The original documents are located in Box 6, folder "National Science Foundation (2)" of the Norman Ross Files, 1974-75 at the Gerald R. Ford Presidential Library.

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

SCIENCE AND TECHNOLOGY
POLICY OFFICE

May 16, 1974

MEMORANDUM

TO : Mr. Norman E. Ross, Jr.
Domestic Council EOB

FROM : Mr. A. Wade Blackman AWB
Science and Technology Policy Office (STPO)

SUBJECT : Unsolicited proposal entitled "Development of A Dynamic Simulation Model of Food Production for the U.S. and the World"

The subject unsolicited proposal has been received from Systems Control, Inc. It is proposed to develop a system dymanic model which would form the methodological framework for the evaluation of policy options relating to the world food problem.

As STPO is considering the sponsorship of this work, I would like to elicit your review and comments on this proposal. I would greatly appreciate receiving your comments on the enclosed form by May 22, 1974. — Sent on 5/21/74 as acceptable.

Thank you again for your help.

Enclosures

Bob Kofer Bolivar Cottin
- Comm. Trading Corporation of Texas
- cotton Import

reap

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

OFFICE OF THE
SCIENCE ADVISER

25 OCT 1974

Mr. Norman E. Ross, Jr.
Room 218, Domestic Council
The White House
Washington, D. C. 20500

Dear Mr. Ross:

Now that the flurry of activity associated with the Conference on Inflation and its immediate aftermath has subsided somewhat, I am writing to express my strong appreciation of your participation and support. The willingness of the various individuals involved in our pre-summit meeting on Science, Technology and the Economy and the Conference itself to come to Washington at very short notice was an especially heartening and significant demonstration to the President of the interest of scientists and engineers in contributing to the resolution of major public problems.

In view of the general interest shown in the Science and Technology component of the Conference, we are printing up a compilation of the preparatory documents, position papers, and summary of the pre-summit meeting together with the two short papers presented at the Conference. I expect to be able to send a copy to you within the next few weeks. The full transcript of the pre-summit meeting is not being included in this compilation, but I should be glad to arrange for a copy to be mailed to you if you indicate a need for one.

Thank you again for your help.

Sincerely yours,

H. Guyford Stever
Science Adviser

10/26

NATIONAL SCIENCE FOUNDATION

Science and Technology Policy Office

13 November 1974

Norman Ross, Domestic Council Staff

After seeing you today, I am reminded to send you the attached copies of the Conference on Inflation material, together with the talk on "Materials, The Next Crisis?"

Look forward to meeting after your trip to Arizona — let's try to get together well before the end of the month. There are several things we should talk about before I go to the OECD meeting in Paris in the first week of December.

Victor

(In press) Proceedings of Henniker III Conference on National Materials Policy

MATERIALS; THE NEXT CRISIS?

by
S. Victor Radcliffe*

(Invited talk presented at the Engineering Foundation Conference on Requirements for Fulfilling a National Materials Policy (August 11-16, 1974, Henniker, New Hampshire)

"We have become great because of the lavish use of resources and we have just reason to be proud of our growth. But the time has come for us to think seriously what will happen when our resources are gone; when the coal, the iron, the oil and the gas are exhausted, when the soil is still further impoverished and washed away in streams, polluting the rivers, denuding the fields and obstructing navigation. These questions do not relate only to the next century or the next generation ---" These comments were made not in 1974, or even 1973, but in 1908 in a speech by President Theodore Roosevelt.

In 1974, the President of the United States was again concerned with the availability of resources. In his State of the Union Message, the President stated that "--- it is imperative that we review our current and prospective supplies of other basic commodities. I have therefore directed that a comprehensive report and policy analysis be made concerning this crucial matter, so that governmental actions can promptly anticipate and help avoid the damaging shortages---." A few months later William S. Paley, the chairman of the 1952 Presidential Commission on Materials Policy expressed concern even more strongly - "--- The energy crisis can be a blessing in disguise for America. A warning has been sounded. We could be heading into stormy seas unless we heed and act now. We face a problem centering around this key question: Does the United States have an adequate supply of raw materials to feed its expanding economy and defend its security? The answer leaves no room for complacency. My experience as president of this Materials Policy Commission which studied the subject exhaustively along with current developments has convinced me that we have reached a watershed in our national life. For the first time we must deal with a wholly new fact -- that the well from which our resources flow is not bottomless. ---"

* Professor of Metallurgy and Materials Science, Case Western Reserve University, Cleveland, Ohio. Currently on leave as Senior Policy Analyst, Science and Technology Policy Office, staff to the Science Adviser.

11/15

While these three quotations appear to express like apprehensions about serious problems for the continued availability of materials resources, the nearly three-quarters of a century between the two presidential statements was a period that seemed to prove that the Malthusian warning of 1908 was misplaced. Over that period, both the United States' population and its national wealth grew with associated increases in the consumption of materials and energy. In the face of these increases and despite the need to move to leaner and leaner ores as the richer mineral deposits became worked out, the "reserves" of the major industrial materials remained stable or increased over the same period and the material cost (in constant dollars) declined continuously. This contra-trend was due in large part to the ability to provide continual improvements in the technological efficiency of extracting and processing these basic materials. This experience of long-term downward trends in the constant dollar cost of materials was in large part responsible for the rise of the "Cornucopia School" of resource economics, which assumes that necessary technological advances will continue likewise into the future.

However, the two statements made in 1974 point to a relatively recent change in attitude towards materials resources which involves concerns both for shortages in the near-term and for the finiteness of the earth's supply of materials. Both these latter concerns--frequently jumbled together in a confusing way--have led to a great deal of current public debate in newspapers, television and technical journals. This revival of neo-malthusian thought was stimulated sharply by the Club of Rome's study "Limits to Growth." Since the onset of the energy crisis in 1973, there have been numerous Congressional Hearings on materials shortages. Indeed, at this moment a bill proposing a National Commission on Supplies and Shortages, supported by both the Majority and the Minority leadership and by the Executive Office is being considered in the Congress. The United Nations held a Special Session of the General Assembly in April of this year on "Raw Materials and Development." In Paris, in June, the Council for Economic Development conducted the "first World Symposium on Energy and Raw Materials."

These various events and activities are all directed to the question that is the topic of this talk. The important point at issue is whether these recent concerns for materials really correspond to a materials "crisis," in the sense that the word crisis means a pivotal decision point or a turning point. In trying to answer the question it is useful to consider in turn, for both the United States and the world at large, the problems of the near term and those of the period beyond the rest of this century.

Concern with the supply of materials over the near-term future i.e. the period of the next 10 to 20 years, appears to have arisen directly from the

events triggering the recent oil crisis, when a small group of oil producing and exporting countries were able to withhold oil supply both to force a four-fold increase in price and to influence a political issue-- the Arab-Israeli conflict. The United Nations Conference mentioned above was initiated to bring together energy and other raw materials exporting countries to demand an improved trading position with respect to the principal raw materials importing countries. Although the United States is a major producer of both energy and raw materials, she has become increasingly dependent on imports from other countries to supply her large and expanding needs. As a result, the country has become vulnerable to supply cutoff or price increase, particularly for several key industrial materials. In 1970, the United States, with only one twentieth of the world population, consumed approximately one-third of the world's raw material supply. For twenty non-fuel minerals, including the important industrial metals - platinum, chromium, aluminum, nickel, and zinc, the United States imports more than half its supply from abroad. For seven of these non-fuel minerals (platinum group metals, chromium, strontium, cobalt, tantalum, aluminum ore and metal, manganese) the imports for each amount to 95 percent or more of the U.S. annual consumption.

This dependence on imports has arisen either because such supplies are cheaper than using indigenous U.S. sources (as is the case for the ore for aluminum, bauxite) or the material is not indigenous to the United States but has performance characteristics uniquely suited to specific and desired technological needs (e.g., palladium for telephone contacts, platinum for the catalysis of chemical reactions, chromium for resistance to corrosion and oxidation). Almost all the other industrialized nations are more dependent on importing raw materials than is the United States and hence have an even more vulnerable position. It is the concern with the price and reliability of supply of such imports over the next several decade that is really the major issue in most current discussions on materials "shortages." In addition, there is an immediate and serious problem of the present actual shortages in many processed materials-such as steel, aluminum, copper, etc. These particular shortages appear to be due principally to the undercapacity of the United States and world materials producing industries, resulting from a long period of underinvestment in new capacity and the unprecedented period of high rate of economic growth that has occurred simultaneously in most of the developed countries. The resulting higher prices for materials, also driven up by energy price increases, is stimulating some cautious expansion in production capacity and some improved efficiency of materials use or

substitution in the materials and manufacturing industries. Such changes can be expected to alleviate this particular source of shortages but will not resolve the questions of vulnerability to imported raw materials.

Is there indeed a "Materials OPEC" threat and what can be done if it occurs? To the first part of the question there is no certain answer only best judgments as to its component uncertainties of the odds of collusion and the odds of successful collusion. However, it is helpful to consider the likely effects of any such success. In general, price multiplication of raw materials should affect product prices much less than has been the case for energy. Thus bauxite has been close to $12 per ton, whereas the price of aluminum ingot is some $600 per ton. Even allowing for the fact that it takes about 4 tons of bauxite to produce 1 ton of aluminum, it is clear that the doubling of the bauxite price should not influence the final metal price as strongly as the changes in crude oil prices increased the resulting prices for energy fuels. However, while the impact of such price increases should accordingly not be as traumatic as was the case for energy, there is evidence that along with price increases for raw materials, the producing countries will press for setting up industries for materials processing and fabrication rather than simply exporting raw materials. Such changes in industrial structure could not only result in significant changes in the rate of economic development, but could also, depending on the future level of world demand for materials, influence the structure of the U.S. materials industry. Correspondingly, at the present time the prospect of "a materials OPEC" is the subject of strong examination both inside and outside the Federal Government. Such considerations have led already to changes in the character of discussions in international trade relations from the focus of the past several decades on "access to markets" towards one of "access to supply." The statement by Ambassador William Eberle (Special Representative for Trade Negotiation) at the recent Hearings on Materials Shortages before the Joint Economics Committee of Congress pointed to such an Administration view on the development of a stable and equitable framework for international trade in raw materials.

The second part of the question, addressing what might be done if the threat becomes reality, involves science and technology issues more strongly. Both increases in price and uncertainty of supply are likely to stimulate the following technical responses:

a. Materials substitution (i.e., the use of a different material, to perform the same function, such as copper or aluminum in conductors.

b. Process substitution (i.e., the use of a different raw material, such as alumina clays in place of bauxite).

c. System modification or substitution (i.e., reduce or avoid the need for a specific material by changing the engineering system, such as the use of a magnetic circuit breaker in a car ignition system in place of the conventional electrical circuit breaker).

d. Stockpiling either of materials or of technology.

The implementation of the first three of these responses is known from experience to require relatively long lead times to effect the technical change involved. For example, the substantial substitution of natural fibers by synthetic fibers has taken some 40 years. More recently, the replacement of open hearth steelmaking technology by the basic-oxygen process has taken some 10 years. In general, historical experience indicates that the substitution of a material or a new process for another takes on the order of 20 years. Usually, exceptions to this time scale occur only when little or no capital investment or write-off of existing plant is required. Such conditions were met in the case of the introduction of hybrid corn, which took only 2 or 3 years for almost full substitution to occur. Crash programs can also effect unusually rapid change as was the case for the development of the atomic bomb or in the program to place a man on the moon, but the investments of resources required are extremely large.

In the case of stockpiling materials, the U.S. experience to date has been primarily with ensuring supplies in the event of war. There still remain serious questions as to the effectiveness of materials stockpiles for the purpose of economic security, and as to whether they should be privately or publicly funded and managed. Furthermore, it is uncertain whether economic security is better met by international stockpiles analogous, for example, to the producer-consumer managed stockpile involved in International Tin Agreement rather than by national ones. The latter clearly are required if military security is the question. The stockpiling of technology can occur either as standby production plants or excess plant capacity, or by subsidizing the operation of higher cost production processes that permit the use of non-vulnerable resources. Compared with maintaining stocks of materials themselves, the costs incurred in stockpiling technology are very large and it appears doubtful if the insurance provided would be worth it. Since we are really trying to insure against finite dislocations in

materials supply and/or price, stockpiling of materials appears to be the least expensive solution and the one that can be implemented most rapidly. A major relevant issue of science and technology policy is whether the Federal Government should underwrite research and development for alternative technologies, substitute materials or raw material supplies. However, such an issue is really more concerned with long term impact than the needs of the short term.

These various considerations lead to the conclusion that, for the short term, materials is not the next crisis--for the United States or indeed the world at large. Undoubtedly, there will be price changes, supply perturbations and alterations in industry structure, but in economic terms none of these developments appear likely to result in a crisis situation, i.e., one comparable to the world energy crisis of the recent past and the world food crisis that appears possible in the near term future.

Let us turn now to the long term questions, that is, the ones of the world of the year 2000 and beyond. Recently, we have seen a rekindling of the conflict of view between the resource optimists and the resource pessimists. The former correspond to the cornucopia school of resource economics, where it is assumed from past history that technology will provide an answer to the gradual decline in quality and quantity of the resource base. In sharp contrast, the resource pessimists, corresponding to the theory advanced by Malthus in 1798 of the inevitability of conflict of arithmetic growth in food supply with geometric growth of population, are concerned with the potential impasse between the finiteness of physical resources* and the limits perceived to technology. While the strong resurgence of these ideas has been associated with the "Limits to Growth" study, already during the 1960's public attention had been drawn to the worldwide pervasiveness of the hazards of nuclear explosions in the atmosphere and of the increasing pollution of water and air from the wastes generated by industry and private individuals. Thus, the dramatization of the resources situation by the Club of Rome study found a receptive public and rapidly generated wide concern for the finiteness of "Spaceship Earth" and its resources, and raised serious questions as to the wisdom of continued economic growth. For many, the current demographic projections of the doubling of the world population for the year 2000 with corresponding pressure on resources has reinforced the import of this analysis.

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*To no small degree, sharp differences in some of the public debates as to the seriousness and immediacy of the problem of the adequacy of resources for materials are associated with the frequent failure to distinguish between reserves (i.e., identified sources that are economically exploitable with current technology) and resources.

Like the question "will there be a materials OPEC?", the optimist/pessimist question cannot be resolved with certainty. Moreover, it appears likely that this may not be the right question to ask because the issue is going to be really one of choosing among alternatives, all involving some restrictions of present choices, rather than "continue as before" versus "catastrophe."

How finite are the world's resources? In the sense that the entire globe is composed of minerals, the answer is a number so large that it is essentially infinite in comparison with the likely world demand; in particular when account is taken, in evaluating such demand, of the evidence for a saturation of the level of the per capita consumption of materials in advanced countries and the fact that problems other than materials are likely to force a solution to the increasing pressure on all resources from population growth long before world population reaches "standing room only" levels. Similar considerations apply to the world supply of "renewable resources" of plants, trees and animals, in contrast to the minerals or non-renewable resources. In this very long term sense, the question whether or not materials resources are finite becomes academic. Much more practical is the question of the costs likely to be incurred, as opposed to the benefits, by continuing high rates of materials production and consumption and how can they be reduced. How can the pain of the transition period be modified? What is the role of science and technology?

The economic and social factors to be taken into account in seeking an optimum solution to this question of balancing costs and benefits in providing and using materials in the economy are principally the integrity of the environment, human health and safety, energy consumption (in particular, associated with the need to use progressively lower grade ores), competing uses for land, water and capital, and the stability of international relations. Science and technology can assist beneficially in this process of optimization through activities that offer options for both the supply of materials and reducing demand for new supply. Thus, increases in supply can be developed through:

1. Advances in the understanding of mineral formation and the techniques for exploration, and of plant biochemistry
2. Creation of new materials or processes that open up new resources (e.g., synthetic polymers, new mining techniques for minerals on land and in the oceans)
3. Improving the physical efficiency of the extraction of resources (e.g., increased energy efficiency in processes for aluminum and steelmaking, or wood products.

4. Develop lower cost alternatives for existing materials (i.e., substitution of materials or systems to provide the same performance or function), including the possibilities for greater use of the more abundant materials, such as magnesium and silicon, or of renewable materials - including current organic wastes such as lignin.

Opportunities for reducing demand for new supply lie in:

1. Better integration of materials selection with component design to develop manufacturing processes that reduce materials loss during manufacturing
2. New or improved materials to permit engineering designs that reduce the amounts of material required to perform a given function (e.g., miniaturization, as in solid-state devices, or improved reliability)
3. Conservation in use through improved materials performance that provides increased service life (e.g., reduction in rates of deterioration by corrosion and wear)
4. Improved recovery or direct reuse of materials during processing, manufacturing and after completion of the useful life of capital or consumer goods.

At the present time, there is increasing recognition that market forces alone may not move the United States and other developed countries rapidly enough towards ensuring that these science and technology activities develop timely contributions to the solution of meeting needs for materials in the future. Involved in this recognition are such issues as "the problem of the commons" and the internalization of external costs that have not yet been incorporated adequately into economic theory. Thus, a major question is how, where and to what extent should the Federal Government become involved so as to encourage effective use of resources and technology, and to anticipate the materials requirements of the future. A variety of deliberations and activities in the Congress and the Executive Branch, in the Organization for Economic Cooperation and Development, and in the United Nations are focusing on different aspects of these issues. Some movement is apparent towards addressing the most difficult question, that of the feasibility and wisdom of developing a more comprehensive approach to the management of materials resources.

From the above discussion, it appears that, while the reasons differ from those for the short-run case considered earlier, the longer term likewise does not threaten a materials "crisis." In particular, it is improbable that the world will "run out of materials" before other potentially critical issues intervene. However, the conclusion that no real crisis is likely for materials does not mean that, in the absence of appropriate attention, serious problems may not arise in their supply and use. Public choices in both developed and developing countries will have to be made between the costs and benefits involved, especially over the immediate future when expanding new production will continue to be the principal means of meeting consumption requirements.

Recently, two wide-ranging and complementary studies have examined the principal questions involved in such matters. The studies point to the close inter-relationships between materials, energy and the environment that, together with the concept of the total materials cycle, are central to adequate management of materials resources. The report of the National Commission on Materials Policy in June, 1973, entitled Materials Needs and the Environment Today and Tomorrow, examines the characteristics of current and future supply and demand for materials in the United States and the world, and the policy issues to be faced. The National Academy of Sciences report in January, 1974, entitled Materials and Man's Needs: Materials Science and Engineering, focuses on the science and technology of materials themselves. In addition, it examines the institutions in industry, government and university that conduct research, education and manufacturing to develop understanding and control of materials properties and performance, and to provide materials for individual and national purposes. Together, these reports offer an excellent starting point and framework for larger public examination of the needs for materials and the opportunities for meeting them. A variety of technical and organizational opportunities are available and given adequate and timely consideration followed by action, alleviation of short-term materials problems in addition to those perceivable as likely over the longer term can be expected.

REMARKS OF H. GUYFORD STEVER
SCIENCE ADVISER TO THE PRESIDENT
THE CONFERENCE ON INFLATION
WASHINGTON, D.C.
SEPTEMBER 27, 1974

SCIENCE, TECHNOLOGY AND THE ECONOMY

No more than economics do science and technology offer simple or unique solutions to the problem of inflation. Nevertheless, like the dismal science, they are essential elements in policies and actions to reduce current inflationary pressures.

In recent years, we have learned to acknowledge the significance of energy and materials resources in the classical relationships between labor, land and capital. Technology is one of the main forces that forms these basic resources from the substances of the earth and translates them into goods and services. Successful development and utilization of technology has been an essential ingredient of the vigorous growth of the United States economy over the past hundred years.

However, I must now make a confession. Science and technology are part of the current inflationary problem as well as part of the solution. First, the remarkable rate of growth of the efficiency or overall productivity of American industry has weakened over the past decade. Our rate of productivity growth is now much lower than that of other industrialized countries.

THEIR GOODS HAVE BECOME VERY COMPETITIVE BECAUSE OF RELATIVE DEFICIENCIES IN OUR GENERATION OR USE OF TECHNOLOGY. SECOND, WE HAVE SEEN MAJOR CHANGES IN NATIONAL POLICIES FOR HEALTH, SAFETY, AND THE INTEGRITY OF THE ENVIRONMENT IN RESPONSE TO A NEW PUBLIC VIEW OF NEED, POSSIBILITY AND IMMEDIACY - A REVOLUTION OF RISING EXPECTATIONS.

THESE NEW POLICIES HAVE BEEN CONCERNED PRINCIPALLY WITH EXTENSION OF THE BENEFITS OF AVAILABLE TECHNOLOGIES, SUCH AS IN HEALTH CARE, OR WITH ALLEVIATION OF UNDESIRABLE BURDENS ARISING FROM PARTICULAR USES OF TECHNOLOGY, SUCH AS AIR POLLUTION FROM AUTOMOTIVE TRANSPORTATION AND ENERGY PRODUCTION. IN RETROSPECT, WE SHOULD HAVE PAID MORE ATTENTION TO TIME-SCALE AND TOTAL COST. FOR WITHOUT SUCH CONSIDERATION THE SEEKING OF THESE DESIRABLE OBJECTIVES HAS CONTRIBUTED TO INFLATION.

IF THESE ARE SOME OF THEIR CONTRIBUTIONS TO THE PROBLEM, WHAT DO SCIENCE AND TECHNOLOGY HAVE TO CONTRIBUTE TO THE SOLUTION? COULD THEY CONTRIBUTE MORE AT THIS TIME?

THERE IS GOOD EVIDENCE THAT TECHNOLOGICAL OPTIONS ARE NOW AVAILABLE AND KNOWN TO INDUSTRY FOR IMPROVEMENTS IN THE EFFICIENCY OF ITS PROCESSES THAT COULD HELP REDUCE COSTS. YET, THESE OPTIONS ARE NOT BEING EXERCISED ADEQUATELY BECAUSE OF PRIVATE AND GOVERNMENT BARRIERS. WE HAVE EXAMINED MANY SUCH IMPEDIMENTS. ONE COMMON TO PRODUCTION AND SERVICE INDUSTRIES

INVOLVES THE SCALE OF THE ENTERPRISE OR OF THE RESOURCES THAT CAN BE APPLIED. WAYS MUST BE FOUND TO RECONCILE THE COMPETITIVENESS OF MANY SMALL ENTERPRISES WITH THE DETRIMENTAL ASPECTS OF INDUSTRY FRAGMENTATION. POOLING OF RESOURCES ON AN INTRA-INDUSTRY BASIS FOR COMMON PRODUCTIVITY PROBLEMS WOULD HAVE A SIGNIFICANT PAY-OFF.

GOVERNMENT STANDARDS AND REGULATIONS INTENDED TO ENSURE QUALITY CAN INHIBIT THE INTRODUCTION OF ADVANCED MANUFACTURING TECHNIQUES - AS FOR BUILDING CODES IN THE CONSTRUCTION INDUSTRY. LIKEWISE FOR SOME POLICIES ESTABLISHED FOR OTHER PURPOSES - TAX REVENUE, ANTI-TRUST. SOME OF THESE SAME BARRIERS, INCLUDING THE HIGH COST OF CAPITAL HAVE BEEN IDENTIFIED WITH RESPECT TO ECONOMIC HEALTH IN GENERAL AT SEVERAL OF THE PRE-SUMMIT CONFERENCES. IT IS IMPERATIVE THAT IN EXAMINING THE SIGNIFICANCE OF THESE BARRIERS AND INTRODUCING ANY NECESSARY CHANGES, THE PRESIDENT'S ECONOMIC ADVISERS TAKE FULLY INTO ACCOUNT THE LIKELY INFLUENCE OF SUCH POLICY CHANGES ON THE EFFECTIVE USE OF TECHNOLOGY FOR THE IMPROVEMENT OF EFFICIENCY AND PRODUCTIVITY.

WE CANNOT LAY ALL BLAME ON INSTITUTIONAL FACTORS. THERE IS A NEED TO QUESTION WHETHER THE PRESENT OBJECTIVES AND EMPHASIS IN THE TOTAL PRIVATE AND PUBLIC EFFORT IN RESEARCH AND DEVELOPMENT DIRECTS ADEQUATE ATTENTION TO THE ISSUES OF EFFICIENCY AND PRODUCTIVITY. I AM PLANNING TO REVIEW THE FEDERALLY-SUPPORTED EFFORTS IN THIS RESPECT. ALTHOUGH SUCH EFFORTS HAVE

GROWN IN RECENT YEARS IN THE SEVERAL FEDERAL AGENCIES ASSOCIATED WITH CIVILIAN TECHNOLOGY, THEY STILL APPEAR UNBALANCED IN RELATION TO THE IMPORTANCE OF THE PROBLEMS. IN ADDITION, I SHALL BE SEEKING THE ADVICE OF THE PRIVATE SECTOR AS TO THE APPROPRIATENESS OF THE TOTAL NATIONAL EFFORT.

IT IS APPARENT FROM THE DISCUSSIONS IN SEVERAL OF THE PRE-SUMMIT MEETINGS THAT THE IMPACT ON NATIONAL WELL-BEING OF POLICIES TO ENHANCE THE QUALITY OF LIFE IS ONE OF THE MOST CONTROVERSIAL ISSUES OF THIS CONFERENCE. PERHAPS SOME LIGHT IS THROWN ON THE CAUSES OF THE DISAGREEMENTS BY PROFESSOR JAMES Q. WILSON, HARVARD PROFESSOR OF POLITICAL SCIENCE, IN HIS RECENT FORMULATION OF TWO GENERAL LAWS BASED ON ANALYSIS OF RESEARCH EVALUATIONS OF PUBLIC POLICY. FIRST LAW: ALL POLICY INTERVENTIONS IN SOCIAL PROBLEMS PRODUCE THE INTENDED EFFECT - IF THE RESEARCH IS CARRIED OUT BY THOSE IMPLEMENTING THE POLICY OR THEIR FRIENDS. SECOND LAW: NO POLICY INTERVENTION IN SOCIAL PROBLEMS PRODUCES THE INTENDED EFFECT - IF THE RESEARCH IS CARRIED OUT BY INDEPENDENT THIRD PARTIES, ESPECIALLY THOSE SKEPTICAL OF THE POLICY. I REPEAT THESE LAWS HERE NOT OUT OF CYNICISM, BUT RATHER TO EMPHASIZE THE NEED FOR CONTINUED IMPROVEMENT IN THE QUANTITATIVE ANALYTICAL TECHNIQUES OF THE SOCIAL SCIENCES THAT IN THE LONGER RUN MAY PROVE PIVOTAL FOR RESOLVING BOTH POLICY AND PRODUCTIVITY ISSUES.

FOR THE NEARER TERM, THE PHYSICAL AND LIFE SCIENCES DO OFFER SPECIFIC OPPORTUNITIES FOR THE DEVELOPMENT OF INFORMATION AT RELATIVELY LITTLE COST THAT WOULD PERMIT WISER DECISIONS ON SEVERAL POLICY QUESTIONS. AN EXAMPLE IS THAT OF AIR QUALITY STANDARDS, WHERE THE RELEVANT ANALYSES REST ON RATHER FRAGILE DATA. THOSE WHO FAVOR EMPHASIS ON THE ENVIRONMENT SAY THAT, SINCE THE DATA ARE UNCERTAIN, WE MUST LEAN ON THE SIDE OF PROTECTING THE INTEGRITY OF THE ENVIRONMENT. FROM AN ANALOGOUS CONCERN FOR THE SHORT-RUN INTEGRITY OF THE ECONOMY, THOSE INVOLVED IN PRODUCTION OF ENERGY OR AUTOMOBILES INSIST THAT WE MUST FAVOR THE ECONOMY. RELATING TO THE HIGH COST OF UNWISE DECISIONS, ONLY MODEST EXPENDITURE FOR BETTER DATA WOULD PERMIT A MUCH CLEARER AND DEFINITIVE RESOLUTION OF SUCH CURRENT CONTROVERSIES.

IN THE MEETING OF SCIENTISTS, TECHNOLOGISTS AND ECONOMISTS THAT I HELD LAST WEEK AT THE REQUEST OF THE PRESIDENT, A VARIETY OF OTHER RECOMMENDATIONS WERE DEVELOPED CONCERNING THE ROLE OF SCIENCE AND TECHNOLOGY. I WILL JUST IDENTIFY AT THIS TIME SOME SPECIFIC AND ILLUSTRATIVE POINTS. IN THE AREA OF AGRICULTURE AND FOOD, WE HAVE ONE OF THE MOST SENSITIVE COMPONENTS OF INFLATION. FOOD COSTS ARE A MAJOR ITEM IN THE AVERAGE FAMILY BUDGET. INCREASES IN PRODUCTIVITY HAVE BEEN SPECTACULARLY HIGH IN FOOD PRODUCTION, BUT THE OTHER PART OF THE TOTAL FOOD SYSTEM - PROCESSING, TRANSPORT, STORAGE AND

RETAILING - HAVE SHOWN MUCH SMALLER GAINS. SIGNIFICANT PROGRESS IN COST REDUCTION WILL DEPEND ON AN INCREASE IN THE INVENTORY OF TECHNOLOGICAL OPTIONS FOR THE TOTAL SYSTEM, RATHER THAN SIMPLY FOR GROWING CROPS. SUCH AN INCREASE DEMANDS EXAMINATION OF THE CURRENT EMPHASIS IN AGRICULTURAL RESEARCH AND OF THE POSSIBILITIES FOR BETTER COORDINATION BETWEEN SPECIALIZED COMPONENTS OF THE FOOD SYSTEM. SUCH CHANGES WILL ALSO DETERMINE THE CONTINUED ABILITY OF THE AGRICULTURAL SECTOR TO BE A MAJOR POSITIVE ELEMENT IN THE U.S. BALANCE OF PAYMENTS AND IN MEETING WORLD FOOD NEEDS.

IN THE FIELD OF HEALTH CARE, THERE ARE SIZEABLE OPPORTUNITIES FOR SCIENCE AND TECHNOLOGY TO MAKE IMPROVEMENTS IN EFFICIENCY AND EFFECTIVENESS. HOWEVER, CERTAIN PRE-CONDITIONS MUST BE SATISFIED BY A COMBINATION OF BOTH PUBLIC AND PRIVATE EFFORTS BEFORE FULL ADVANTAGE CAN BE TAKEN. THERE ARE UNIQUE CHARACTERISTICS OF BOTH DEMAND AND SUPPLY IN HEALTH CARE WHICH REQUIRE PROMPT ATTENTION IF CURRENT INFLATIONARY TRENDS ARE TO BE AMELIORATED. FURTHER, THERE ARE OTHER INSTITUTIONAL BARRIERS AND PERVERSE INCENTIVES WHICH MUST BE DEALT WITH. AN IMMEDIATE ACTION THAT WOULD BEAR ON THESE ISSUES WOULD BE THE CREATION, BY A CONSORTIUM OF ORGANIZATIONS FROM THE PRIVATE SECTOR, OF AN INSTITUTE FOR HEALTH CARE. SUCH AN INSTITUTE, IN COOPERATION WITH THE GOVERNMENT WOULD AIM SPECIFICALLY AT IMPROVING THE MANAGEMENT, PRODUCTIVITY AND OVERALL EFFECTIVENESS OF THE HEALTH CARE INDUSTRY THROUGH EVALUATION, GATHERING OF INFORMATION, AND RESEARCH AND DEVELOPMENT.

ESPECIALLY FOR THE MANUFACTURING SECTOR, USE OF THE POSITIVE POWER OF GOVERNMENT STANDARDS, REGULATIONS AND PROCUREMENT COULD PRODUCE IMMEDIATE EFFECTS IN IMPROVING PRODUCTIVITY IN SOME OTHERWISE UNPROGRESSIVE INDUSTRIES. INCENTIVES COULD BE PROVIDED IN THIS WAY FOR ACHIEVING HIGHER PERFORMANCE, LOW LIFE-CYCLE COSTS, AND LOW CONSUMPTION OF MATERIALS AND ENERGY. SIMILARLY, DIS-INCENTIVES WOULD REDUCE PRODUCT DIFFERENTIATION AND LACK OF STANDARDIZATION IMPEDING LOWER COSTS FROM AUTOMATION IN WAREHOUSING AND DISTRIBUTION. AN IMPORTANT FEATURE THAT IS INSUFFICIENTLY RECOGNIZED IS THE EVIDENCE THAT INCREASED SAFETY DOES CORRELATE WITH INCREASED PRODUCTIVITY.

FOR ALL SECTORS OF THE ECONOMY, THE CONTINUED ABILITY TO SUSTAIN THE EFFORTS TO UTILIZE TECHNOLOGY EFFECTIVELY WILL DEPEND ON THE MAINTENANCE OF THE TOTAL STREAM FLOW, INCLUDING THE ORIGINAL GENERATION OF NEW KNOWLEDGE, AND THE REMOVAL OF IMPEDIMENTS TO ITS FLOW. TECHNOLOGY TAKES TIME TO DEVELOP AND ONE CAN REACH OUT FOR TECHNOLOGICAL OPTIONS ONLY IF AN INVENTORY OF SUCH OPTIONS HAS BEEN BUILT AND MAINTAINED. IN ITS ABSENCE, WE WILL LACK THE FLEXIBILITY REQUIRED TO MEET THE CHANGING RANGE OF OBJECTIVES OF PUBLIC POLICIES, NOW AND IN THE FUTURE.

SOME TWO HUNDRED YEARS AGO, A REMARKABLE AMERICAN AND ONE OF THE FATHERS OF THE CONSTITUTION COMBINED MANY OF THE CHARACTERISTICS THAT WE NOW SEE NECESSARY TO MOUNT AN ATTACK ON

CURRENT INFLATIONARY TRENDS. BENJAMIN FRANKLIN IS PERHAPS BEST KNOWN AS "THE FIRST APOSTLE OF FRUGALITY AND THE PATRON SAINT OF SAVINGS ACCOUNTS." WHILE THESE FEATURES ARE CENTRAL TO OUR PRESENT CONCERNS, HE ALSO WAS A SUCCESSFUL BUSINESS MAN AND AN INTERNATIONALLY KNOWN SCIENTIST WITH A REMARKABLE TALENT FOR PRACTICAL INVENTION. IN PARTICULAR, HE WAS CONCERNED WITH THE USE OF SCIENCE AND TECHNOLOGY TO MAKE LIFE EASIER AND PLEASANTER THROUGH MORE EFFICIENT USE OF RESOURCES. I SUGGEST THE THRUST OF OUR PRESENT PLANNING TO COMBAT INFLATION HAS MUCH TO GAIN FROM CONSIDERATION OF THE EFFORTS OF THIS UNUSUAL MAN AT THE VERY BEGINNING OF OUR UNUSUAL REPUBLIC.

REMARKS OF H. GUYFORD STEVER
SCIENCE ADVISER TO THE PRESIDENT
THE CONFERENCE ON INFLATION
WASHINGTON, D. C.
SEPTEMBER 28, 1974

MR. PRESIDENT, DISTINGUISHED PARTICIPANTS:

THE MEETING ON SCIENCE, TECHNOLOGY AND THE ECONOMY WAS DIRECTED TO IDENTIFYING PRIORITIES FOR THE REDUCTION OF INFLATIONARY TRENDS THROUGH

A. REMOVING BARRIERS TO EFFECTIVE USE OF EXISTING TECHNOLOGY, AND

B. INTRODUCING NEW TECHNOLOGY.

THREE SPECIFIC AREAS APPEAR TO OFFER THE GREATEST POTENTIAL LEVERAGE FOR LOWERING INFLATION. THESE ARE:

A. MANUFACTURING, MATERIALS AND ENERGY.

B. HEALTH SERVICES.

C. AGRICULTURE AND FOOD.

TECHNOLOGICAL PROGRESS HAS BEEN RESPONSIBLE FOR THE PRODUCTIVITY GAINS AND IMPROVEMENTS IN THE SUPPLY AND QUALITY OF GOODS AND HAS HELPED MAKE THE U.S. A LEADER IN BOTH STANDARD OF LIVING AND QUALITY OF LIFE. ECONOMIC GROWTH, WITHOUT INFLATION, WILL REMAIN HIGHLY DEPENDENT ON TECHNOLOGY AND ITS APPLICATION.

ALTHOUGH WE HAVE DONE VERY WELL INDEED IN THE PAST, THERE ARE SOME SPECIFIC ACTIONS WHICH CAN ACCELERATE THE APPLICATION OF SCIENCE AND TECHNOLOGY.

IN THE MANUFACTURING SECTOR THERE ARE OPPORTUNITIES FOR IMPROVING PRODUCTIVITY. EXAMPLES ARE THE WIDE USE OF INFORMATION HANDLING FOR PRODUCTION SCHEDULING, INVENTORY CONTROL AND CASH MANAGEMENT, AND THE APPLICATION OF NEW PROCESSES WHICH REDUCE COSTS BY USING LESS CAPITAL, ENERGY AND MATERIALS.

REPEATED SEVERAL TIMES IN YESTERDAY'S CONFERENCE DISCUSSIONS WERE CALLS FOR FRUGALITY AND SAVING, FOR CONSERVATION OF ENERGY AND MINERALS AND INCREASE IN THEIR DOMESTIC SUPPLY. THE NEED FOR RESEARCH AND TECHNOLOGY TO ACHIEVE THESE OBJECTIVES WAS STRESSED. SOME SUCH ACTIVITIES ARE ALREADY STARTED FOR ENERGY SUPPLY. IN SUPPORTING THESE EFFORTS, I HAVE REPEATEDLY EMPHASIZED THE CORRESPONDING OPPORTUNITIES FROM INCREASED USE OF CONSERVATION TECHNOLOGY. CONSERVATION MEANS BOTH <u>EFFICIENCY</u> AND <u>FRUGALITY</u> IN ENERGY AND MATERIALS USE BY BOTH INDUSTRY AND THE CONSUMER. IT BOTH REDUCES DEMAND AND INCREASES THE AVAILABLE SUPPLY.

THE HEALTH CARE INDUSTRY IS LABOR INTENSIVE AND THE APPLICATION OF TECHNOLOGY AND MANAGEMENT SCIENCES CAN MAKE IT MUCH MORE EFFECTIVE. SINCE HEALTH CARE IS NOW A HIGHLY DISPERSED INDUSTRY, ITS PRODUCTIVITY CAN BE ENHANCED BY TREATING IT AS A SYSTEM FOR DELIVERY. THE CREATION OF HEALTH CARE INSTITUTES, REGIONAL CENTERS AND OTHER CENTRALIZATION TECHNIQUES WOULD PERMIT THE BENEFITS OF MODERN TECHNOLOGY TO BE MADE AVAILABLE TO LARGE SECTORS OF THE POPULATION AT LOWER COST.

OUR PHENOMENAL AGRICULTURAL PRODUCTIVITY IS THE RESULT OF THE APPLICATION OF BIOLOGICAL AND CHEMICAL KNOWLEDGE AND THE INVENTION OF INGENIOUS MACHINERY.

THIS TREND MUST CONTINUE. FORTUNATELY, THE LAST THREE DECADES HAVE BEEN THE MOST PRODUCTIVE PERIOD IN THE HISTORY OF BIOLOGICAL SCIENCE. THAT NEW SCIENCE NOW PRESENTS GREAT OPPORTUNITIES FOR THE FUTURE OF AGRICULTURE. BUT OTHER AREAS IN THE FOOD SYSTEM, PARTICULARLY IN FOOD PRESERVATION, DISTRIBUTION AND MARKETING NEED MUCH MORE ATTENTION, AND ARE SUSCEPTIBLE TO THE SAME IMPROVEMENTS AS WE HAVE SEEN IN AGRICULTURE ITSELF.

MR. PRESIDENT, IN SHORT, WE RECOMMEND THAT EVERY PIECE OF LEGISLATION AND EVERY EXECUTIVE ACTION BE EXAMINED BEFOREHAND TO BE SURE THAT IT DOES NOT IMPEDE AND INDEED ENCOURAGES THE GENERATION AND USE OF BENEFICIAL TECHNOLOGY.

AND, MR. PRESIDENT, FINALLY YOU AND THE CONGRESS MUST INSURE THAT WE CONTINUE TO EXCELL IN SCIENCE SO ESSENTIAL TO THE LONG RANGE ECONOMIC WELL BEING OF THE NATION.

THE SCIENCE AND TECHNOLOGY CONFERENCE ON INFLATION

Summary

September 18, 1974
Washington, D. C.

TABLE OF CONTENTS

	Page
Narrative Summary	1
Agenda	9
List of Participants	10

NARRATIVE SUMMARY

I. GENERAL

The meeting on Science, Technology and the Economy consisted of a main session on Wednesday, September 18, preceded by smaller working group sessions on the evenings of September 16 and 17. During the latter, a review of the national economy and the federal budget was provided by the Office of Management and Budget.

The meeting was directed most strongly to identifying priorities for reduction in inflationary trends through (a) removing barriers to effective use of existing technology, (b) introducing new technology and (c) application of improved analytical methods. In keeping with this emphasis on priorities, three specific sectors were identified for detailed examination as offering the greatest potential leverage for contributing to the lowering of inflationary pressures in the national economy in both short and long term through science and technology. These three illustrative sectors were (a) manufacturing, materials and energy, (b) health services and (c) agriculture and food. Detailed position papers and specific issues for each sector were provided to participants in advance of the meeting. The summary presented here points up a number of features common to these sectors, and there was agreement among the meeting participants that similar problems and opportunities exist in several other sectors of the national economy. It is useful here to remark on several general points that emerged from the discussions, before summarizing the outcome of the sector analyses.

There is worldwide recognition that the growth and strength of the U. S. economy is associated in large part with the stimulation of technology and effective use of its opportunities. However, over the past decade significant contributions to inflationary tendencies are associated with two national developments involving technology. The first is the introduction of policies intended to correct social costs incurred by rapid growth of certain technologies - e. g., automobile transportation, energy. The second is the introduction of policies to extend the benefits of specific technologies - e. g., health care. The contributions to inflation have resulted from inadequate recognition in the policy-making process, given the time-scale set for policy implementation, of the need to (a) stimulate the necessary and optimum corrective technology to ensure least-cost solutions, and (b) create the environment to best ensure the least-cost application of desirable technology.

In particular, there is evidence that responsiveness to providing technological change to meet regulatory requirements has been obtained at the price of diverting research and development resources away from process or

product improvement in some key industries. The tools and information for a proper analysis of total (economic and social) cost and benefits are emerging only slowly. Accordingly, greater attention should be paid now to re-assessing the desirable balance point, given present knowledge, between the rate of striving for laudable social goals and the rate of accumulation of measurable economic costs. At the present time, greater effort is needed to improve the quality of the scientific measurements which form the basis of wise public judgment as to the desirability of specific goals in such important areas as environmental quality, safety and health care. Likewise, appropriate effort and emphasis is needed in the national science and technology effort, both public and private, to sustain the creation of technological options that can provide the flexibility required to meet the changing range of objectives of public policies, now and in the future.

II. MANUFACTURING SECTOR

There was general agreement that technological progress, manifested in productivity gains and improvements in the supply and quality of goods produced, has a strong influence on economic growth and the control of inflation. Approximately seventy-seven percent of the economic growth which occurred during the postwar period can be attributed to technological progress. Continued economic growth will depend on continued activity in science and technology which will provide future technological options for improving productivity with the flexibility necessary to be responsive to changing emphases in public policy. Historically, technology has had a particularly significant effect on productivity in the manufacturing sector. Its potential for further improving productivity in this sector in the future is believed to be high relative to that for the agriculture and service sectors.

It was recognized that there are essentially two avenues by which technology can improve productivity in the manufacturing sector. First, research and development resources may be re-allocated to fund those programs which have the greatest leverage on obtaining significant productivity improvements; such expenditures would thus contribute less to inflation than they would without the re-allocation. Second, initiatives can be undertaken which eliminate policies and institutional factors which tend to cause barriers to improved productivity. The first avenue will lead to productivity improvement over the long-term while the second avenue can lead to more immediate results.

Several participants stressed that major barriers in the manufacturing sector to the implementation of productivity - enhancing technology arise frequently from workers resistance to change and from institutional and organizational inertia. Furthermore, there are indications that these barriers are becoming even more pervasive. They reflect, in part, the workers perception that technological change sometimes causes side effects undesirable for the workers involved, such as job dislocation, reduced employment opportunities, and reduced job satisfaction from downgraded job skills, lack of challenge and opportunity, de-humanization of the working environment, increased boredom. Government policies which are designed to create incentives for greater application of technology must give close attention to such socio-economic factors if they are to be effectively implemented.

For impact on inflationary pressures in the near term, it was widely agreed that:

Significant opportunities exist for improving productivity in the manufacturing sector by increasing the efficiency of the production process. These efficiencies can best be achieved (1) through wider application of advanced information technologies for production scheduling, inventory control, cash management, etc.; (2) through the application of advanced computer-managed systems for discrete-piece manufacturing; (3) through the application of techniques such as hot iso-static pressing of powdered metals, precision forging, etc. which reduce the manufacturing operations required to meet dimensional specifications and the amount of scrap produced; and (4) through the use of more efficient coservation and conversion techniques which reduce energy and material requirements.

Furthermore, changes in Government standards and regulations could produce immediate effects on the use of existing technology for improving efficiency and productivity. Here, special attention should be directed (1) toward achieving uniformity and compatability of codes and standards within and between states which will allow advanced manufacturing techniques to be applied to improve productivity in building construction and (2) toward the revision of Government procurement and contracting procedures which currently contain dis-incentives for contractors to invest their discretionary capital to reduce costs and increase productivity.

Likewise, the purchasing power of the Government can be used to create incentives for the application of technology to improve manufacturing productivity. Products can be specified in terms which place incentives on achieving high performance, low life-cycle costs, and low materials and energy consumption. Similarly, dis-incentives can be created to discourage excessive product differention and lack of standardization which impedes implementation of automation in warehousing and distribution.

In identifying action that should be taken now to be capable of influencing inflationary trends over the longer term, the following items were seen to be important:

Barriers to the development of productivity-enhancing technology can arise as an unforseen and unintended result of Government policy-making. The extent to which current tax, regulatory, anti-trust, and standard-setting policies, together with existing institutional barriers, impede the application of technical progress to improve manufacturing productivity requires examination with a view to minimizing the impedence.

Manufacturing productivity can be enhanced through development of an institutional mechanism which would pool available resources for manufacturing research and development, promulgate uniform procedures for measuring total productivity at the firm level, and provide statistical data on the rate of productivity change. Industry fragmentation can impose limits on

the scale of development programs which can be undertaken to improve manufacturing productivity, and joint research and development programs tend to be discouraged because of anti-trust considerations. The establishment of an institutional mechanism to allow the pooling of resources on an intra-industry basis and which would be directed toward common productivity problems should have a significant pay-off.

Finally, wide dispersions exist between the most efficient manufacturing plants and the less efficient plants in various industries. Government actions which create improved technology transfer systems and investment incentives could serve to reduce these gaps and produce important productivity gains.

III. HEALTH SERVICES

The questions which were posed of the industry of health care were similar to those raised for other industries (e.g., what was the particular contribution to inflation, what opportunities were there for its relief, what special opportunities were there for science and technology toward improvements in productivity, efficiency, and effectiveness, etc.). These questions were answered for health care in a way which reflected the peculiar characteristics of that industry (unusually inflationary, highly labor-intensive, high degree of elasticity of demand not always clearly related to real need, highly fragmented in its organization, and possessed of a series of incentives which did not particularly favor improvement).

There appeared to be few opportunities for the direct application of science and technology to make sizeable alterations in the inflationary character of that industry in the immediate future. However, certain actions should be started now in order to be able to realize tangible results later on. By contrast, there were clearly seen to be enormous opportunities to bring about economic stability in the health care sector over the medium and longer term. A question central to this issue was, assuming the advent of a national financing scheme for health care (national health insurance) and of suitable regulatory mechanisms, are there roles for science and technology that can help solve problems of inflation and the poor record of productivity gains? The answer was clearly in the affirmative in the long run. However, this answer was accompanied by an impressive list of qualifications and prior conditions which must be satisfied in order to realize the benefits from science and technology and which reflect a series of institutional barriers and perverse incentives which must be altered:

1. The present generation of health insurance mechanisms and the present arrangements for capital financing deliberately foster in-patient hospitalization accompanied by expensive services often of uncertain benefit.

2. Present practices strongly encourage the use of supportive (but expensive) technologies rather than less expensive, but curative technologies.

3. Some forms of health insurance under consideration (such as catastrophic insurance alone) will promise to be further inflationary.

4. Health care is provided to a great extent in the form of disaggregated, individual, enterpreneural units.

5. Defensive medicine, caused by the thrust of a malpractice climate, is highly expensive.

6. Present regulatory schemes, although desirable in concept, promise to be inflationary in practice if not done properly.

A combination of both public attention through governments and private efforts will be needed to bring about the necessary conditions for the full participation in the benefits of science and technology. Contrary to the situation perhaps in some other sectors, both the demand and the supply aspects require forthright and deliberate attention. This attention should be directed at all of the aspects of financing, regulating, organizing and evaluating health care, at assuring adequate information, and at finding solutions to the highly expensive and unproductive patterns of accommodation to malpractice concerns.

As to specific actions, there was agreement that there was an immediate need for a new institutional setting in order to fulfill the tasks of evaluation, information, and research and development aimed at improving the management, productivity, efficiency, and effectiveness of the health care industry. Specifically, an Institute of Health Care Studies should be created by a consortium of organizations from the private sector. Such an institution should be designed to harmonize the best resources of government, industry and universities and should bridge the public and private sectors. This institute should receive its financial support ultimately from funds intrinsic to the health services industry including both the private and the governmental aspects. This notion would go far toward combining the advantages of a creative, private-public partnership with those of supporting research and development in the health care industry in the way which has been traditional and so productive for much of American industry.

Finally, for the long term, the discussions recognized the scientific limitation on the improvement of health (extension of life, and reduction of mortality) to be overwhelming. It is only through continued investments in futures through fundamental research that expensive supportive therapies ("halfway technologies" such as the iron-lung and the current kidney machines) can be replaced by much less costly definitive and curative methods of treating disease.

IV. AGRICULTURE AND FOOD

This area has a profound influence on the inflationary picture, not only in terms of agricultural abundance being basic to changes in costs of food, but also in terms of the influence of agricultural exports on the balance of payments; in 1973 agriculture provided the largest single contribution ($9.3 billion) to the trade surplus. Science and technology offer some leverage on agriculture for the short term, but their principal influence lies in actions now and in the near future that would contribute to the continuous rise in productivity of the total food system -- production, handling, transportation, storage, processing and marketing -- that is necessary to exert a steady downward pressure on inflationary trends into the longer term. At the present time, food and agriculture maintain a much smaller backlog of unexploited technology than, for example, manufacturing generally. The present structure of research and technology support for agriculture was asserted by several of the discussion participants to be less vigorous than needed to meet the nation's demands over the coming decade. The group called for a strengthening of the research and development organization, in both the basic and the applied aspects, as being essential to meeting these needs, in particular by strengthening the cross-ties between the biological sciences and the applied agricultural technology.

Since the Federal Government is the source of a large proportion of the research funding for agriculture and food, it is in a position to effect an improvement in the recognition of the value of selecting research emphasis on the basis of its contribution to the effectiveness of the total food system, and also to effect a better coordination of research activities in this area. The opinion was expressed that efficiency would be enhanced by a greater coordination of both Federal and state research under regional directors, structured either around specific crops or around natural geographic regions of the country.

Numerous participants indicated that, in view of the inflationary pressures on food prices of regulatory requirements on the agriculture and food industry, a mechanism is needed to better assess consumer and social costs arising from regulatory controls. Calculations of the costs and the benefits both for the consumer and for society would provide a realistic means of assessing the merits of existing and pending legislation. This would apply especially to food standards, labeling, pesticide tolerances, effluents from processing plants, and related regulatory standards, including the question of inconsistencies with the standards for other effluents, e.g., urban sewage. There was agreement that some opportunities for reduction in these costs should result from research on alternative use of processing waste flows.

The recurring use of transportation in the food system was noted, and in view of the already increasing shortage of both railroad and truck units, the inflationary pressures in the agricultural sector could worsen with further deterioration of the transportation system.

Suggestions were made that a mechanism of monitoring both inventory and location of railroad cars and truck transports is badly needed. A nation-wide system, utilizing contemporary information technology, would maximize the efficiency of transportation by permitting optimum control by operators of location and despatch of transport units.

Science, Technology and the Economy

AGENDA

Wednesday, September 18, 1974

Chaired by Dr. H. Guyford Stever, Science Adviser to the President

8:30 a.m.	Remarks by the Chairman
8:35 a.m.	Agriculture and Food: Assessment and discussion
9:00 a.m.	Health Services: Assessment and discussion
10:00 a.m.	Manufacturing, materials and energy: Assessment and discussion
10:30 a.m.	General Discussion: Development of principal priorities for attention with respect to assisting in the alleviation of inflation, and specific recommendations for action. (a) Short term (b) Long term
12:30 p.m.	Break
1:00 p.m.	Lunch
Afternoon	Staff and appropriate meeting members work on preparation of specific issue papers.

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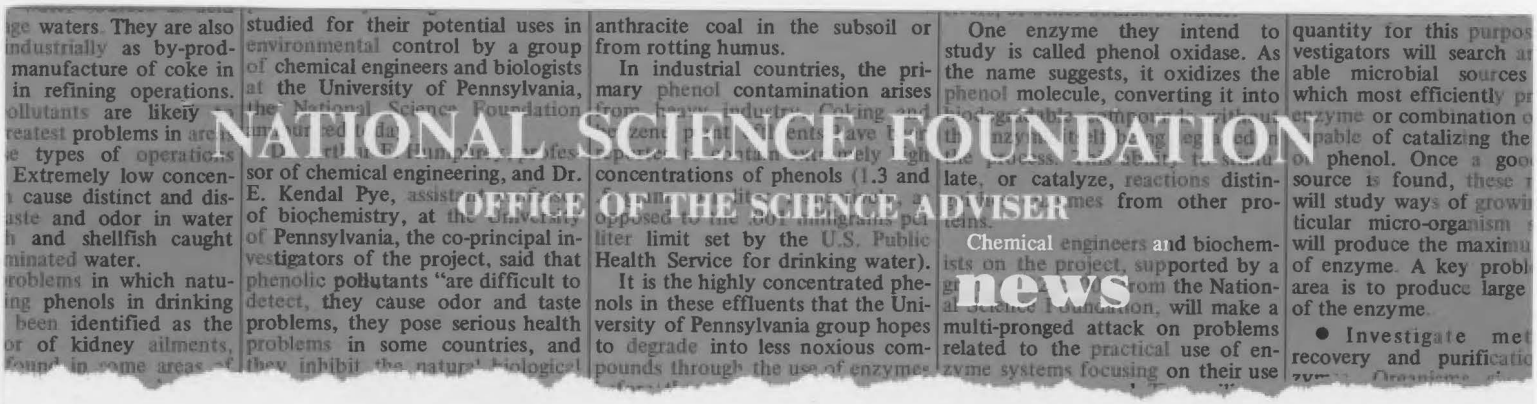

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REPORT ON THE FEDERAL R&D PROGRAM

FY 1976

The Federal Council for Science and Technology, an interagency committee of policy-level officials representing the major R&D performing agencies, today released a "Report on the Federal R&D Program -- FY 1976" which provides a summary of activities of 17 agencies in applying science and technology to a wide range of national issues.

In releasing the report, the Science Adviser and the Chairman of the Council, Dr. H. Guyford Stever, has pointed out that the report, in addition to covering individual agency programs, includes functional analyses that cut across individual agency lines in nine selected areas of special interest, such as energy, basic science, food, health and biomedicine, and the environment.

This is the first FCST report which addresses the total Federal R&D effort, and, as such, it provides an annual report on science and technology that focuses more strongly on the future rather than the past.

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TOTAL PROGRAM

The budget of the United States for FY 1976 includes approximately $21 billion for research and development programs. This is a 15% increase in estimated obligations over the FY 1975 R&D program of $18.8 billion. In addition, $1 billion will be obligated for R&D facilities in FY 1976.

While the impact of inflation has been felt in all Federal programs, in FY 1976 the Federal R&D program should experience growth that generally makes adjustments that offset expected inflationary pressures. This increase will maintain the forward thrust of high priority programs in energy, national defense, and the environment as well as support the search for fundamental new knowledge. Total obligations for R&D since 1965 are shown in Figure 1.

In FY 1976 approximately $7.4 billion is planned for civilian programs, including energy, health, education, agriculture, environment, urban problems, transportation, and other areas, an increase of $0.8 billion or 12% over FY 1975. This continues increases in support for civilian R&D programs over the last several years. Since 1967, civilian R&D programs have grown from obligations of $3.3 billion to $7.4 billion in 1976 for an overall 124% increase (see Figure 2).

AGENCY PROGRAMS

Health R&D will continue to receive the largest single share of Federal civilian R&D dollars, approximately $2.6 billion. Of this, the National Institutes of Health will receive $1.6 billion. Major current thrusts are in knowledge development, ranging from understanding of basic physiological and disease processes, including continued effort in cancer and heart research, to prevention and quality assurance, and in improving systems of health care delivery.

About one-fourth of the civilian R&D budget for 1976 is planned for energy, with the largest share, $1.55 billion, going to the Energy Research and Development Administration. This reflects the national objective to utilize more fully domestic energy resources.

There are, in addition, program increases in the Departments of Transportation, Interior, Commerce, Housing and Urban Development and Agriculture as well as in National Aeronautics and Space Administration, National Science Foundation, Environmental Protection Agency and the Nuclear Regulatory Commission, reflecting the general recognition of the role of R&D in contributing to the solution of a wide range of national problems.

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The Housing and Urban Development increase provides for community development research and for research assisting in the development of State and local government capability for determining and testing new research methods. Transportation increases are for Federal Aviation Administration air traffic safety research, auto collision R&D, and research aimed at lowering operating costs by providing more efficient coordination of freight movements between railroad and truck. The Agriculture increase is mainly for high priority domestic programs to increase crop yields and productive efficiency.

The National Science Foundation program for conduct of research will increase by almost 10% to a total of $680 million in 1976, exclusive of facilities. Of this increase, special emphasis is being given to basic research in the scientific disciplines and in national research programs and centers, scientific equipment and the non-energy portion of the Research Applied to National Needs program.

In the field of space R&D, satellite projects to explore Mars, Venus and the outer planets will be continued as well as programs for observation of the sun. In addition, utilization of satellite systems for earth resources assessment (LANDSAT), weather prediction and thermal surveys of potential geothermal energy sources will be continued. An improved LANDSAT-C will be initiated. Space program R&D will increase by $200 million to a total of $2.9 billion for 1976. The increase projected for FY 1976 is primarily related to programmed buildup of development activity on the space shuttle.

Funding for defense R&D is projected to increase by $1.9 billion for a total of $11.4 billion in FY 1976, including military programs of the Energy Research and Development Administration. A major part of this increase reflects inflationary cost increases in major weapons systems developments. The DOD R&D program supports the maintenance of a strong deterrent posture through the development of an effective mix of system options for strategic and tactical forces. Examples of major programs are the B-1 manned strategic aircraft, the Trident missile and submarine system, and the Navy and Air Force air combat fighters.

Obligations for conduct of R&D are reported in Table 1.

-END-

FEDERAL R&D OBLIGATIONS, FY 1965 - 76 (EST.)

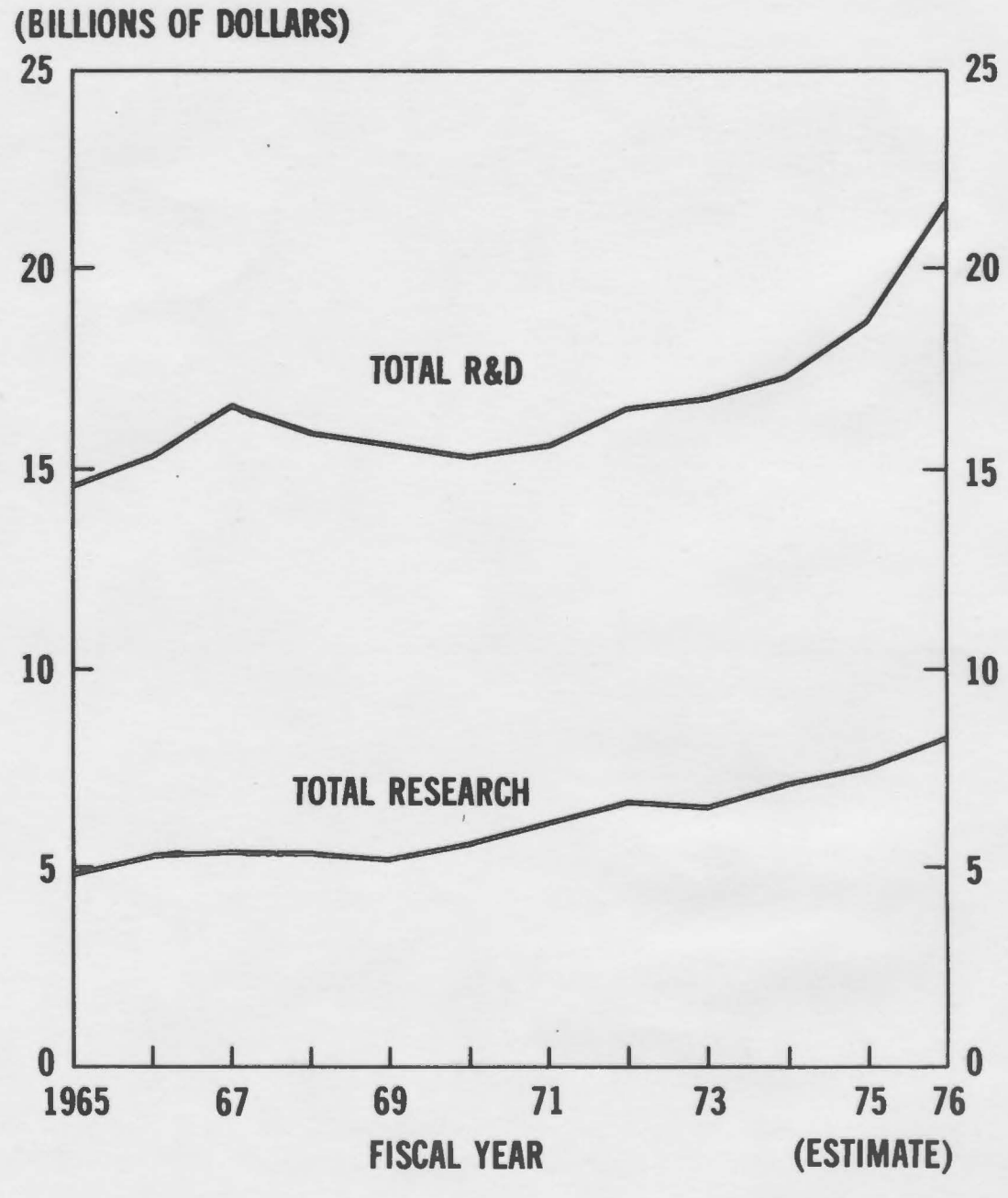

FIGURE 1

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CONDUCT OF RESEARCH AND DEVELOPMENT – OBLIGATIONS

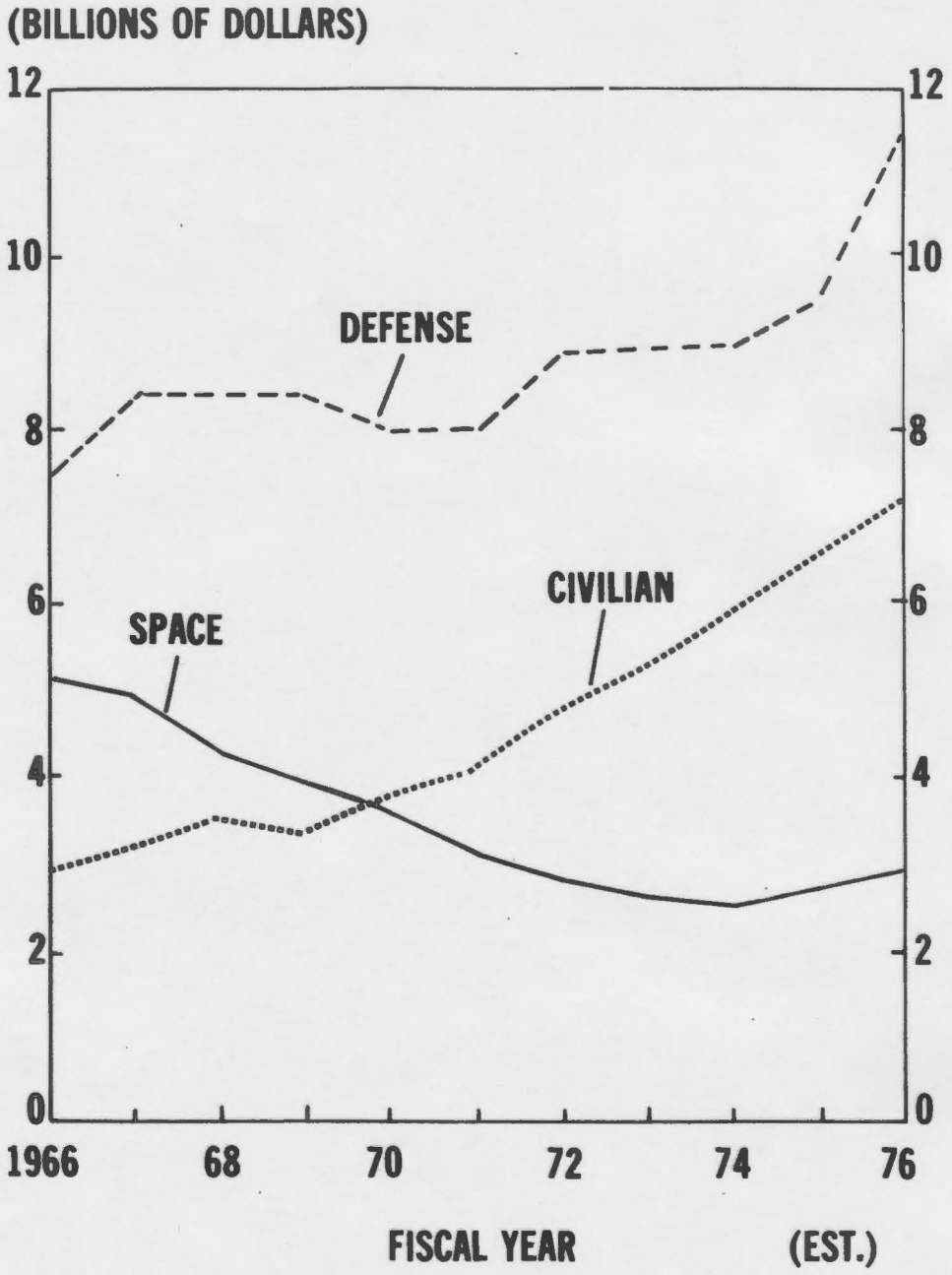

FIGURE 2

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TABLE 1

CONDUCT OF RESEARCH AND DEVELOPMENT
BY MAJOR DEPARTMENTS AND AGENCIES

(in millions of dollars)

	Obligations		
	1974 actual	1975 estimate	1976 estimate
Defense -- military functions	8,396	8,833	10,608
National Aeronautics & Space Administration	3,024	3,327	3,526
Energy Research & Development Admin.	1,475	1,893	2,346
Health, Education and Welfare	2,286	2,092	2,285
National Science Foundation	556	619	680
Agriculture	384	428	468
Transportation	370	368	402
Interior	198	303	315
Environmental Protection Agency	177	287	300
Commerce	181	211	230
Veterans Administration	87	102	102
Nuclear Regulatory Commission	44	59	96
Housing and Urban Development	65	58	65
Justice	37	67	45
All other	127	135	134
Total	17,409	18,780	21,602
Total Conduct of Research	7,163	7,545	8,256
Total Conduct of Development	10,246	11,235	13,346
Total R&D	17,409	18,780	21,602

1/6/75

NATIONAL SCIENCE FOUNDATION

Science and Technology Policy Office

Norm:

Per our telecon, herewith a copy of draft transmittal letter for the Federal Ocean Program report (April 1974). It will be bound into the book immediately after the title page, as in previous years.

Gil Blake

LETTER OF TRANSMITTAL

TO THE CONGRESS OF THE UNITED STATES

The Federal Ocean Program continues to build upon the base established during the late 60's and early 70's, with some shifts of emphasis in response to pressing national needs, such as increasing our domestic supplies of energy and other resources of the areas off our coasts. These and other activities in our coastal zone, coupled with our increasing environmental concerns, are leading to further growth of our coastal zone management and conservation programs, both at the Federal and at the State levels. All these programs and others, such as the development of our Merchant Marine, require a strong scientific and technological support, including improved maps, charts, and other data banks. We are also looking forward to a favorable outcome from the Law of the Sea Conferences occuring under the auspices of the United Nations in furtherance of world-wide peace and prosperity.

(Gerald R. Ford)

SAVE

FOR IMMEDIATE RELEASE FEBRUARY 28, 1975

Office of the White House Press Secretary

THE WHITE HOUSE

TO THE CONGRESS OF THE UNITED STATES:

I am pleased to submit to the Congress the Twenty-Fourth Annual Report of the National Science Foundation, covering fiscal year 1974.

One of the clear lessons of the past few years is that our society, as well as that of the rest of the world, is intimately tied to technology and the science that produces it. Certainly our own approaches to problems in energy, environment, food production, and the well-being of the national economy will include substantial contributions from science and technology. As a Nation we are fortunate to have an extraordinarily strong science and technology base to draw on in dealing with these and other important national problems.

The National Science Foundation has a key role in ensuring that the Nation maintains leadership in all fields of basic science from which our technological advances of the future will be derived.

The National Science Foundation programs in basic research range over fundamental studies of the structure and behavior of matter, the process of living things, the dynamics of the Earth and universe, energy and materials and many other areas described in this report. In addition, as this report shows, the Foundation is continuing, through its programs in science education, to assist in the development of the scientific manpower needed to meet tomorrow's technological challenges.

The research results contained in this report remind us of the changes that we have seen in our lives as a result of our investments in science. It is, I believe, a preview of many beneficial developments that will occur in coming years. I commend this report to you.

GERALD R. FORD

THE WHITE HOUSE,
February 28, 1975

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