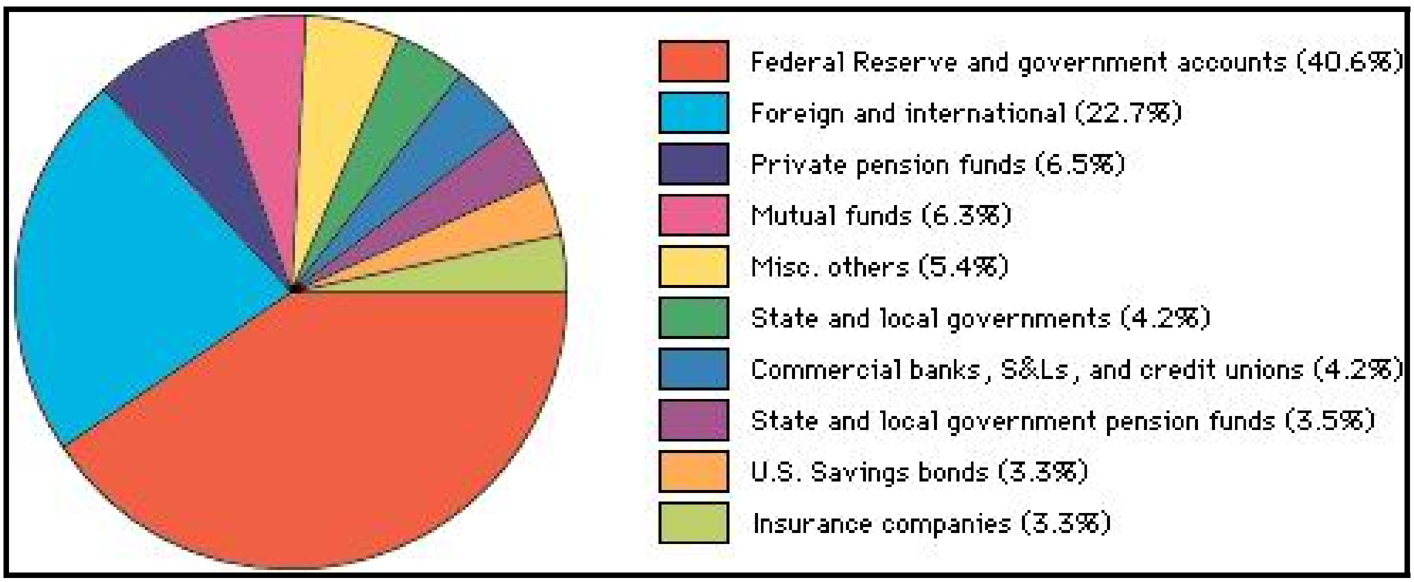
International Database



National Debt from 1940 to Present

Source: U.S. National Debt Clock
http://www.brillig.com/debt_clock/

WHERE FEDERAL DEBT IS OWED TO



Source: U.S. National Debt Clock http://www.brilling.com/debt_clock/

Growth of Total Installed Prime Mover Technological Power Capacity in the United States

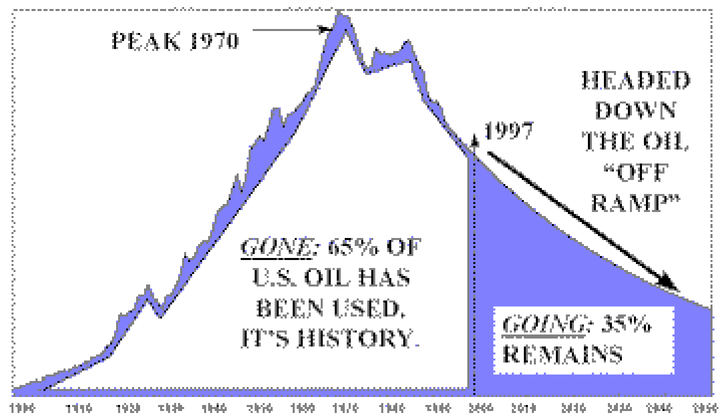
(million mechanical – electrical horsepower)

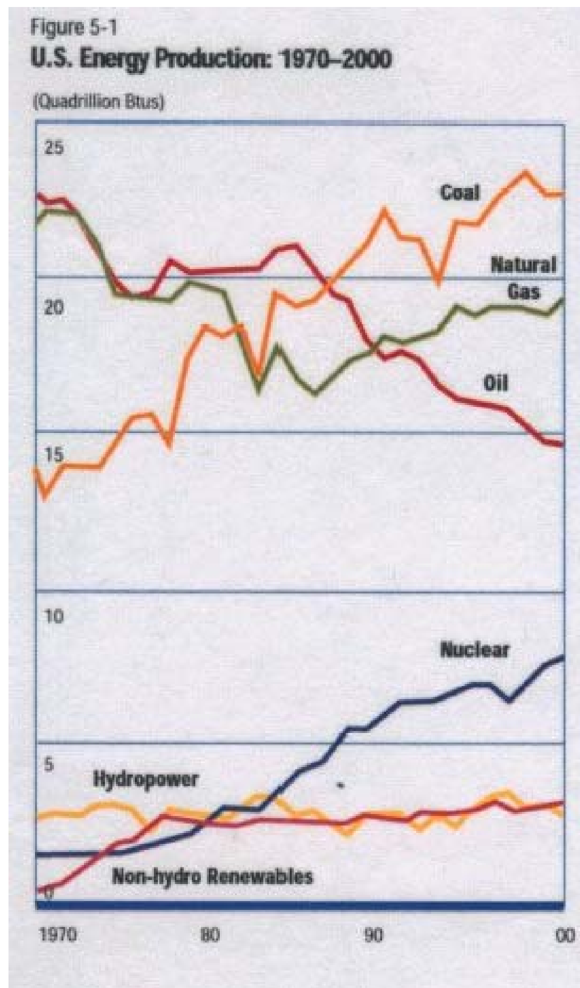
		1987	
1900	45		
1920	431	Factories	65
1930	1,646	Mines	47
1940	2,761	Railroads	53
1950	4,860	Merchant Ships	29
1960	11,003	Farms	354
1970	20,405	Electric Power Stations	958
1980	28,919	Aircraft	269
1987	33,263 ➡	Automotive	31,488

Note: All above figures include only prime mover engines and turbines. Electric motors would be duplicative, since they derive their power secondarily from the elecric utility

Source: Statistical Abstract of the United State. U.S. Bureau

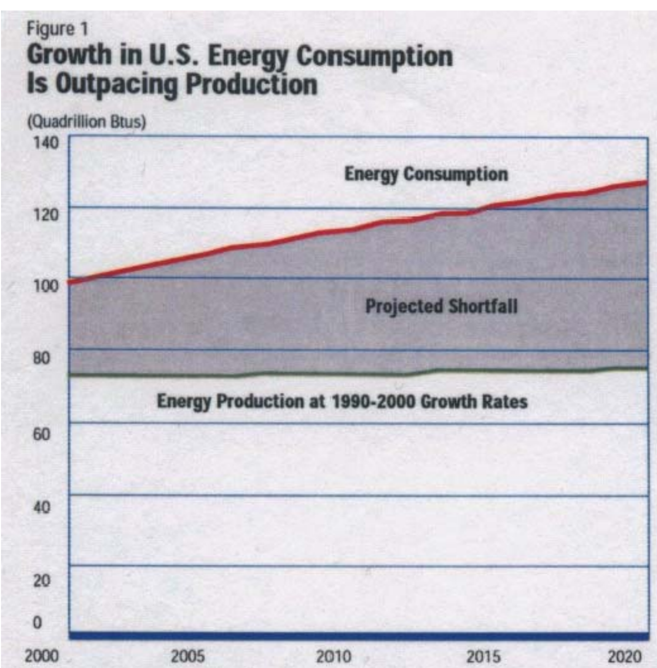
U.S. OIL PRODUCTION 1900 TO 2050



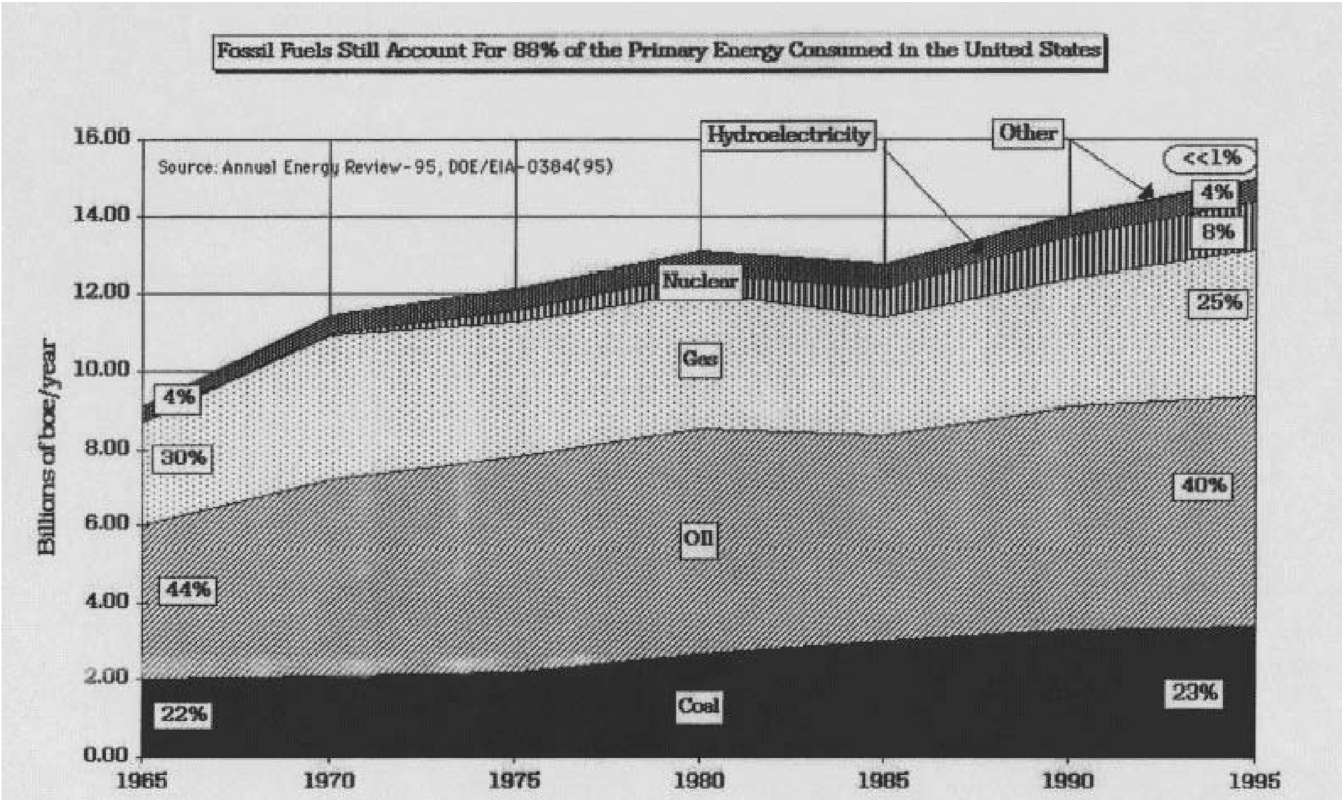


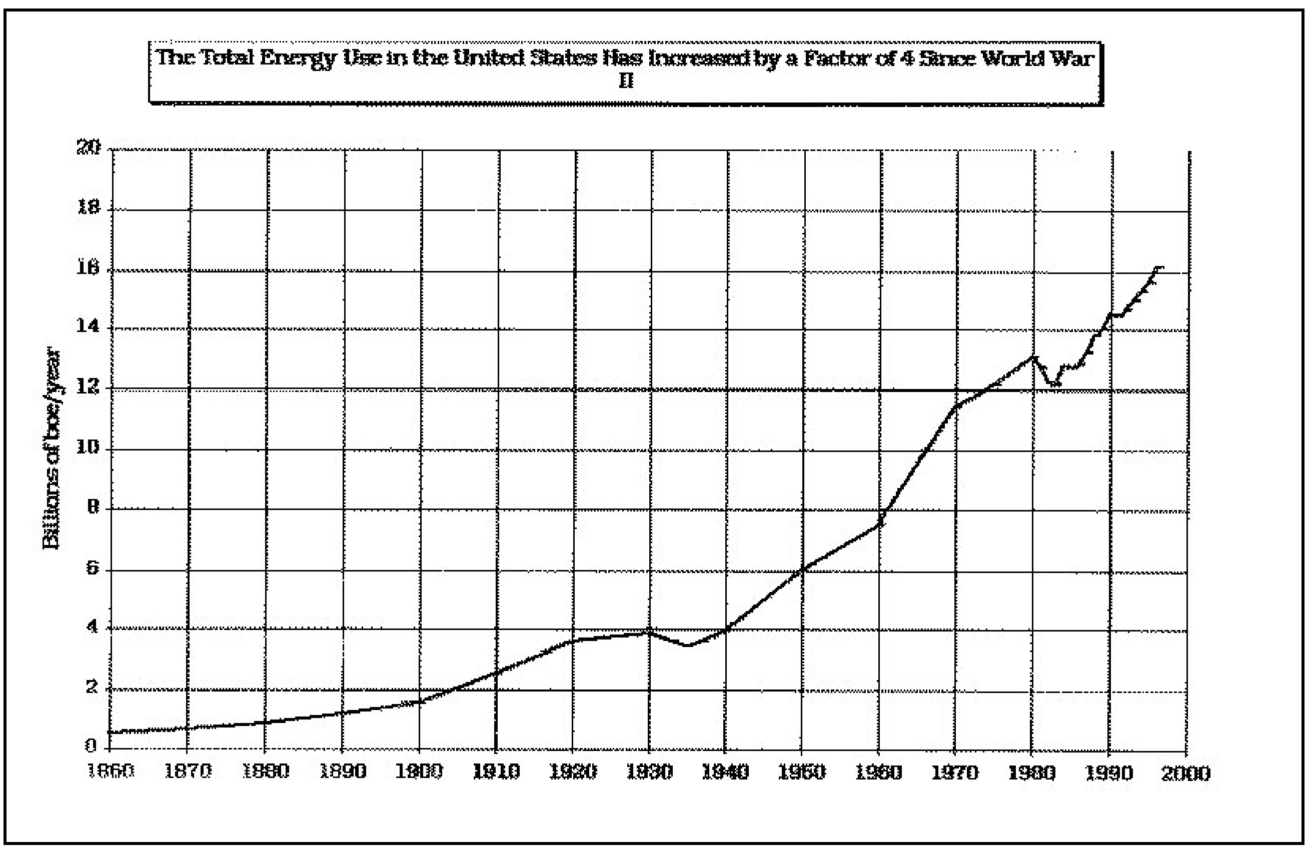
Production of coal, the nation's most abundant fuel source, exceeded 1 billion tons in 2000. Electricity generation accounted for about 90 percent of U.S. coal consumption last year.

Source: U.S. Department of Energy, Energy Information Administration.

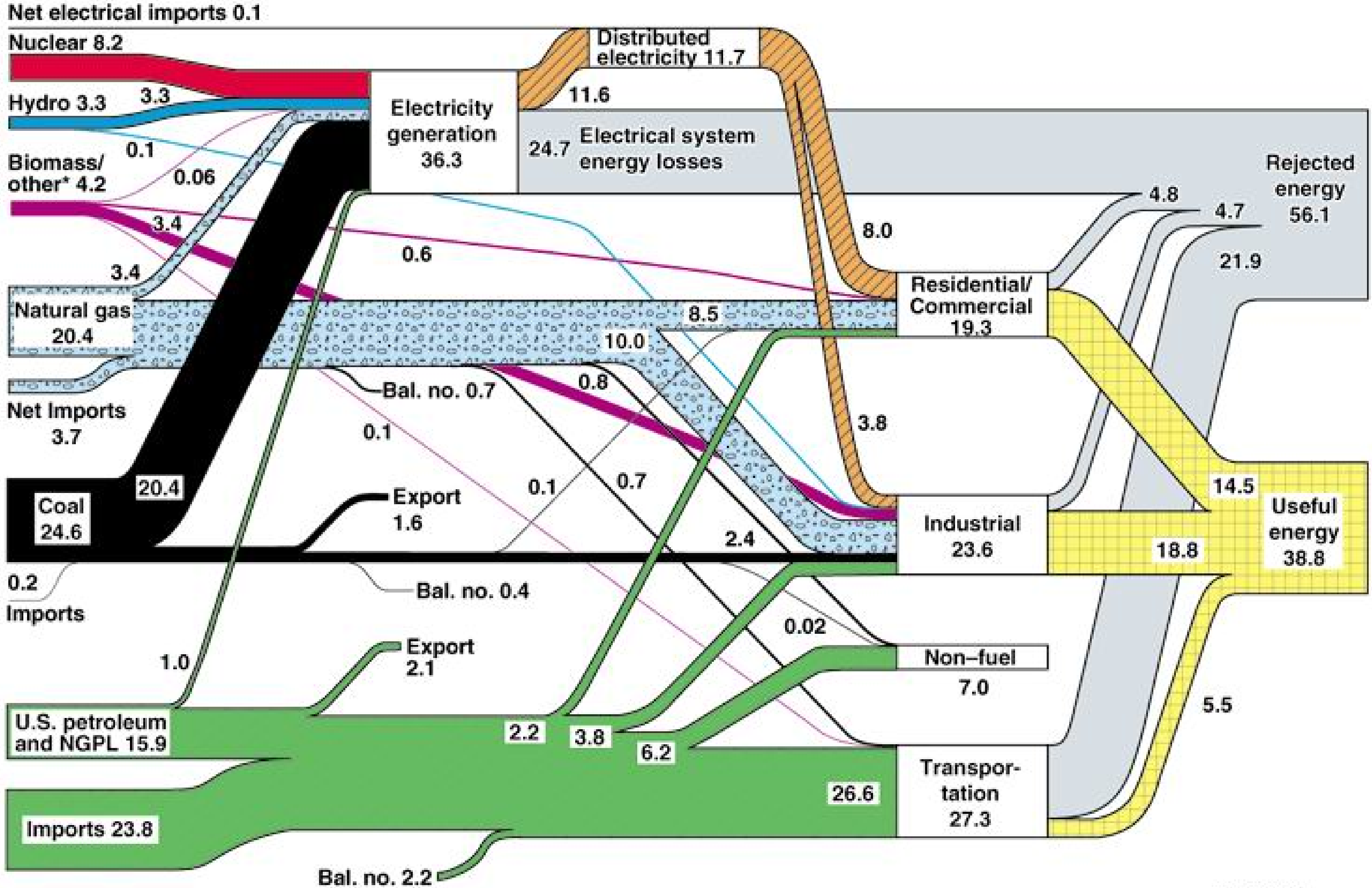


Over the next 20 years, growth in U.S. energy consumption will increasingly outpace U.S. energy production, if production only grows at the rate of the last 10 years.


Fossil Fuels Still Account For 88% of the Primary Energy Consumed in the United States
Source: Annual Energy Review-95, DOE/EIA-0384(95)
Hydroelectricity
Other
<<1%
4%
8%
25%
40%
23%
Nuclear
Gas
Oil
Coal
4%
30%
44%
22%
Billions of boe/year
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
1965
1970
1975
1980
1985
1990
1995


The Total Energy Use in the United States Has Increased by a Factor of 4 Since World War II
Billions of boe/year
20
18
16
14
12
10
8
6
4
2
0
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000

U.S. Energy Flow – 1999
Net Primary Resource Consumption 102 Exajoules



Source: Production and end-use data from Energy Information Administration, *Annual Energy Review 1999*
*Biomass/other includes wood and waste, geothermal, solar, and wind.

March 2001
Lawrence Livermore
National Laboratory

Proposed concept for an Automobile free Zone: “Green City” (An URBANATE)

This U.D.P. provides underground Transportation for all citizens everyday shopping items

No Parking areas will exist above ground -Truck delivery to be underground: As it is at Disney’s EPCOT in FL

Utilities Distribution Planning

By James M. Warwick, *Project Director*

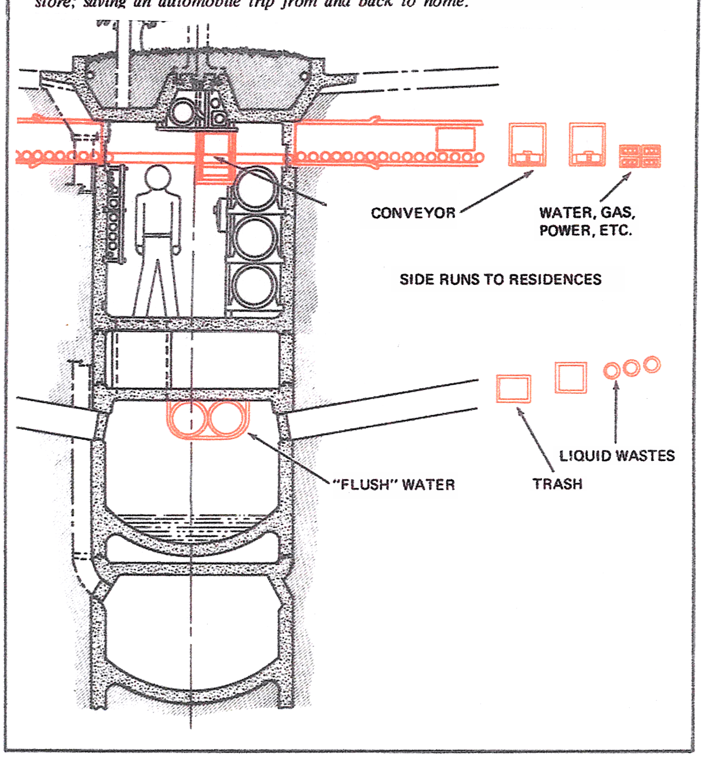
Reprinted: The Technocrat, June 1971 No.238, vol. 39 Published In *Handling & Shipping,* copyright 1970 Industrial Publishing Co.

We compliment Mr. Warwick on his concept for an underground distribution system. Howard Scott, founder of Technocracy Inc., often spoke of the need for such a system as part of an overall design concept as proposed by Technocracy to minimize waste.

A Technocracy Urbanate with a population of 150,000 would require only one Shopping center complex, with local showrooms works well with the U.D.P. All shippable stock would be kept at a central location for delivery. Practically all items that make up the list of deliverable commodities would fit incrementally or in multiples in one size of carton, say 11 x 12 x 18 inches (size of the carton is beyond the intended scope of this article)

Everything is going underground: Water – Natural Gas – Electric Power – Parcels – Food – All small goods – Cleaning / laundry – Heated And/or Cooled air (water) – Cable TV – Fire Hydrant water Street Lighting – Sewer – Storm Drains…

IN CROSS-SECTION, the conveyor system is incorporated to deliver to every resident commodities from the post office, drug store, grocery store, department store; saving an automobile trip from and back to home.



U.D.P. system can not only provide for receipt of items, but also offer removal of waste material, trash, rainwater. Each additional function broadens the base, reduces cost to user; and impact far beyond the ends of the conveyor.

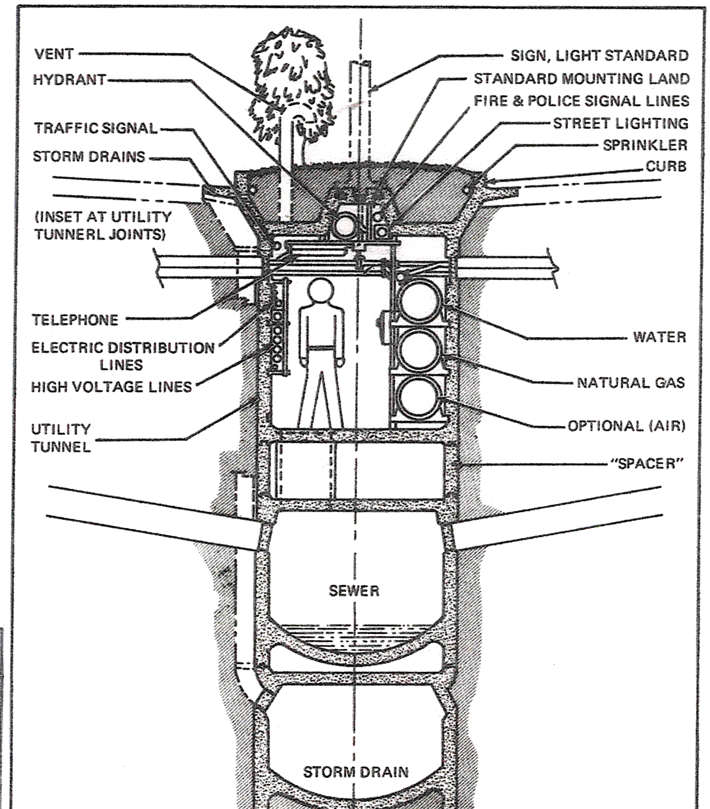


Fig. 1

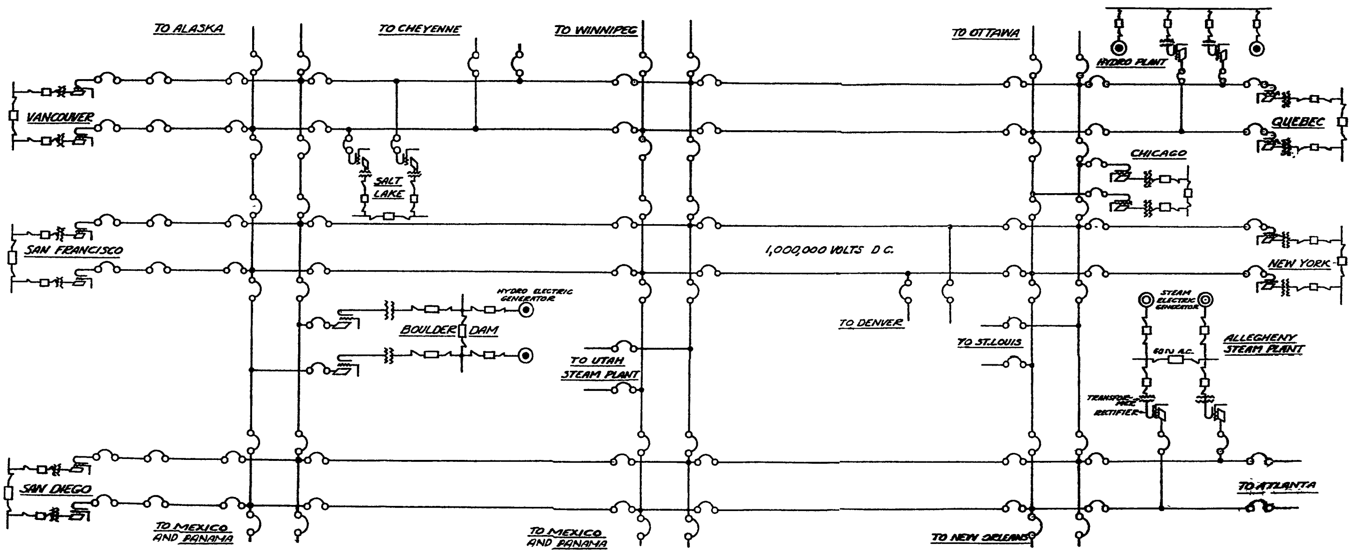
As Figure 1 illustrates, the utilities tunnel is large enough for a man to walk through. Space is available for Transformers, phone terminal boards, and Gas and water pressure regulators and valves.

Other services provided: A partial list includes (delivered) prepared Food, Mail, consumable liquids, grocery items, clothing, cleaning, Medications and various Drugs, newspapers; (removed) garbage and trash… in any weather and eliminate a number of handlings in the process. Residents would order daily by phone, or place standing orders for daily delivery of standard items.

A conveyor system designed to serve 12,000 addresses could Deliver 338,000 cartons daily (or 27 per address) with four main Conveyors operating at 88 feet per minute from the Distribution Center. The low speed and quantity of cartons (greatly in excess of probable demand) provide overcapacity for growth, repair, and shut down as well as diurnal and seasonal cycles.

Cartons could be designed to nest, so that several can be put together. Filled with daily trash from each Residence, the cartons would be sent to a 100% recycling center. All metals, glass and paper will be collected and automatically sorted, thereby eliminating any possibility of wasting any valuable resources.

Proposed Concept for a 1 MILLION VOLT DC Continental Power Grid



In the 1920's Technocracy Inc. drew up this design concept for a 1 million volt direct current (DC) continental power grid. At the time those who had proposed said that "we don't need it". Today the necessity is clear.

The ability to transmit power anywhere on the North American Continent would make possible the transmission of solar power from the desert southwest or wind power from the Midwest to anywhere. Today the power system in the US continues to build polluting coal fired plants because power is not available easily from elsewhere. With global warming looming as onrushing disaster, it is imperative to reduce power consumption and the use of fossil fuels for power in any form.

Power systems must always be built for the peak power that is used on the system. Peak power almost always occurs in the mornings when people get up and in the evening when they return home. Other peaks occur when it is either very hot or very cold. To deal with this, power plants must be held at the ready to supply a peak when it occurs.

One of the major benefits of a continental power grid would be that areas where a peak is occurring would be able to draw power from areas that are not. This alone would reduce the amount of generating plants required and would permit the closing of plants that are heavily polluting or just simply inefficient. It would make possible the development of power sources such as wind, hydropower, geothermal or solar that exists in abundance where no one needs the power.

The high voltage DC lines could be buried in concrete trenches next to existing road and freeways. This would eliminate the necessity of plowing through land that doesn't need to be disturbed as well as eliminating the need for access roads. In concrete trenches maintenance could be drastically reduced below that for overhead lines. Being a DC line the positive could be on one side of the road the negative on the other. Substations would only be needed every six to eight hundred miles. Provisions for cooling of the line would increase the capacity as well. A voltage of at least a million volts should be needed but this would have to be verified by design calculations.

The US continues to consume vast amounts of fossil fuels that are rapidly being depleted. The waste products that are being generated create global warming that threatens the very existence of future generations. The May 7^{th} ^{1970} issue of The Nation magazine reported that only three percent of dams that exist in the US produce power. This is an incredible waste. Many dams in the US were built for no other reason than to make some developer money. No thought was given to negative impacts or any impacts other than making money which is the way a price system works. A great deal of power cold be produced from wind and other sources but few resources are being dedicated to the effort. A huge amount of money goes to those large sources that have enough money to buy the proper amount of political horsepower. The larger an industry becomes the more effort is expended to keep it going no matter how much damage or waste is created in the process. The "defense" industry is an outstanding example of how a price system works.

Appendix 3: Glossary

Here is a collection of terms that may be uncommon or used by Technocracy exclusively. They are defined here for your convenience.

Abundance

A state where a nation possesses a high amount of natural resources, a high energy technological industrial complex, and sufficiently trained personnel to operate that technology to produce a high standard of living. To date only the continent of North America possesses all three of these. See Scarcity.

Bottom-Up Design

A method of design whereby the design is started with a single detail, with subsequent details being added as time progresses, with little or no thought as to the implications or consequences of each detail upon the others, past or future. All modern cities are built in this fashion. See also: Top-Down Design.

Conspicuous Consumption

The need or desire of people with money to spend that money on items that will obviously display their wealth. Examples include expensive clothes, exotic cars, or generally any item that is priced high for the purpose of being expensive, rather than because of actual cost of the item. This leads to a race to expend resources simply to see how much one can expend.

Distribution, Method of

A unidirectional method of providing goods and services to the public by producing the items, transporting them, and then finally consuming them. Currency is not transferable and thus is nulled once spent. The only method to date to use this is Energy Accounting.

Energy Accounting

A Method of Distribution (q.v.) that employs Energy Credits (q.v.), and accounts for the total energy created, transformed, and consumed to provide a stable, balanced load for maximum production of goods and services while minimizing waste of resources.

Energy Credit

A form of currency used by Energy Accounting (q.v.). Energy Credits are non-transferable, and are only valid for the duration of the balanced load period. Energy Credits are replenished to full level for each citizen at the beginning of each balanced-load cycle.

Enforced Scarcity

Any High Energy Society (q.v.) that uses a Method of Exchange (q.v. rather than one of Distribution (q.v.). Since the base currency is scarce, but the products and services are not, economic instability occurs due to Technological Disemployment (q.v.).

Exchange, Method of

A method of providing goods and services to the public whereby goods and services are traded back and forth among individuals. Currency is transferrable and never terminates, thus creating a situation of continuous growth, occilatory cycles, instability, and leaving no central method of control.

Extreaneous Energy

Any energy used to create or provide goods or services that does not originate from human power. Examples include animals and self-powered machines.

High Energy Society

Any society whose citizens, on average, expend more extraneous energy (q.v.) than human energy for their standard of living.

Load Factor

The ratio of a machine's actual output over a given time period to the output that would result if the machine were operated continuously throughout that time period.

Politics

A means of social control by controlling people, whether democratically or autocratically. This differs from a Technocracy (q.v.) in that a Technocracy controls technology, not people.

Price System

Any system whatsoever that effects the distribution of its goods and services on a basis of commodity evaluation and that employs any form of debt tokens or money. By this definition, every economy on Earth beyond the tribal stage, is a Price System. This includes all forms of democracy, capitalism, communism, socialism, and fascism. Price Systems are all Scarcity (q.v.)

economies, whether Enforced (q.v.) or natural, and use a Method of Exchange (q.v.).

Scarcity

A state where there is insufficent natural resources, technology, or trained personnel to create a High Energy Society (q.v.). See Abundance, Enforced Scarcity.

Sustainable Economy

Any economy that is based on cycles rather than growth. While most economies will have both of these, one will generally predominate. A sustainable economy may grow, but only when a society determines that it is desired, and safe. Non-sustainable economies require continuous growth in order to survive, which is inherently self-defeating, since no environment is unlimited.

Technate

A society or nation that employs a technocratic government.

Technocracy

Science applied to the social order. The use of machines to release citizens from work while increasing purchasing power.

Technological Disemployment

The destruction of purchasing power by the rapid introduction of high-energy machines to replace human workers. On microeconomical terms, this makes sense, since machines work longer, harder, and cheaper than humans at most tasks. However, when this occurs at a fast rate all over a nation, production (and therefore supply) grows rapidly, while more disemployed workers no longer have purchasing power with which to buy the new abundance of products, thus demand falls. Both of these conditions cause the price of products to fall, thus creating an economic crash. This is what occurred to cause the Great Depression of the 1930s. Thus it is shown that you cannot have a stable Enforced Scarcity (q.v.) in a state of Abundance (q.v.).

Top-Down Design

A method of design whereby the design of a project is begun with certain objectives or requirements specified before anything else is decided. From there, the largest and most abstract problems are worked out first, working down towards the smallest details, with the objectives incorporated in each aspect of the design. This method creates the most efficient and desirable results, and is the method used in designing Urbanates (q.v.), as well as all components of Technocracy (q.v.). See also: Bottom-Up Design.

Urbanate

Living areas similar to cities but designed to provide maximum comfort in a High-Energy Society (q.v.). They are characterized by their small size, top-down design (q.v.), lack of pollution, and energy efficiency. They would also have integrated transportation, utilities distribution, and waste management.

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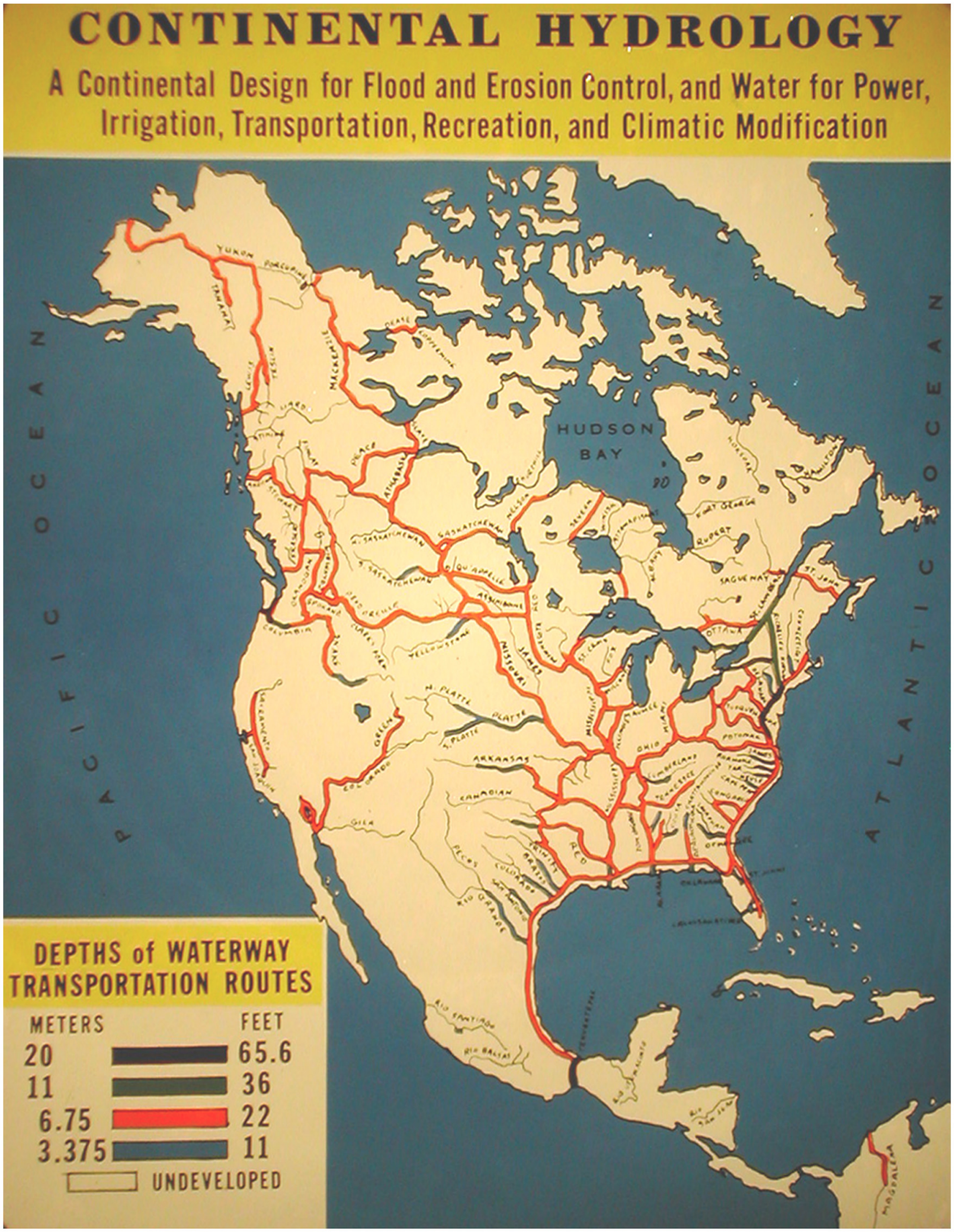

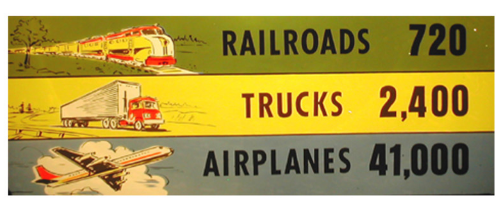

The construction of a continental hydrology was first proposed in Capitalizing Calamity by Howard Scott in 1936. A proposal to link the many rivers across the continent, increasing the amount of power as well as providing water transportation which requires the least amount of energy for moving goods around. Today this plan would be a most valuable asset especially so with application of advanced ecological research which we now have available to prevent unintended consequences--the destruction of the fish populations for example. Apparently people who eat fish never seem to understand that they are also a resource.