THE FUTURE

A Challenge To Industrial Arts

monograph

AMERICAN COUNCIL
ON INDUSTRIAL ARTS
TEACHER EDUCATION

THE FUTURE
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PREFACE

The American Council on Industrial Arts Teacher Education was founded in 1950 to support and further the professional ideals of industrial arts education. In striving to achieve this goal, the Council has from time to time published materials which would make a significant contribution to the profession. No regular schedule has been established for the publication of monographs, rather each proposed publication is considered on its merits.

Increased attention during the last decade has caused industrial arts to focus more on technology and its implications for society. This monograph, "The Future – A Challenge to Industrial Arts", will be a valuable resource to teacher educators as they strive to develop improved programs of teacher education in an increasingly technological world.

This monograph, fifth in the series, is the work of two ACIATE members who are most knowledgeable of technology and its implications for industrial arts, Dr. Lee H. Smalley, University of Wisconsin – Stout and Dr. Donald P. Lauda, West Virginia University. The officers on behalf of the ACIATE membership wish to express their sincere appreciation to Drs. Smalley and Lauda for their efforts and contribution to the profession.

Credit for the success of the monograph series is due in a large measure to the dedication and work of the Publications Committee under the very able leadership of Dr. Clois E. Kicklighter, Eastern Michigan University. Members of this committee who shared in this task are listed on the inside front cover.

Inquiries regarding the monograph series should be directed to the chairman of the Publication Committee or to any officer of the Council. Specific questions or observations relating to the content of this monograph should be sent to the authors.

Walter C. Brown
President, ACIATE

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CONCEPTS AND TECHNIQUES

FUTUROLOGY

The term futurology is undoubtedly new to most people and possibly conjures up fantasies of Buck Rogers or the 2001 Space Odyssey. Terms such as prognostics, fustory, delphology, technological forecasting, anticipations, future studies, futuristics, and others have been used by many persons. As a matter of fact, all of these terms were considered when the World Future Society began in 1967. But where did the term *futurology* come from, and what does it mean?

In the beginning the term futurology, or its derivatives, was used to refer to poets, playwrites, or painters of the early 20th century. However, the first use of the term in published materials was in 1943 when Ossip K. Flechtheim, a political scientist at the Free University of Berlin, used it in his articles. The term is from the Latin *futurum* and the Greek *logos*, or science. The word gained popularity in the 1960's as a result of the developments of methods of forecasting social and technical processes. The emergence of research groups in many areas also aided in its growth.

Even a cursory review of the literature will reveal that the study of the future is not limited to any one country in the world. Writers throughout Europe, Asia, the Soviet Union, and the North American continent are involved in such studies. At this point, definitions from several of these writers is necessary to place the term futurology into perspective. Bestuzhev-Lada, the top Soviet futurist, has defined futurology as:

> Today the general term "futurology" denotes both a complex combination of specific social prognoses and a prognostication proper, a new, gradually developing science of the laws, methods, and ways of prognostication. The sphere of prognostication has been substanitally broadened to embrace not only economics but demography, the social implications of the technological revolution, politics, etc. (20, p. 196)

Alvin Toffler, author of *Future Shock*, has stated:

> The word (futurology) denotes a growing school of social critics, scientists, philosophers, planners, and others who concern themselves

with the alternatives facing man as the human race collides with an onrushing future. (20, p. 3)

Any attempt at defining the term futurology must include a summary of the feelings of the person who coined the term. Ossip K. Flechtheim prefers to refer to futurology as a science or as a "prescientific" branch of knowledge. He says,

> . . . futurology does not so much deal with a new and special segment of knowledge, but rather represents a new synthesis of varied materials. It is clearly related to history in a new time dimension.
>
> Since futurology encompasses the destiny of man, the future of his society, and the tomorrow of his culture, it must deal not only with his prospective biological and psychological evolusion, but also with the entire range of his future cultural activities.
>
> Futurology tries to answer, as objectively as possible, the problem of the destiny of our civilization within the next centuries. (20, p. 269)

Flechtheim is quick to point out however, that the study of the future must use a different methodological approach since it functions within a different time frame and without recourse to the usual historical data that is available to a historian. It cannot work within the chronological sequence of detailed facts; instead futurists must avail themselves of interpretation, generalization, and speculation to a considerably higher degree. In this respect, its kinship to cultural anthropology, theoretical sociology, and social philosophy becomes apparent.

What information, principles, or concepts does a person need in order to begin the work of a futurist? Everyone has done some preparing for a future, but some of this activity will have to be sharpened to provide a professional direction that is needed. Following is an introduction to futurology terminology and principles:

Terms

Now: frozen, not much choice

Near Term: two to five years from now, some control can yet be exercised, generally a reaction to events

Intermediate Term: five to twenty years, tremendous choice available, most fruitful time to determine alternatives yet available

Long Term: twenty to fifty years, largely uncontrollable, too many variables, unreliable predictions, science fiction area

Far Term: over fifty years, largely unknown, invisible, pure speculation

Everyone Must be a Futurist

Just as educators have to prepare everyone to be a consumer, so should they accept the responsibility of preparing everyone to become their own futurist. This cannot be left to an elitist group; especially in a democracy. Everyone should be able to dream.

The Future Can be Changed, Not the Past or Present

If a person wants to make a difference, then he will have to function in a future time frame. The past is important, but only to get a sense of why the present situation exists and to be able to project a possible future.

People Need to be Prepared for a Rapidly Changing Society

We do not have generations of time to become comfortable with a change. People need to be taught how to relate to change. One looks ahead in order to do something in the present.

Creating the Future Through a Self-Fulfilling Prophecy

Alternatives should be developed as possible futures. You then determine which should be enhanced and which inhibited. This will involve some value decisions as to what ***should*** happen, and widens the sphere of moral choice. A plan is then developed to implement this prophecy.

The Future is Projected, not Predicted

The future is projected from the present situation with an understanding of the past. A prediction does not usually have this base of reality and so is left to people who use tea leaves, cards, dice, or crystal balls. Future projections are like past recollections, the further away from the present, the more unreliable they are.

The Future is Lurking in the Present

The perceptive person should be able to see elements in the current scene which suggest some possible trends or events which will be of more importance in the future. It must be emphasized that things never remain as they are, and so ***how*** are they going to change, ***when*** are they going to change, and not ***if*** they are going to change is the prime concern.

There are Techniques to Project the Future

Future studies can yield relatively reliable data. There are people skilled in the use of these techniques, and knowledgeable in their area, that have more expertise than persons not familiar with future studies.

All Projections Depend Upon One Major Assumption

There is no way to build in break throughs, system breaks, disasters, into specific projections, so most forecasts are based upon the assumption that nothing will happen to introduce a basic and disastrous change in human affairs.

Futurology is a new discipline where new skills, new time relationships, new information, new ideas, and new principles and procedures are needed to function in the 20th Century. Bertrand De Jouvenel summed up the meaning of futurology when he said:

> Finding out what we want should become a major object of our attention . . . there is a vast difference between letting change occur and choosing the changes we want to bring about by our technological means. (8, p. 444)

ROLE OF TECHNOLOGY

During the early post World War II years, Americans were too busy relishing our human achievements to take time to analyze the meaning of technological growth. We failed to realize that technology is a man-made phenomena and that it exists in all cultures. With 95 percent of all the scientists who have ever lived practicing their profession, and research funds utilized as never before, the growth spurt was inevitable. This era coupled with landmark patents such as computers, transistors, and synthetics was bound to grow relentlessly unless we took time to study it objectively.

Several persons did just this as they predicted consequences of technology but for the most part, we were caught up in the job of providing comforts never before known to man. Patents generated more patents as man created a society with unlimited growth potential. It was not until the late 1960's that questions began to be raised. These questions evolved about the consequences of a technological culture and were not only concerned with technical consequences for the environment but the human commitment as well. Growth spurts demand that the creators establish priorities, especially when there are techniques available to alter the entire cycle of the earth's support systems. Technological prowess therefore, must be studied, projected, and checked against the "ultimate life".

What is this technology that everyone talks about and which seems to have such an impact upon our lives. Stanley Kasprzyk concludes an exhaustive study with, ". . .technology may be defined briefly as a form of human work concerned with selecting and systemizing knowledge for some ulterior use." (14, p. 135) Technological work is motivated by a pragmatic interest to know how, through methods, tools, and skills to knowledge in the form of systematized rules. Technological work is located between the scientific or theoretical interest, and the technical or productive interest.

Technological rules can apply to every realm of human work – "artistic, economic, political, religious, agricultural, domestic, medical, military, industrial, educational, literary, mathematical, rhetorical." (14, p. 127)

Today is the cybernetic, atomic and space age; each of which mandates the establishment of priorities based upon rationality rather than bureaucratically protected and politically entrenched values. For planet earth to survive the colossal growth of technology will require decisions never before considered possible by even the earliest futurists. For example, with the energy crisis, we must consider whether we will use ten kilograms of hydrogen to produce electricity for one-half million Americans for three months as a replacement for coal, which, in the same amount would burn for one-third of a second.

Henry Adams, noting the acceleration of American history wrote:

> The world did not double or triple its movement between 1800 and 1900, but measured by any standard known to science – by horsepower, calories, volts, mass in any shape – the tension and vibration and so-called progression of society were fully a thousand times greater in 1900 than in 1800. (1, p. 167)

If Henry Adams were writing today he would undoubtedly recognize the impact of technological growth since World War II. This growth dominates all aspects of human life as we alter the world. Just 60 years ago the Wright brothers were still on the ground; Lindbergh had not made his famous flight 30 years ago; and ten years ago we had our first unmanned space shot. Today with the rapid pace of change, space shots seem to go unnoticed. And today as man has the power to solve the problems of mankind he somehow fails to have the power to reach into himself. Futurology serves not only to concentrate on providing advice to those in policymaking roles but to help the policymaker become capable of recognizing alternate futures, their consequences, and the best course to follow for making heuristic decisions.

Olaf Helmer, another futurologist and founder of the Delphi method, has identified four clearly recognizable trends that should force us to study the future and its implications. These are:

1. Judging by the trend during the second third of the century and extrapolating very conservatively, the world's scientific manpower in the year 2000 is likely to be at least five times what it is today. In addition, because of availability of more sophisticated instruments, and above all, of more powerful computing machines, the productivity of the individual researcher is apt to rise at the very least by a factor of two. Consequently, we may expect the total rate of scientific productivity to grow at least tenfold by the end of the century.
2. The second computer revolution accompanied with automation of the computer and invention of versatile display devices will create the true symbiosis between man and machine.

3. A reorientation among social scientists toward policy-related research.
4. An interdisciplinary systems approach in the development of a comprehensive theory of organization . . . by this I mean the general discipline concerned with human interactions in decision-making situations. (10, p. 155)

American business and industry leaders have not had much trouble exporting their technological know how, whereas our political processes have not gained much favor with other countries. America is increasingly being known as an *industrial* democracy, with emphasis on the industrial rather than the democracy.

Since the mechanical or engineering technology has such as impact on the life style of people, most future projections have to relate to this area at some time or another. As industrial arts relates to both the future and industrial technology an interwoven triumverate is developed that requires some competence of industrial arts teachers in all three aspects of this alliance.

FORECASTING TECHNIQUES

Futurists generally do not attempt to predict the future, but to forecast, project or create it. Forecasting tells us what *can* happen or what we *can* change whereas predictions tell us what *will* happen. Just as there are recognized methods of historical research, so are there tools, concepts and techniques developed to provide a "window" through which possible futures become more clear.

There are many types of futures that may be forecast: utopian futures, intuitive futures, designable futures, feasible futures, short range futures, most likely or least likely futures, goal directed futures and self-fulfilling futures. A plan will indicate what steps will be needed to reach a goal or a destination, but the determination of the goal is made possible by forecasting techniques. There are limits to the completeness and accuracy of the results of any technique used. These differences will show up because of the data used, the type of technique used, the system of logic applied, the time range of the forecast, and the extent to which the future is controllable.

Several of the more widely used techniques will be described here. Obviously there are other types of forecasting, and derivations of these, but this should provide a person with a start if they wish to become involved with some future studies.

Trend Extrapolation

This is the simplest, and most used type of exploratory forecasting. Historical data is compiled, plotted and extrapolated into the future. The

factors which have produced a trend in the past are assumed to remain constant or to make a gradual change. Robert Ayres defines trend extrapolation as:

> Here the underlying supposition is simply that the 'environment' or the balance of forces – does not change, so that it is reasonable to assume that the behavior of the recent past is a good model for the behavior of the near future. (2, p. 35)

Trend forecasting assumes that the future will be the same as the past, or at least a constant rate of change. There may be cyclic patterns of change that will probably continue for these patterns will be revealed in the historical data collected. The forecast that the party in political power will lose seats in Congress in an off year election is a result of trend extrapolation. Herman Kahn, in a speech delivered at a Futurology Conference in Cincinnati said, "I have made more money drawing lines with a ruler than any other man in history." The book he co-authored with Anthony Wiener, *The Year 2000,* was filled with straight line projections from the past to the intermediate future.

The information developed from trend extrapolation is useful in providing a picture of the future that we are currently moving toward. It will provide an indication of expected changes, maximum and minimum bounds of what might happen, and the most likely near future. It will probably also provide the least likely far future.

Delphi Forecasting

"A Delphic probe, (named after a Greek oracle) is a multi-step systematic process for extracting 'expert' intuitive expectations (forecasts) of alternate possible futures." (11) The key to the validity of the Delphi is that the respondents are truly expert in the area being probed. These experts not only build the instrument, but respond until there seems to be a consensus about the items. This type of forecasting is particularly good at getting estimates or judgements of alternative futures, the expected time frame for events, expected breakthroughs, future opportunities, as well as a value judgement as to whether an event should be enhanced or inhibited.

A typical Delphi might involve the following four rounds of responses from selected experts:

Round 1: Ask each respondent to indicate what is expected to happen in their particular field of expertise.

Round 2: After the list is organized, ask each one to independently indicate for each item, when it is likely to happen, the extent of impact on a particular institution, and whether the event should be enhanced or inhibited.

Round 3: Provide the information gathered in Round 2 to all respondents, having then re-evaluate their position and justify why they may have responded differently from the majority.

Round 4: Continue to provide this informational feedback to all those involved. Have each one evaluate the validity of the justifications for exceptions.

"The Delphi method is designed to produce consensus judgements in inexact fields; it would be a mistake to consider such judgements as complete or precise descriptions about the future." (9, p. 6) The quality of results rely heavily on the cooperation and excellence of the individuals involved for as in a computer program: garbage in -- garbage out. Advantages of the Delphi are that it is usually cheaper than calling everyone to a conference, the questionnaire is developed from the responses of the experts, the respondents have time to reflect and alter their judgements, and individuals may be less influenced by oral polemics. This is also a good device to get people who should already be thinking about the future, more involved in its creation.

Scenario Forecasting

Writing scenarios are a popular method for forecasting possible futures. These are stories or descriptions of what might or could happen if certain steps are taken, or not taken. Kahn and Wiener describe scenarios as:

> Scenarios are hypothetical sequences of events constructed for the purpose of focusing attention on casual processes and decision-points. They answer two kinds of questions: (1) Precisely how might some hypothetical situation come about, step by step? and (2) What alternatives exist, for each factor, at each step, for preventing, diverting, or facilitating the process? 'Alternative Futures' can be used for generating additional scenarios, for setting forth and discussing criteria, for the systematic comparison of various alternate policy (or alternate combinations of assumptions and objectives), or for the analysis and examination of specific issues. They are also of interest in making of assumptions and context explicit, as should be done, for example, in any analysis of directions and destinations. (13, p. 6)

If one wishes to describe systematically future alternatives and their possible impact or side effects, then writing a scenario may be the best way to present a forecast. There is a focus on critical decisions that result in a particular constellation of events. This type of forecasting is generally used when communicating possible futures to nonexperts, as it is usually more readily understood than tables, charts and graphs. The concept of trade-offs can easily be illustrated in this manner. A person may want to write a scenario about something they *want* to happen, so that you work toward its fulfillment.

Scenarios are valuable, not for straight-line, evolutionary projections that might occur but to provide practice in dealing with uncertainty such as wars, earthquakes, assassinations, decline in population, life on other planets, anti-

gravity machines, etc. Much of science fiction writing may be described as scenario writing about possible alternative futures.

Relevance Trees

This is a goal oriented forecasting which provides "road maps" or networks for reaching selected future goals. A relevance tree is a type of normative forecasting. With normative forecasting, you start with an end goal and then work backward to find out what steps must be taken to reach that desired goal from the present. Robert Bundy describes the relevance tree as:

> A procedure for determining the means or techniques for accomplishing a stated goal. Each branch point of the tree, moving downward from the stated objective, represents a potential decision to follow a particular direction to ultimately reach the stated goal. A relevance tree might be used to deal with such things as: (1) objectives and goals of an organization, (2) a national objective to deal with air pollution, or (3) a medical goal for extending human life. These goals appear at the top of the tree. At the next level down, activities, alternative methods or sub-goals are defined. At each subsequent level, activity, alternate methods, or sub-goals are further refined and elaborated as the various levels are developed they move progressively downward from the goal to be realized to the many activities which must be accomplished in order to ultimately reach the stated goal. (5, p. 4)

The map which results from such a technique will identify possible and impending areas where there is a need for change. It will pinpoint threats to normal progress and highlight what needs to be done today to reach a desired goal tomorrow. Relevance trees are powerful management tools for controlling the attainment of a selected goal. They will depict the time flow, hierarchy of events and their relationship. One of the programs developed during World War II to build the Nautilus submarines was called P.E.R.T. (Program Evaluation Review Technique). This is an example of a relevance tree and has been used in business, industry and education.

The assumption used in this technique of forecasting is that of planned control over the future. The future is not haphazard and will not just happen, but actions now will determine the future. By working backward, from a future goal, there will be a definite connection and relationship between today and tomorrow. It is especially important to see the time line involved in bringing about change.

Technology Assessment

Assessment involves anticipating the likely or possible impact an alternative or proposed change may have on segments of the population or environment. "The intended effect of a technology is rarely, if ever, the only impact

it has on human life. Unintended, unknown, and delayed consequences may prove even more important in the long run than the direct and intended effects. At times, different technologies can have similar unintended consequences that combine to have a serious impact undreamed of by the users of the technology." (7, p. 228)

Since we seem to be coming more interdependent upon what others do, there is an increasing need to study proposed changes as to their effects. The rate of change has increased so that we do not have generations of time available to adjust to new dimensions. Technology holds great promise for solving problems, if someway can be found so that fewer problems will be caused than solved. Through technology assessment, means are being sought to predict, evaluate, and direct the path of technological change.

Raymond Bauer uses this analogy as to how to start an assessment:

> How does one carry out technology assessment? I suppose that at this stage the problem is akin to that of how one can eat an elephant. The only answer is that one must begin by biting the elephant. And, considering the magnitude of the task, it is difficult to argue that one place is better than another for biting to start. And, after a considerable amount of biting has taken place, the elephant remains largely unscathed. (3)

Although attention appears to be focused now on the negative effects of technology, an effective system of assessing technology would as often stimulate the development and application of desirable new technologies as it would give warning of possible harmful side effects.

These are numerous proposals and procedures for conducting an assessment. Many of these are quite complex, involving many man-hours of experts and volumes of data, but most of them have the following elements in them:

I. Name & briefly describe the technological change that is to be assessed.
II. Specify the social and technical objective to be achieved by this technological application.
III. Contextual factors:
    A. Demands of participants
    B. Resources available
    C. Customary practices
    D. Influential trends
IV. Consideration of alternative proposals designed to achieve the same social objectives.
V. Projection of the probable outcomes of each alternative proposal.
VI. Cost/benefit assessment of the technological change
VII. Conclusions – recommendations

The role of assessment is the identification of future impacts resulting from present decisions in order to obtain a better understanding of their cause-effect relationship on the future. This allows today's efforts to be influenced and controlled on the basis of the future and by others outside the immediately concerned area.

The tools used for forecasting are no better than the data involved and the insights developed by the people involved. All projections involve value decisions and this must be taken into account. Forecasting, like any other skill, is not intuitive, but can be developed to a greater degree of validity by reference to other works and one's own participation. With knowledge and skill in using a variety of forecasting techniques, a futurist will be able to use those that are most appropriate in order to get some element of reliability into future projections. If these techniques are not adequate, what is the alternative?

EXAMPLES OF TECHNOLOGICAL PREDICTIONS

Most futurists, as they forecast the future, dwell to a great extent upon a specific aspect of technology. The hardware of industrial technology seems to be not only more visible, but more dramatic, than social changes, and plays an important role in changing people's attitudes, behaviors and life styles. One of the important ingredients in industrial technology are the materials that are available. There is obviously a great difference of opinion as to what and how long these materials will be available, but there is obviously going to be a change. Following is a sample of alternatives relative to the prospects for raw materials in the future.

The most pessimistic of reports is probably that done by a team of M.I.T. scientists lead by Dennis Meadows for a Club of Rome project. One of their most quoted conclusions is as follows:

> If the present growth in world population, industrialization, food production, and resource depletion continues unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity. (16, p. 3)

The key to their conclusion is "present growth". They feel that something can be done to avert the catastrophy that would come if we continue our present rate of growth which is exponential. At the current global consumption rates the following are the number of years of known reserves of these materials: (16, p. 56)

aluminum	100 years	natural gas	38 years
coal	2,300 years	nickel	150 years

copper	36 years	petroleum	31 years
iron	240 years	silver	16 years
lead	26 years	tin	17 years

Their study deserves serious consideration, but it should also be compared with other projections by equally qualified persons. Dennis Gabor feels that our supply of raw materials is essentially a problem of cheap power. He would predict serious shortages by the end of the century in copper, lead, zinc, and tin, but adds that there are good substitutes available and low-grade deposits are widely distributed. McHale predicts that by 1980 plastics will surpass that of iron products, and that polymers will become the basic materials of the future. In order to conserve our material resources he advises that we will have to recycle much more of our metals and materials in the system, and increasingly employ the energies of solar, water, wind, tidal, and nuclear power. (15, p. 236) Another middle ground approach is one by J.H. Westbrook, writing of "Materials for Tomorrow": "Most of the materials and their associated processing which will be in common use at that time (in 30 years) are with us today in developmental form. That which is technically feasible to do now will eventually become economically possible, granted a sufficient incentive in terms of breadth of application on the intensity of need." (4, p. 329) This position is more optimistic about the future of materials, noting that we can create our own future, and that generally the future is now here in some form.

Earl Joseph, writing a scenario for a projected "non-throwaway" future society sees, "Things designed and manufactured to last hundreds and thousands of years." (12, p. 4) This would put a tremendous responsibility on the materials used. Herman Kahn, in one of the early, and still most valuable studies of the future, projected one hundred technical innovations that will very likely occur in the last third of the twentieth century. Only included here are those related to raw materials.

1. Extreme high-strength and/or high temperature structural materials.
2. New or improved superperformance fabrics (papers, fiber, and plastics)
3. New or improved materials for equipment and appliances (plastics, glasses, alloys, ceramics, intermetallics, and cements)
4. New and improved materials and equipment for buildings and interiors (e.g., variable transmission glass, heating and cooling by thermoelectric effect, and electroluminescent and phosophorescent lighting)
5. Commerical extraction of oil from shale.
6. Practical large scale desalinization. (13, p. 51)

Kahn projects into the future by trend extrapolation, taking the performance of the past and assuming these will continue into the near future. He treats resources as a muscle, one that is not finite, but capable of regeneration through utilization of lower grade ores and a heavier investment of energy.

Arthur Clarke, one of the most optimistic of the futurists, admits that we have been living off our capital resources but that rocks, clay and the sea holds untold elements, which could be available by using great amounts of energy. But even the energy can come from the rocks and seas! He ventures further by citing the fact that our deepest mines are only about 7,000 feet into the earth, whereas we could probably get machines to go down five to ten miles. If you want to go the other way he has "plans" to go to other planets and bring them onto the moon, from where they would be "floated" to earth for use. If all of this fails, there is nuclear transmutation, or nuclear chemistry, where we may be able to create any element, in any quantity. (6)

Westbrook lists five generalizations concerning materials for the future:

1. Our decreasing dependence on natural materials.
2. The increasing diversity of materials available for any given application.
3. The increasing synthesis and use of new composite materials.
4. The increasing efficiency in the engineering use of materials.
5. The increasing degree of reliability required of materials. (4, p. 330)

Regardless of who you read there are problems and promises. Cellarius and Platt have outlined a "Classification of Crises Research Studies by Project Areas". Included here are only those problem areas identified under the general heading of *Natural Resources:*

1. Water supply
   a. Conservation/regional ecology; management design
   b. Pollution/waste disposal; recycling, thermal pollution monitoring
   c. Nuclear desalination
2. Fossil fuels
   a. Econ. for various countries/substitution methods
   b. Forecasts
   c. Low-level extraction
3. Minerals
   a. Recovery and recycling
   b. Nuclear extraction from low level rock (18, p. 338)

What does the future hold for material resources? Like most other areas, it is still up to us. The pessimist sees us using up our valuable resources with the end rather clearly in sight – unless we take drastic action now. Others feel that the future will be a gradual extrapolation from the past, that we will be like we are now, only more of the same. There will be problems, but they can be solved

with existing technology. Others are more far-sighted and can imagine many possibilities for a more abundant life. This point of view is best summed up by Arthur Clarke's, "We will run out of brains before we run out of materials." (6)

Regardless of which projections you may agree with, it is important that 1) someone is concerned, studying, and researching the area, and 2) that many people are aware of the possibilities so that they are not surprised when things change.

IMPLICATIONS OF FUTURE STUDIES

EDUCATION

By the 21st century the knowledge explosion will have generated the world's largest industry. This industry will constitute about one-fourth of the entire gross national product and will employ a huge portion of the work force in education. Dr. Robert Hilliard, an educational broadcasting specialist for the FCC, remarked:

> At the rate at which knowledge is growing, by the time the child born today graduates from college, the amount of knowledge in the world will be four times as great. By the time that same child is 50 years old, it will be 32 times as great, and 97 percent of everything known in the world will have been learned since the time he was born. (19, p. 174)

This revolution will not subside in the year 2000 but will be just getting underway. Today one of our roles is to determine which direction this revolution must take. In the year 2000 there will be millions of people in the power structure of America who are now in our public schools. We are now preparing them for lifestyles that will be vastly different than those of today. How can we educate these millions to come to grips with today? How do we emphasize the fact that their future can be directed according to their will? These questions are devastating when we realize that the half-life of knowledge acquired today is ten years. This means that one half of it will be obsolete or useless in 1984. In the midst of this explosion individuals will be able to move beyond the questions of "What was?" and "What can be?" to "What should be?"

As our society advances, educators must realize that their students will face new lifestyles and new demands. The key is to have them understand trends and probabilities and create options with enough vision to avoid disasters. These trends and probabilities are ignored by many people since some future theories lack the perspective of history.

The educational model of the past (to which most educators subscribe) consists of the teacher knowing all and presenting all. This is no longer a valid concept. The storehouse of available knowledge is just too large to teach it all,

but the teacher can help the student to learn how to learn. This becomes difficult for the average teacher because he is too secure in his profession. This is evidenced by the teacher's reluctance to branch out into new vistas and to engage the pressing social questions generated by the technology. To move from present perceptions of reality into patterns which our students will face seems almost like sheer suicide. It is at this insecure stage that the teacher makes the mistake of his career, a mistake that will leave the student a technological illiterate and a frustrated adult.

The psychologists tell us that all people have certain basic needs, such as Maslow's heirarchy of needs (physiological, security, social ego, and self fulfillment). Today, and more so in the future, we see increased emphasis placed on the need for self fulfillment. The results of rapid technological change alter our universal beliefs which threaten the very foundation of our culture. Young people therefore need flexibility in responding to stress, acceptance of themselves, variety of satisfactions, and accurate models of what their lives have in store for them. As professional teachers we would consider our students pathological if they did not have these needs. Yet we seem to insist upon providing models which reflect hypocricy because our contrived models are not realistic in terms of today and tomorrow. Consequently our students are busy working out their own compromises with adult figures and our basic institutions. As these compromises raise their head in the form of anxiety and disorientation, adults are quick to refer to the generation gap syndrome and leave it at that. When in fact, these young people are asking for honesty in their education. They are asking for a portrayal of culture and society as it is and will be. They are asking for tools with which they can cope with information overload, with which they can gather, synthesize, and make rationale decisions. Of course they cannot explain in sophisticated terms that they want to keep pace with humankind's learning curve, that they want to keep pace with the knowledge explosion, or that they want to ward off the symptoms of future shock through rational thought. But just the same, many are asking for it in other forms. The most tragic condition of education today are the many students who are not equipped in any way, to even consider unconsciously, what life is all about.

There are many people commenting on the future of education. There is however a small amount of "hard" studies concerning this area. The future is too new to have a great amount of work accomplished, but the following are some common themes that run through most of the literature.

Probable Societal Changes

Societal changes that are expected to occur in the future are:

1. Technology is on all of the lists. Technology multiples the number of possibilities for mastering nature and transforming resources, time and space. However, people are becoming more aware of both the possible positive and negative changes arising from a changing technological culture.
2. The second source of change is the diffusion of existing goods and privileges in society. As we become closer to the promise of equality, there will be a rising expectation from social institutions, including education.
3. Greater centralization of our economy will evolve into a postindustrial society. Major occupational opportunities will shift from production to service-oriented.
4. The relationship between the United States and the rest of the world will change. Markets and raw material changes will have an impact upon American society.
5. The increased interaction between population and environment and the ecology, will place additional stress upon some of our "traditional" practices and involve a push for change.
6. A greater demand for accountability from employers, parents, and students themselves is a change that cannot be ignored. As costs for education rise, there will be a corresponding call for an accounting of results. The increased complexity of our society also demands an increasingly better educated citizen and worker.

Probable Educational Changes

Following are some of the possible alternatives and implications of societal forces upon educational programs and strategies:

-Public schools will be extended and expanded in all directions. (Pre-school, community colleges, non-credit courses)

-Greater concern for career cycles and career shifts will involve massive retraining programs.

-Cooperative work experience programs will bring business and industry into closer contact with schools.

-Development of broader series of learning experiences for those with exceptional characteristics.

-More emphasis on leisure time for those who can expect to live longer and healthier lives, as well as those presently in the labor force.

-Professional preparation will be extended to at least six years of collegiate level instruction.

-There will be an increase in non-instructional staff members.

-Computor based instruction will increase the productivity of fewer, higher paid teachers.

-Movement toward a year round 24 hour school.

-Holography, with its three-dimensional visual images will revitalize audio visual education and put less emphasis on print.

-The home will be an extension of, but not a replacement for, the formal school centers.

-Far out possibilities include electronic brain stimulation, neuro-surgical intervention, memory drugs, and enzyme assisted instruction in order to control behavior.

-Lockstep instruction will decrease; and the specification of individual differences and their effects upon learning will become more precise.

-Interdisciplinary courses concerned with solving social problems will increase, as will emphasis on teaching problem solving.

-Students will become actively involved in planning instructional programs and will assume greater responsibility for their own learning.

-Teachers will become more strongly unionized, with more specific responsibilities and accountability.

Education, as an integral part of our society, will change as the society changes. Some changes will be slow, some profound, but change it will. Educators should be "tuned-in" to possible changes so that they can equip young people to cope with an evolving dynamic society. This is the real challege to educators today.

INDUSTRIAL ARTS

The implications of future research are no different for industrial arts than any other discipline. All disciplines have a stake in immunizing students against disorientation generated by hyper-growth. Dr. Harold B. Shane, of the University of Indiana, interviewed 82 leading futurists in America and England and found agreement that education must become more closely linked with the real world. (17) Of course this conclusion is far from being a new revelation. We have heard this at conventions, and read it in journal articles for years. However, industrial arts teachers have not taken these conclusions seriously. The research funds of the 1960's have left us with deeply rooted beliefs about interpreting American industry as our base for our pursuits. Little do we realize that since that time our technological growth has doubled in many areas and will double again in the next ten years. It is to these implications that we need to address ourselves.

Few people would argue against the idea that it is the human's innovative spirit and the resulting inventions that have moved us into a cybernetic era. Few people can refuse to see the high technology in action since it has become part of our daily life. Yet countless industrial arts teachers fail to match their educational efforts with this concept. We turn our back on such startling facts as urbanization, the advent of a non-work society, international responsibilities,

along with the increased economic and social investment in technological change. These voids must be recognized at the teacher education level and reflected in new curriculum approaches. It is all too common for industrial arts teachers to address themselves to the "anticipated" future, but revert to the past or at best the present, when decisions are made that affect the future. We have not up-dated our laboratories to represent current technology in most schools. This has been due to a lack of funds but more contributable to the fact that we have not consciously agreed to keep pace with rapid change. Security in the technology of the past is now reflected in our laboratories. However, the most tragic part is that our methodology has not kept pace with the demands of a high technological society. Students have not, and are not, being helped to see how rapid changes interact with each other, giving rise to new directions and societal trends. They have not been taught to see and anticipate interactions between disciplines and institutions. In a high technological society, the economic, sociological and psychological impacts are just as important and long-lasting as the tangible side of innovation and invention. To study tangibles without their effects can only lead to the continued fragmentation of knowledge.

Teachers today have not been educated to work in the affective and cognitive domain to the point where they can help students see the interrelatedness of all systems. We have not helped students realize that it is they who will be in responsible positions and that they *can decide "What should be?"*

Enough for the problems. What are some of the solutions? The techniques and methods introduced in Chapter 1 should provide some hints as to how one may proceed to forecast or project the future. Following are some suggestions to help one become a *"Future-Oriented"* industrial arts teacher.

Many educators will claim that we do not have access to content that adequately represents the 21st century. However, all we have to do is look around us to see and experience much of what will be the future. Synthetics, for example, will be utilized in almost all products of the future. Even though this is almost a norm in 1975, industrial arts teachers insist on spending every class period working with vanishing species (e.g., hardwoods). What about the computer? Almost every school has a computer or at least access to one. Could this be used or at least demonstrated to your students? What about the laser? School-type lasers are now available for less than $100 and could be used in several disciplines.

Obviously there are many tangible items that we cannot bring into our classroom which represent the future. It is possible however, to utilize other strategies such as models, simulations, games, films, tours, etc. Many organizations now exist to help the teacher find ways to bring reality to the classroom. The last section of this monograph reveals many materials for use by teachers.

Of course we must not forget the intangibles of our society which will be prevalent in the future. These are new problem solving techniques, new value systems, new legislation, new ideas, and of course we must not forget the social consequences of rapid growth.

Whether the class is working with tangibles or intangibles he must be placed in an atmosphere that represents the future he will experience. Look about your laboratory and see if it represents the future, or even today? The student *must* experience the future with his senses while he learns to make rational decisions with this new knowledge base. This is probably one of the most important elements of the futurism movement. Every student must realize that every decision made must incorporate consideration for every human and every institution.

Literally every experience, whether working in the laboratory or in "rap" sessions, will lead to consideration of human values. It is at this point that the students must be allowed to question and to come to conclusions based upon their research. Values of the future can be predicted by even the youngest student, or the poorest student, or the least interested student.

Of course there are whole new vistas yet to be discovered. These we cannot provide for our students through films, models, or tours. However, this is the opportunity to let our students innovate and predict their own future. By designing their own lifestyle they will be forced to reflect on "What is?" "What can be?" but most importantly, "What should be?" This experience will be frustrating, for the teacher, because the students will be working in new vistas and may even have more data than that he has. This may reveal value conflicts or inconsistancies between the teacher and class.

Experience in the futurism movement has revealed that students will achieve closure as they discuss the future but at the same time seem to maintain a mind set capable of handling change. The new literature, new problem solving techniques, multi-disciplinary roles, etc., will provide this stimulus and of course will give them a "jump" on the future.

In summary, industrial arts teachers should realize that our society is a technological society. Technology is future oriented which means we are in an opportune position to assist students in the challenges they will have as adults. Our goal must be to provide the most realistic models of life that we can. The futurism movement is the only way this can be accomplished.

Listed below you will find teaching strategies which should prove useful as you begin to work in this new area:

1. Expand every concept you teach into the future. For example, what is the future of a natural resource such as wood?
2. Consider the global community in all endeavors. Work with the assumption that we will have a global production system.

Keep in mind that in 1980 85% of the world's manufacturing assets will be controlled by multi-national corporations.

3. Make every effort to incorporate other disciplines into your efforts. Students must be able to comprehend the interrelatedness of all aspects of their culture.
4. Explore the concept of technology assessment and technological forecasting. By their very nature these are future-oriented, people-oriented and technology oriented. Let your students do assessments of projects in your community (e.g., park locations, new factories, possible damn sites, mass transit, etc.)
5. Help your students learn the value of anticipation. Have them anticipate the consequences of ideas they study. Do not lose sight of the fact that consequences may be economic, ecological, psychological, sociological.
6. Consider new teaching techniques, such as:
   Scenarios
   Simulations
   Gaming
   Cross impact analyses
7. Look for experiences that will force students into the future. For example:
   Redesign your hometown for the year 2000.
   Generate a new book list dealing with the future.
   Write headlines for the year 2000.
   Work with the English teacher to utilize science fiction.
   Administer a pre-test and a post-test about the future.
   Generate interest by polling the entire student body and faculty about the future.
   Visit people in the community who make forecasts.
   Trace some of our natural resources from the beginning of time through the future.
   Develop new vocabulary lists for the future.
8. Purchase new books for the library which represent the future. The World Future Society has a list of books that deal with the future which they sell directly.
9. Be ecologically oriented in your classes. Assign some advanced students to develop techniques of recycling sawdust, using "scrap" pieces of materials, monitor the particulate matter in the air, and design houses that use less energy to heat and cool them.
10. Build future models of transportation systems, housing, solar energy panels, wind power.

11. Test out products as to their efficiency and effectiveness, and make recommended design changes so that they will be more compatable with future material and consumer requirements.
12. Provide experiences that will result in a greater awareness of the impact of industrial technology. New products, processes and materials will result in changes. Teachers and students will have to look at these changes to see if they want to enhance or inhibit them.

Because of the relationship of industrial arts and technology the industrial arts teacher carries a heavier burden in preparing students to become futurists. This is the challenge of the next 20 years, and how we meet it will determine our effectiveness in influencing the future of our society. That is what teaching is all about so lets get on with the job.

RESOURCES FOR FUTURE STUDIES

Following are listed some of the materials available that may prove to be of value to teachers and students who take seriously the challenge of the future. Only a representative sample has been selected for inclusion as it would be impossible to include everything. As one gets acquainted with some of these, new different ones will be suggested for study.

BOOKS

Armytage, W.H.G., *Yesterday's Tomorrows: A Historical Survey of Future Societies.* Toronto: University of Toronto Press, 1968, 288 pp.

Baier, Durt and Nicholas Rescher (eds.) *Values and the Future: The Impact of Technological Change on American Values.* N.Y.: The Free Press, 1969, 527 pp.

Bell Daniel (ed.) *Toward the Year 2000. Work in Progress.* N.Y.: Houghton Mifflin, 1968, 400 pp.

Best, Fred, (ed.) *The Future of Work,* Englewood Cliffs, N.J.: Prentice-Hall, 1973, 179 pp. $2.45

Educational Policy Research Center at Stanford. *Alternative Futures and Education Policy.* Menlo Park, California: Stanford Research Institute, EPRC Memorandum Report, January, 1970, 43 pp.

Farrell, Edmund, *Deciding the Future: A Forecast of Responsibilities of Secondary Teachers of English,* 1971, 188 pp., $3.00

Ferkiss, Victor C., *Technological Man: The Myth and the Reality.* N.Y.: George Braziller, 1969, 352 pp.

Fuller, R. Buckminster and Robert Marks, *Dymaxion World of Buckminster Fuller,* Double Day Anchor, $4.95

Fuller, R. Buckminster. *Utopia or Oblivion? The Prospects for Humanity.* N.Y.: Bantam Books, Matrix Editions, December 1969, 363 pp., $1.25

The Future. Current Affairs Study Case. N.Y., Newsweek Educational Division May, 1972. (teaching materials for a unit of the future)

Gordon, Theodore J. and Robert H. Ament. *Forecasts of Some Technological and Scientific Developments and their Societal Consequences.* Middletown, Conn.: The Institute for the Future, IFF Report R-6, Sept. 1969

Hellman, Hal, *The City in the World of the Future.* Evans and Company, $5.95

Hellman, Hal, *Communications in the World of the Future,* N.Y.: J.B. Lippincott 1969, 201 pp., $4.95

Hostrop, Richard (ed.), *Foundations of Futurology in Education.* Homewood, Illinois: ETC Publications, 1973, 249 pp., $7.95

Jungk, Robert and Johan Galtung (eds.), *Mankind 2000.* London: Allen & Unwin, 1969, 368 pp., $14.90

Kahn, Herman and B. Bruce-Briggs, *Things to Come: Thinking about the 70's and 80's.* N.Y. Macmillan Co., 1972, 262 pp., $6.95

Kahn, Herman and Anthony J. Wiener, *The Year 2000: A framework for Speculation on the Next Thirty Three Years.* N.Y.: Macmillan, 1967, 431 pp.

Lundberg, Ferdinand, *The Coming World Transformation.* Garden City, N.Y.: Doubleday, 1963, 395 pp.

McHale, John, *The Future of the Future.* N.Y.: George Braziller, 1969, 322 pp., $7.95

Meadows, Donnella and others, *The Limits to Growth.* N.Y.: Universe Books, 1972

Mesthene, Emmanual, *Technological Change: Its Impact on Man and Society.* Harvard Studies in Technology and Society. Cambridge: Harvard University Press, 1970, 124 pp.

Michael, Donald N., *The Unprepared Society: Planning for a Precarious Future.* Forward by Ward Madden. The John Dewey Society Lecture-Number Ten. N.Y.: Basic Books, 1968, 132 pp.

Muller, Herbert J., *The Children of Frankenstein: A Primer on Modern Technology and Human Values.* Bloomington: Indiana University Press, 1970, 431 pp.

Reich, Charles A., *The Greening of America: How the Youth Revolution is Trying to Make America Livable.* N.Y.: Random House, 1970, 399 pp., $7.95

Rochberg, Richard, Theodore J. Gordon, and Olaf Helmer. *The Use of Cross-Impact Matrices for Forecasting and Planning.* Middletown, Conn.: Institute for the Future, IFF Report R-10, April 1970, 63 pp.

San Francisco State College Center, *Technology and Education In the 21st Century,* $3.50

Shane, Harold, *The Educational Significance of the Future.* Bloomington, Ind. Phi Delta Kappa, 1973. $3.00

The Technological Society: Fitting Machines to Man and Designing for the Future. Columbus, Ohio: Xerox Education Publications, 63 pp. (Booklet of teaching materials)

Theobald, Robert (ed.) *An Alternate Future for American II.* Revised and Enlarged Edition. Chicago: Swallow, May 1970, 199 pp., $6.00 paper-$2.00

Thring, M.W., *Man, Machines and Tomorrow.* $7.00

Toffler, Alvin. *Future Shock.* N.Y.: Random House, 1970, 505 pp., $8.95

Toffler, Alvin, (ed.) *Learning for Tomorrow: The Role of the Future in Education.* N.Y.: Random House, 1974

U.S. Congress, House Committee on Science and Astronautics. *A Study Of Technology Assessment.* Report of the Committee on Public Engineering Policy, National Academy of Engineering. Washington: USGPO, July 1969 208 pp., $1.25

U.S. Congress, House Committee on Science and Astronautics. *Technology: Processes of Assessment and Choice.* Report of the National Academy of Sciences. Washington: USGPO, July 1969, 163 pp., $.75

U.S. Government Printing Office, *A Look at Business in 1990,* $5.25

Waggar, Warren W., *Building The City of Man,* W.H. Freeman Company, $3.25

Weaver, W. Timothy., *The Delphi Method.* Syracuse: Educational Policy Research Center. Working Draft, June 1970 160 pp. mimeo

Wolfgang, Marvin, (ed.) *The Future Society: Aspects of America in the Year 2000.* Philadelphia: The American Academy of Political and Social Science. July 1973, 205 pp.

Ziegler, Warren L., with the assistance of Michael Marien. *An Approach To the Future Perspective in American Education.* Syracuse: Educational Policy Research Center, May 1970 103 pp.

CASSETTE TAPES

American Chemical Society, 1540 North Hudson, Los Angeles, California 90028
"Prospects for Energy"
"Antidote to the Energy Crises"

Center for Cassette Studies, 8110 Webb Avenue, North Hollywood, California 91605
"2000 A.D. The Universe of the 21st Century"
"The University in 1984: A Contemporary Vision of Man's Progress in Science and Government"

Center for the Study of Democratic Institutions, Box 4068, Santa Barbara, California 93103
"Beyond Freedom, What?"

Creative Sight and Sounds, P.O. Box 473, Middletown, Ohio 45042 (distributes tapes, some of their selections are:

"Working to Make the Future of Education Less Certain" Dwight Allen Dean of Education, University of Massachusetts

"Things to Come: Prospects for Mankind", Herman Kahn, Director of Hudson Institute)

Educational Technology Publication, 140 Sylvad Avenue, Englewood Cliffs, New Jersey 37632

"Tomorrow's Educational Engineer"

Living Library Corporation, 211 Centre Street, New York, New York 10013

"2001: An Educational Odyssey" by Neil Postman

"Educational Bill of Rights for Modern Man" by Ivan Illich

Phi Delta Kapp, Box 789, Bloomington, Illinois 47401

"Educational Futures" (with slides) by Harold Shane, Professor of Education, Indiana University

The World Future Society has prepared a series of tape recordings based on the Society's radio interviews. Two half hour radio interviews are combined on a single one hour tape cassette. Each tape is $5.00. A complete list of available tapes can be obtained from: World Future Society, 4916 St. Elmo Ave. (Bethesda) Washington D.C. 20014.

Tape 7301

"The Future of American Values" Sam Wilson, General Electric Consultant, author of *Our Changing Business Environment*

"Future Conflicts of Scientific and Social Values" Charles Williams Deputy Director, Social Policy Research Center, Stanford Research Institute.

Tape 7302

"The Future of Computers in the Classroom" Joseph Margolin and Marion Misch, George Washington University.

"The Future of American Education" Gabriel Ofeish, American University

Tape 7303

"Revolutionary Choices for Education" Hendrick Gideonse

"The Future of Higher Education" Alvin Eurich

Tape 7304

"Future of Women in America" Jessie Bernard, Sociologist

"Women in Their Middle Years"

Tape 7305

"The Future: Optimism vs. Pessimism" by Edward Cornish, President World Future Society

"Talking About the Future" by Edward Cornish, President World Future Society

Other Tapes, 2 for $5.00 are:

"The Future for Moral Values" Phillip Wogaman, Wesley Theological Seminary

"The Future of Transportation" Robert Ayers, Vice President International Research and Technology Corporation

"The Future Impact of Technology on the Evolution of Mankind" Richard Bettinger, Professor Physics and Astronomy, University of Maryland.

Technology Assessment Tapes ($20.00 per set):

#1 "Technology Assessment and Technological Forecasting" Marvin Cetron

#2 "Technology Assessment in Developing Countries" Larry Connor

#3 "Industrial Applications of Technology Assessment" Christine Ralph

#4 "Technology Assessment Symposium" Hollis Vail

GAMES

Guide to Simulations/Games for Education

Describes more than 600 simulation games including ordering information. Written by David Zuckerman. $15.00 Available from World Futures Society.

The Futuribles

Designed to help people get acquainted with future possibilities, share their feelings about the future, and clarify their own feelings, $9.45

New Town

Players build a viable new community 25 miles from a major city. $8.95

JOURNALS

Footnotes to the Future

Futuremics, Inc., headquarters at 2850 Connecticut Avenue, N.W. Washington, D.C. 20008, $15.00 for 12 issues

Future Report

(a semi-monthly newsletter for those concerned with the future)12 Shattuck Street, Nashua, N.H. 03060

Futures

(A journal of forecasting and planning) IPC America, Inc., 205 East 42nd

Street, New York, New York 10017, Printed in England in cooperation with Institute for Future, Bi-monthly, $26.00 per year.

Futures Conditional

(A participation trendletter to create a more human future) Box 1531, Wickenburg, Arizona 85358, Edited by J.M. Scott and Robert Theobald. Monthly. $18.00 per year.

The Futurist

(A Journal of forecasts, trends, and ideas about the future) P.O. Box 303069, Bethesda Branch, Washington, D.C. 20014, Editor Edward Cornish, President of World Future Society, Bi-monthly subscription included in $12.00 yearly dues to World Future Society.

Technical Survey

650 Newark Avenue, Elizabeth, New Jersey 07208

Technology Forecasting and Social Change

American Elseview Publication, 52 Vanderbilt Avenue, New York, New York 10017

Technology Review

Room E19-430, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139.

Tomorrow's World

A semi-monthly newsletter for those interested in the world of the late 1970's. . . the 1980's. . . and beyond. Hilltop House, Barrett's Hill Rd. RFD 2, Hudson, N.H. 03051. $75.00 per year

ORGANIZATIONS

Center for Integrative Studies

School of Advanced Technology
State University of New York
Binghamton, New York
John McHale, Director

Center for Study of Democratic Institutions

Box 4546
Santa Barbara, California 93103
$10.00 per year

Commission on the Year 2000

American Academy of Arts & Sciences
280 Newton
Jamaica Plain, Massachusetts

Hudson Institute

Quaker Ridge Road
Cronton-on-Hudson, New York 10502
Herman Kahn, Director

Institute for the Future

2725 Sand Hill Road
Menlo Park, California 94025

International Society for Technology Assessment

Rue de la Pair 11
P.O. Box 236
1820 Montreux
Vd., Switzerland
$20.00 per year

Syracuse University Research Corporation

1206 Harrison Street
Syracuse, New York 13210
Stuart Sandow, Research Fellow

World Future Society

4916 St. Elmo Ave. (Bethesda)
Washington D.C. 20014
$12.00 per year
Edward Cornish, President

16mm FILMS

The source listed for the film is usually only one of several places where it may be requested from. The price is also subject to change.

America on the Edge of Abundance

Black & White	60 minutes	Indiana University Audio Visual Center
Net 2604	$12.00	Bloomington, Indiana 47401

Conquering the Sea

Color	25 minutes	McGraw-Hill Films
689314	$18.00	

Cosmopolis (Part I and II)

Color	52 minutes	University of Iowa Audio-Visual Center
#50074	$19.00	Iowa City, Iowa 52240

Future Shock

Color	42 minutes	Bureau of Audio-Visual Inst.
8715	$22.00	University of Wis. - Ext.

P.O. Box 2093
Madison, Wisconsin 53701

Future Shock Series

Color

A series of 13 films on the future. A list and prices may be obtained from:
Future Shock Department
McGraw-Hill Films
1221 Avenue of the Americas
New York, New York 10020

The Futurists

Color	25 minutes	McGraw-Hill Films
689316	$18.00	330 West 42nd Street
		New York, New York 10036

Games Futurists Play

Color	26 minutes	McGraw-Hill Films

Industries in the Future

Color	26 minutes	McGraw-Hill Films
689352	$18.00	330 West 42nd Street
		New York, New York 10036

Margaret Mead

Black & White	30 minutes	University Extension
6930	$11.00	University of California
		Berkeley, California 94720

Mars and Beyond

Color	30 minutes	Modern Talking Pictures Service
3006	Free	(use local distribution center)

The Next 50 Years (a series of 32 study programs)

	25 minutes	Visual Information Systems
		Division of Republic Corp.
		15 Columbus Circle
		New York, New York 10023

R. Buckminster Fuller: Prospects for Humanity

Black & White	30 minutes	Indiana University Audio-Visual Center
CS 1809	$6.75	

Towards the Year 2000 Series

Color	30 minutes	Document Associates
		573 Church Street
		Toronto, Canada

"Technology: Catastrophe or Commitment"
"The World of Future Shock"
"Geopolitics: Shape of Things to Come"
"Genetics: Man the Creator"
"Cities: Living in a Machine"
"Communications: The Wired World"
"Computers: Challenging Man's Supremacy"

21st Century Series

Color 30 minutes McGraw-Hill Films

Originally a television series, these are now available in 16mm film. These are only a few of the topics available:

"A trip from Chicago," "How do Things Look", The communications Explosion," "The Class of '01: The Challenge of Tomorrow"
"At Home 2001," "Cities of the Future"

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18. Theobold, Robert. *Futures Conditional.* New York: Bobbs – Merrill, 1972.
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