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OSTP

THE WHITE HOUSE
WASHINGTON

Date: 8/14/90

TO: *Lee/Down*

FROM: CHARLES E. M. KOLB

- Action
- Draft Response
- FYI
- Let's Talk

COMMENTS:

Please review and send Tom any suggestions you may have. Thanks!

DRAFT: DO NOT QUOTE OR CITE

[August 13, 1990]

SCIENCE, TECHNOLOGY, AND THE DEPARTMENT OF DEFENSE

J. THOMAS RATCHFORD

Associate Director for Policy and International Affairs

Office of Science and Technology Policy

Executive Office of the President

Department of Defense

Science and Technology Apprentice Program

George Washington University

Washington, D.C.

August 17, 1990

*COB
Wednesday*

It is a great pleasure to be here.

Usually August is a pretty slow month in Washington, with half of the people out of town and the other half, like me, trying to catch up on work from the rest of the year. But as you well know from the news, this August has been anything but quiet at the White House.

The events of the last couple of weeks illustrate a point that the President made in a speech in Colorado earlier this month. We shall continue to need a military capability to respond to threats that arise, as the President put it, "suddenly, unpredictably, and from unexpected quarters." Many people have been calling for large cutbacks in defense forces, and there is little doubt that our armed forces are going to grow smaller. But we shall need a defense structure that preserves our security and supports the legitimate needs for self-defense of ourselves and of our friends and allies for a very long time.

To achieve this end, we are no doubt going to have to restructure our defense forces as their size declines. We don't have to worry as much about a surprise Soviet invasion of Western Europe. Much more likely are regional conflicts, such as Iraq's invasion of Kuwait, that pose threats both to the citizens and interests of countries outside the region and to the force of international law. These conflicts require a different kind of military capability. They require that the United States have a forward presence in key areas, that we be able to respond quickly and effectively to crises, and that we retain the national capacity to rebuild our forces as necessary.

There is another important factor in future defense capabilities which is often overlooked -- technology. In many future local or regional conflicts, America and its allies cannot hope to match the ground forces of an aggressor. So what are we to do? One answer is sophisticated technology -- in the form of advanced aircraft and radar, "smart" weapons with state-of-the-art guidance systems, and communications systems that assure coordination of our responses. History has shown that even small groups outfitted with the very best in weapons technologies can overcome much larger forces.

This, too, was a point that the President made in his speech earlier this month. He said, "Time and again, we have seen technology revolutionize the battlefield. The U.S. has always relied upon its technological edge to offset the need to match potential adversaries' strength in numbers." The President also pointed out the long time horizons involved in defense R&D. Most weapons systems take at least 10 years to move from the drawing board to the battlefield. So it is essential that this country take a very long view of our defense requirements, because the decisions we make today will determine what kind of military capability we have in the 21st century.

You have been working in Defense Department laboratories for the last eight weeks, so you've had some exposure to the kinds of technologies I'm talking about. You've probably noticed something else about those technologies -- that they have potential applications that range far beyond military purposes. Here in Washington we tend to talk about defense R&D and nondefense R&D as if they were completely separate categories. But in fact it is very difficult to think of a technology that does not have both defense and nondefense applications. Many of the United States' most

important commercial products -- such as computers and jet aircraft -- grew directly out of defense research and development in the 1930s, 1940s, and 1950s. The same may very well be true of the technologies that you have been working on this summer.

Support for Defense R&D

I want to focus for a few moments on funding for research and development, and our tendency to separate it into defense and civilian categories. For instance, the President's fiscal year 1991 budget proposes that the federal government spend \$38.7 billion on defense R&D during the fiscal year starting this coming October and \$32.5 billion on civilian R&D -- a total of \$71.2 billion.

That's a lot of money. There's a famous story up on Capitol Hill about Everett Dirksen, a Senator from Illinois, who was once discussing defense spending and said, "A billion [dollars] here, a billion dollars there, and pretty soon you're talking about real money." There's another story about David Bell, who was John F. Kennedy's budget director. One time before the Senate Appropriations Committee he gave an estimate for a particular set of outlays totalling \$366 billion. But a week later the committee called him back and said that his estimate was in error and that it should have been \$350 billion. Bell replied, "Well, give or take \$10 or \$15 billion, the estimate was substantially correct."

It's interesting to compare these R&D levels to some other quantities. If you look at the entire federal government, about one in every 20 dollars that the

government spends goes to research and development. For the Department of Defense, about one in every eight dollars supports research and development.

There is going to be a lot of pressure to reduce defense R&D spending as our total defense expenditures decline. But my boss, Allan Bromley, and a number of other people in the Administration are arguing that this is one part of the defense budget that should be examined very carefully. They point out that in a time of declining tensions we must continue to develop the basic knowledge and technologies that may be needed in the future, because it is very likely that any potential adversaries are doing so as well. In fact, a time of declining tensions may be the best time to lengthen the horizons of research, devoting more resources to basic and applied research that will have its practical payoff a decade or more into the future. We can't afford to be blindsided by technology in the hands - and in the laboratories - of our adversaries.

Future Employment for Scientists and Engineers

Of course, we in OSTP are not the only ones worrying about the level of defense R&D. The scientists and engineers who are engaged in defense activities also have reason to be concerned; you probably heard some of that this summer. A decline in defense R&D would undoubtedly mean fewer jobs in those areas, which is something that no one likes to see. But we don't yet know if or by how much defense

R&D will be cut. As I've said, many people would like to see it rise, at least on the research end of the spectrum.

Also, it's very likely that civilian R&D is going to continue to rise, as it has in real terms, for the past seven years. The President's 1991 budget before the Congress calls for an increase of 12 percent in nondefense federal R&D, and, if the current budget problems can be overcome, I believe you will see further increases in the future.

Finally, the concern among observers of science and research these days is not so much about a glut of scientists and engineers as about an impending shortage. You might already know this, but right now the number of people your age in the United States is as low as it has been for over 25 years. In other words, yours are the smallest high school classes to come through the educational system since the early 1960s.

Many people believe that this demographic trend is going to have a dramatic effect on the numbers of scientists and engineers in the United States during the next several decades. The National Science Foundation has estimated that the country is going to face shortfalls of hundreds of thousands of scientists and engineers over the next 15 years. Other people contend that the shortfalls won't be that bad, because more people will be attracted into science and technology as the demand grows. But, in general, we should look for undersupplies rather than oversupplies of scientists and engineers.

Of course, that news is not necessarily bad for you. Your timing -- over which I recognize you had remarkably little control -- is excellent. If you go on to become a

scientist or engineer, you will be in great demand. And great demand in our economy usually translates into higher salaries.

But at the same time, it is considerably more fun to be working in fields that are thriving, fields that are full of new people and new ideas. You, too, will experience the pain of personnel shortages, and the country will not be well served if there are not enough scientists and engineers to meet the demand for highly skilled and trained technical personnel.

A Focus on Education

These are some of the considerations that have led the Bush Administration to place a high premium on making changes in the precollege educational system in the United States. We need many more people who are attracted to careers in science and engineering, particularly among women and minorities, who have traditionally been underrepresented in science and engineering. We also need to teach more science and engineering to people who do not go on to become scientists or engineers, so they can perform the jobs that need to be done in an increasingly high-tech economy.

You have been going through the American educational system during a very interesting period. Since the early 1980s, there have been a large number of calls for reform of American education. American students were performing much more poorly on standardized tests than students from other countries. And it was clear that

people were coming out of high school without the skills that they both needed and deserved.

During the 1980s, a number of these reforms were instituted. Class size was reduced. Teacher salaries were increased. New graduation requirements were imposed. The schools are a different place now than they were 10 years ago.

In the last few years, as you might expect, people have started to look for the results of these reforms. The United States spends \$44 billion more on elementary and secondary education now than we did ten years ago. What are we getting for this investment?

Unfortunately, the results have been very slow in coming. We still graduate a relatively small group of very capable, highly skilled students, including those of you in this room. But test scores overall have remained more or less flat. About a quarter of the people who enter high school drop out before graduating, a percentage that has been roughly constant for the past 30 years. And teachers, who have in the past been the focus of the reforms, often report that they do not feel any more productive now than they did 10 years ago.

President Bush was well aware of this problem when he came into office, and he has developed three broad approaches to deal with it. First, he has sought to raise the visibility of education by emphasizing it in speeches and meetings, by visiting schools, and by convening last September's Education Summit with the nation's governors. He wants to get not only teachers involved but parents, businesses, and government at all levels, each of which must contribute if meaningful reforms are to be made.

Second, he has sought to interject new ideas into long-standing debates in education. These include giving schools more autonomy while making them accountable for results, removing restrictions on the use of federal funds in education, and making it possible for students to choose where they will go to school. This last idea is one of the most interesting. Say you were able to go to any school you wanted within your city or region, rather than just the school to which you are assigned because of where you live. How many of you would choose to go someplace else? In a recent experiment in Fall River, Massachusetts, nearly 40 percent of students went someplace other than the school where they would normally have gone, and because of the competition and independence this generated among the schools involved, the test results of Fall River students went up markedly.

The third approach the President has taken, working together with the nation's governors, has been to establish six national goals in education. One of these goals is making American students first in the world in mathematics and science by the year 2000. This is perhaps the most ambitious of the six -- some have referred to it as the "moonshot" of the education goals. But just as we managed to reach the moon just eight years after President Kennedy announced that goal, we have the national capacity to achieve this goal by the end of the decade.

I think the people in this room are a perfect example of what I mean. Clearly the American educational system has the ability to produce students that are second to none in mathematics and science. The strength of this country's science and technology enterprise attests to that. Now we need to extend the knowledge and skills you have achieved to a much larger group -- not just so we will continue to have

enough scientists and engineers, but so that our country can compete internationally in the 21st century.

Probably the most important factor in your success -- and by implication the most important factor in achieving the national goals -- is motivation. The only way for American students to be first in the world in science and mathematics education is for them to want to be first. We need to figure out the way to extend the motivation so apparent in your success to your classmates. Please let us have your thoughts on this.

There are a number of other things we need to do. We need to get businesses involved, so that students who come through the educational system are more responsive to the needs of the economy. We need to involve all parents in the education of their children, because no one can be as effective an advocate for a student as a parent. And we need to make sure that all levels of government are working together -- local, state, and federal -- each filling its appropriate role in a coordinated fashion.

The federal government also needs to be internally coordinated, since it has a number of agencies that are often doing very different things. One of the ways the Bush Administration has begun to provide this coordination is through the interagency Committee on Education and Human Resources, which is chaired by Admiral Watkins, the Secretary of Energy, with strong leadership from the Department of Education and the National Science Foundation as well. This interagency committee coordinates the activities of all of the different federal agencies -- and there are something like 16 altogether -- that are involved in mathematics and

science education. The committee is in the process of preparing a comprehensive, interagency approach to mathematics and science education, which will accompany the next budget that the President sends to Congress.

Conclusion

In considering the role of the agencies, I want to single out the Department of Defense for its accomplishments in education. The Defense Department recently did an analysis indicating that it spends about \$340 million a year on science and engineering education. The program you've been participating in is an excellent example of this forward-looking policy of the Department. This initiative and the commitment of Department leaders can make a huge difference, because it gives students an early exposure to the kinds of technologies and research that will later occupy a major portion of their careers, whether they stay in the military field or not. So I commend the DOD for sponsoring this program, and I hope they will continue to do so.

Meanwhile, you probably have only about two or three weeks of summer left and a lot to do. I've probably taken more of your time already than I should. So thanks for having me over today, and I wish you luck as you head back to school.

THE WHITE HOUSE
WASHINGTON

Date: 7-26-90

FOR: *Charlie Kolb*

FROM: ROGER B. PORTER

- Action
- Draft Response
- FYI
- Let's Talk

COMMENTS: *I assume you are
planning on attending this for
us.*

Document Originally
Attached to
Following Page

OSTP

THE WHITE HOUSE
WASHINGTON

July 24, 1990

Dear Roger:

I cordially invite you to join the Members of the PCAST and myself during our meetings on Thursday and Friday, July 26 and 27, for which I am enclosing the agenda. We look forward to your presence at any point in the schedule, and I would appreciate your office letting us know whether you will be able to join us.

I appreciate your continuing participation with the PCAST in addressing our national priorities in science and technology.

Sincerely yours,



D. Allan Bromley
Assistant to the President
for
Science and Technology

Attachment
Draft Agenda

The Honorable Roger B. Porter
Assistant to the President
for Economic and Domestic Policy
The White House
Washington, D.C. 20500

PRESIDENT'S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY

JULY 26-27, 1990

AGENDA

THURSDAY, JULY 26, 1990

**OPEN SESSION, 8:50 - 11:15 a.m.
CONFERENCE ROOM, COUNCIL ON ENVIRONMENTAL QUALITY
722 JACKSON PLACE, N.W.**

8:30-8:50	ARRIVAL -- COFFEE AND PASTRIES	
8:50-9:00	OPENING REMARKS	DR. BROMLEY
9:00-9:45	ENVIRONMENTAL QUALITY: TWENTIETH ANNUAL REPORT OF CEQ	HON. MICHAEL DELAND
9:45-11:00	GLOBAL CHANGE - CEES UPDATE INFORMATION BRIEFING AND DISCUSSION	DR. DALLAS PECK DR. ROBERT CORELL
11:00-11:15	CLOSING REMARKS	DR. BROMLEY

THURSDAY, JULY 26, 1990 continued

CLOSED SESSION, 12:00 Noon - 5:00 p.m.

**ROOM 208, CORDELL HULL CONFERENCE ROOM
OLD EXECUTIVE OFFICE BUILDING**

12:00-2:15	PCAST UPDATE DURING WORKING LUNCH	DR. BROMLEY DR. RATCHFORD DR. WONG DR. PHILLIPS
2:15-3:00	INITIATIVES IN EASTERN EUROPE DR. ROBERT W. HUTCHINGS DIRECTOR FOR EUROPEAN POLITICAL AFFAIRS NATIONAL SECURITY COUNCIL	
3:00-3:30	THE VICE PRESIDENT	
3:30-3:45	BREAK	
3:45-4:45	EDUCATION AND HUMAN RESOURCES PANEL -- DISCUSSION OF ISSUES AND DIRECTION	DR. LIKINS DR. RATCHFORD
4:45-5:00	CLOSING REMARKS	DR. BROMLEY

FRIDAY, JULY 27, 1990

**CLOSED SESSION, 9:00 A.M. - 12:00 NOON
ROOSEVELT ROOM, THE WHITE HOUSE**

8:30-9:00	BRIEFING ON PLANS FOR U.S. FUSION PROGRAM	DR. GUYFORD STEVER
9:00-10:00	THE ROLE OF SCIENCE AND TECHNOLOGY IN U.S. ECONOMIC POLICY	DR. MICHAEL BOSKIN
10:00-10:30	DISCUSSION	
10:30-11:30	RECRUITMENT FOR FEDERAL SERVICE -- INFORMATION BRIEFING AND DISCUSSION	DR. MARY GOOD CHAIRMAN NATIONAL SCIENCE BOARD
11:30-11:45	OTHER PCAST ISSUES	
11:45-12:00	THE NEXT MEETING AND CLOSING REMARKS	DR. BROMLEY

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

January 4, 1991

MEMORANDUM FOR CHARLES KOLB

FROM:

TOM RATCHFORD 

SUBJECT:

OSTP LETTER REPORT TO SENATOR MIKULSKI

Attached are copies of the OSTP letter report submitted to Senators Mikulski and Garn on January 3, 1991. They outline the progress of efforts so far to address mathematics and science education for FY 1992. As you know, the formal, complete report, being prepared by the FCCSET Committee on Education and Human Resources, will be submitted with the President's FY 1992 budget.

I want to thank you personally for your especially fine work in developing and reviewing this report. It is a much better document because of your efforts.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

January 3, 1991

Dear Madam Chair:

I am pleased to send you this progress report describing efforts underway by the interagency Federal Coordinating Council for Science, Engineering, and Technology (FCCSET) to address issues of mathematics and science education. These efforts to develop a strategic plan for the Federal program on mathematics and science education for FY 1992 are in support of the National Education Goals related to these fields. Three of the six Goals address, directly or indirectly, science and mathematics education. They are:

By the year 2000, American students will leave grades four, eight, and twelve having demonstrated competency in challenging subject matter including English, mathematics, science, history, and geography . . . [Goal 3]

By the year 2000, U.S. students will be first in the world in science and mathematics achievement. [Goal 4]

By the year 2000, every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship. [Goal 5]

The President noted the importance of the interagency process recently when he signed Public Law 101-589, the "Excellence in Mathematics, Science and Engineering Education Act of 1990." The President stated:

"In developing the FY 1991 budget immediately following the Education Summit, the Administration took important steps to strengthen programs of Federal agencies and to increase funding for science and mathematics education. We intend to further develop that initiative through the work of a new interagency committee which is developing a strategic plan and priorities for the Administration's program in science and mathematics education."

Senate Request

This progress report is submitted in response to the Senate Appropriation Committee's request, as set forth in its Report No. 101-474 to accompany H.R. 5158. The formal, complete report requested by the Committee will be submitted with the President's FY 1992 budget. This progress report incorporates the multilevel priority-setting framework, also called for in the Committee report.

FCCSET Committee on Education and Human Resources

The White House Office of Science and Technology Policy (OSTP), through the Federal Coordinating Council for Science, Engineering, and Technology, established the Committee on Education and Human Resources (CEHR). This Committee is charged with addressing issues critical to:

Improving science, mathematics, and engineering education, and technical training;

Ensuring an adequate supply of well-educated and trained scientific and technical personnel;

Enabling the Nation to retain world leadership in science and technology; and,

Ensuring a well-informed, scientifically literate citizenry.

To accomplish this, the Committee plays a central role in coordinating activities of the Federal agencies related to science, mathematics, engineering, and technological education and training.

The CEHR is chaired by Secretary of Energy James Watkins, with the Deputy Secretary and Acting Secretary of Education, Ted Sanders, and the Assistant Director for Education and Human Resources of the National Science Foundation (NSF), Luther Williams, serving as vice chairmen. The Committee includes senior policy-level officials from all Federal agencies with significant responsibilities in the area of science, mathematics, engineering, and technological education, including those with jurisdiction over the education of scientists, mathematicians, and engineers, as well as those with responsibilities for technician training and science literacy for the general public. The Committee also includes those agencies that are major users of scientific and engineering personnel.

The Committee established a Working Group on the FY 1992 Federal Program Plan for Education and Human Resources (EHR) to develop the first comprehensive inventory of Federal EHR programs and to begin the process of developing options for an FY 1992 multi-agency program for EHR activities. The members of the Working Group include representatives from the:

Department of Energy
 Department of Education
 National Science Foundation
 Department of Health and Human Services
 Department of Defense
 Department of Commerce
 Department of the Interior

Department of Agriculture
 Department of Labor
 National Aeronautics and
 Space Administration
 Environmental Protection Agency

The focus of the Committee's effort is to develop recommendations for moving the Nation toward achieving the three National Education Goals related to mathematics and science education. Since the Goals relate primarily to precollege education, the CEHR focused on those programs relating predominantly to grades K-12. The Committee did, however, take into consideration all components of the educational system, including both "formal" (in-the-classroom) and "informal" (out-of-classroom or experiential) programs. The scope of activities includes (in descending order of priority):

Precollege, formal
 Precollege, informal
 Undergraduate, formal
 Undergraduate, informal
 Graduate.

U.S. graduate education programs are in a clear and undisputed position of world leadership. The priority placement of graduate education reflects an emphasis by the CEHR on those elements of our educational system most in need of attention.

Priority Framework

The Committee developed a National Mathematics and Science Education Priority Framework which lists both strategic objectives and implementation priorities. The implementation priorities vary, depending on the particular educational level.

Strategic Objectives

The CEHR program's four strategic objectives, listed in descending order of priority, reflect the National Education Goals. These objectives relate to:

Improved student performance in science and mathematics;
 Better prepared precollege teacher workforce;

Provision of an adequate workforce supply to all fields of science and technology, including increased participation of underrepresented groups; and,

Improved public science literacy.

Implementation Priorities

The CEHR implementation priorities specify program areas that require emphasis to accomplish the strategic objectives. Each implementation priority is dependent, to some degree, on the others, and the mix of programs will be important to enhancing the overall Federal effort. Emphasis in one area will necessarily influence the level of accomplishment of the others. Likewise, neglect of an area associated with a particular priority may affect overall success in meeting the Nation's education goals. In descending order of importance, the implementation priorities recommended for use in establishing the programmatic content of the Federal effort are:

Teacher preparation and retraining;

Curriculum reform, research and development in teaching and learning, dissemination, and technical assistance;

Organizational and operational reform of the education delivery system;

Student incentives (support) and opportunities; and,

Scientific literacy activities directed toward the general public.

FY 1990 and FY 1991 EHR Baseline

The Working Group developed a comprehensive inventory of Federal mathematics and science education programs. As a tool for planning, while at the same time recognizing differences in the character of EHR program activity across agencies, the Federal inventory was divided into three categories to reflect the source of funding and agency administrative control over EHR activities:

Category 1 programs are those whose budgets are directly appropriated for mathematics, science, and technology education, or are funded from research (or other) accounts and expressly managed as education programs.

Category 2 programs are funded under research or other accounts that do not fall under Category 1 (e.g., graduate research assistantships).

Category 3 programs are those whose purpose is general education (not specifically mathematics and science education) but under which science and technology education activities are supported (e.g., formula-driven programs of which mathematics and science are an integral part).

In its initial work, the Working Group concentrated on Category 1 programs. The FY 1991 EHR Category 1 budget, which serves as the baseline for subsequent fiscal years, is \$1.72 billion, a 16% increase over FY 1990. Although graduate programs account for the majority of the budget, precollege programs received by far the largest absolute and percentage increases.

Although graduate education received the lowest priority, this ranking is not, in any way, meant to diminish its importance or downplay the critical role played by the Federal government in this area. Support of U.S. graduate education is essential to maintaining the quality of U.S. scientific research and economic competitiveness. In that graduate education also ensures adequate numbers of quality faculty to teach future generations of college students, it has a long-term impact on both the undergraduate and precollege education levels. The Federal government spends the largest share of its Category 1 mathematics and science resources on graduate education.

FEDERAL MATHEMATICS AND SCIENCE EDUCATION PROGRAMS

CATEGORY 1

	FY 1990	FY 1991	% Increase
Precollege	\$333 million	\$526 million	58%
Undergraduate	\$412 million	\$422 million	3%
Graduate	<u>\$741 million</u>	<u>\$769 million</u>	4%
TOTAL	\$1.49 billion	\$1.72 billion	16%

NOTE: Percentage increases are based on unrounded figures.

The above figures are those appropriated for FY 1990 and FY 1991. Although the agencies have their appropriations at this time, minor modifications within budget amounts can be expected as agencies complete their current plans. The figures in the formal report may, therefore, vary slightly from those above.

Different agencies dominate program activities at each education level. For five agencies, mathematics and science education programs comprise relatively small

portions of the budget yet fill important programmatic roles related to their missions. Many of these activities support training of specialists; expand and support traditional curricula; provide informal teacher enhancement programs; and make students aware of important issues such as energy conservation, nutrition, health education, aeronautics and space, and the environment. The list below includes only those agencies that contribute significant percentages of the total Federal expenditure by educational level.

**MATHEMATICS AND SCIENCE EDUCATION
PATTERN OF AGENCY RESPONSIBILITIES
FY 1991 CATEGORY 1 BUDGET**

A. By educational level

	<u>Total \$</u>	<u>Agency (% of total Federal support)</u>
K-12	\$526 million	ED (46%); NSF (40%)
Undergraduate	\$422 million	DOD (42%); NSF (25%); HHS (14%)
Graduate	\$769 million	HHS (52%); DOD (30%)

B. Formal and Informal

Precollege formal	ED (57%); NSF (39%)
Precollege informal	NSF (41%); DOI (22%); DOE (20%)
Undergraduate formal	NSF (37%); DOD (34%); HHS (19%)
Undergraduate informal	DOD (57%); NASA (15%); DOE (12%)

FCCSET/CEHR Activities in the Year Ahead

With the CEHR program inventory and priority framework in place, the FCCSET Committee on Education and Human Resources shortly will begin a more intensive review of the effectiveness of current Federal programs. This review will look at evaluations and other information on program outcomes, and will analyze program designs to determine which strategies are most likely to be successful. The results of this review will guide development of a coordinated strategy for reallocating resources, as appropriate, to programs that will be the most effective in addressing priority needs.

The Future

The FY 1992 Budget which the President sends to Congress will be developed with the FCCSET recommendations in mind and will be consistent with the overall requirements of the Omnibus Budget Reconciliation Act of 1990 (P.L. 101-508)

OSTP is committed to working with all elements of our society and all parts of Federal, State, and local governments to achieve our National Education Goals. As you are well aware, a coordinated, national effort is necessary to make American students first in the world in science and mathematics achievement. The Administration, the Congress, the States, local governments, teachers and other educators, as well as parents, will all have to work together to attain the National Education Goals. With your help and cooperation, we are convinced that these Goals can be met.

Sincerely,



D. Allan Bromley
Director

The Honorable Barbara A. Mikulski
Chair
Subcommittee on Veterans Affairs,
Housing and Urban Development,
and Independent Agencies
Committee on Appropriations
U.S. Senate
Washington, DC 20510

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

January 3, 1991

Dear Senator Garn:

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To accomplish this, the Committee plays a central role in coordinating activities of the Federal agencies related to science, mathematics, engineering, and technological education and training.

The CEHR is chaired by Secretary of Energy James Watkins, with the Deputy Secretary and Acting Secretary of Education, Ted Sanders, and the Assistant Director for Education and Human Resources of the National Science Foundation (NSF), Luther Williams, serving as vice chairmen. The Committee includes senior policy-level officials from all Federal agencies with significant responsibilities in the area of science, mathematics, engineering, and technological education, including those with jurisdiction over the education of scientists, mathematicians, and engineers, as well as those with responsibilities for technician training and science literacy for the general public. The Committee also includes those agencies that are major users of scientific and engineering personnel.

The Committee established a Working Group on the FY 1992 Federal Program Plan for Education and Human Resources (EHR) to develop the first comprehensive inventory of Federal EHR programs and to begin the process of developing options for an FY 1992 multi-agency program for EHR activities. The members of the Working Group include representatives from the:

Department of Energy
 Department of Education
 National Science Foundation
 Department of Health and Human Services
 Department of Defense
 Department of Commerce
 Department of the Interior

Department of Agriculture
 Department of Labor
 National Aeronautics and
 Space Administration
 Environmental Protection Agency

The focus of the Committee's effort is to develop recommendations for moving the Nation toward achieving the three National Education Goals related to mathematics and science education. Since the Goals relate primarily to precollege education, the CEHR focused on those programs relating predominantly to grades K-12. The Committee did, however, take into consideration all components of the educational system, including both "formal" (in-the-classroom) and "informal" (out-of-classroom or experiential) programs. The scope of activities includes (in descending order of priority):

Precollege, formal
 Precollege, informal
 Undergraduate, formal
 Undergraduate, informal
 Graduate.

U.S. graduate education programs are in a clear and undisputed position of world leadership. The priority placement of graduate education reflects an emphasis by the CEHR on those elements of our educational system most in need of attention.

Priority Framework

The Committee developed a National Mathematics and Science Education Priority Framework which lists both strategic objectives and implementation priorities. The implementation priorities vary, depending on the particular educational level.

Strategic Objectives

The CEHR program's four strategic objectives, listed in descending order of priority, reflect the National Education Goals. These objectives relate to:

Improved student performance in science and mathematics;
 Better prepared precollege teacher workforce;

Provision of an adequate workforce supply to all fields of science and technology, including increased participation of underrepresented groups; and,

Improved public science literacy.

Implementation Priorities

The CEHR implementation priorities specify program areas that require emphasis to accomplish the strategic objectives. Each implementation priority is dependent, to some degree, on the others, and the mix of programs will be important to enhancing the overall Federal effort. Emphasis in one area will necessarily influence the level of accomplishment of the others. Likewise, neglect of an area associated with a particular priority may affect overall success in meeting the Nation's education goals. In descending order of importance, the implementation priorities recommended for use in establishing the programmatic content of the Federal effort are:

Teacher preparation and retraining;

Curriculum reform, research and development in teaching and learning, dissemination, and technical assistance;

Organizational and operational reform of the education delivery system;

Student incentives (support) and opportunities; and,

Scientific literacy activities directed toward the general public.

FY 1990 and FY 1991 EHR Baseline

The Working Group developed a comprehensive inventory of Federal mathematics and science education programs. As a tool for planning, while at the same time recognizing differences in the character of EHR program activity across agencies, the Federal inventory was divided into three categories to reflect the source of funding and agency administrative control over EHR activities:

Category 1 programs are those whose budgets are directly appropriated for mathematics, science, and technology education, or are funded from research (or other) accounts and expressly managed as education programs.

Category 2 programs are funded under research or other accounts that do not fall under Category 1 (e.g., graduate research assistantships).

Category 3 programs are those whose purpose is general education (not specifically mathematics and science education) but under which science and technology education activities are supported (e.g., formula-driven programs of which mathematics and science are an integral part).

In its initial work, the Working Group concentrated on Category 1 programs. The FY 1991 EHR Category 1 budget, which serves as the baseline for subsequent fiscal years, is \$1.72 billion, a 16% increase over FY 1990. Although graduate programs account for the majority of the budget, precollege programs received by far the largest absolute and percentage increases.

Although graduate education received the lowest priority, this ranking is not, in any way, meant to diminish its importance or downplay the critical role played by the Federal government in this area. Support of U.S. graduate education is essential to maintaining the quality of U.S. scientific research and economic competitiveness. In that graduate education also ensures adequate numbers of quality faculty to teach future generations of college students, it has a long-term impact on both the undergraduate and precollege education levels. The Federal government spends the largest share of its Category 1 mathematics and science resources on graduate education.

FEDERAL MATHEMATICS AND SCIENCE EDUCATION PROGRAMS

CATEGORY 1

	FY 1990	FY 1991	% Increase
Precollege	\$333 million	\$526 million	58%
Undergraduate	\$412 million	\$422 million	3%
Graduate	<u>\$741 million</u>	<u>\$769 million</u>	4%
TOTAL	\$1.49 billion	\$1.72 billion	16%

NOTE: Percentage increases are based on unrounded figures.

The above figures are those appropriated for FY 1990 and FY 1991. Although the agencies have their appropriations at this time, minor modifications within budget amounts can be expected as agencies complete their current plans. The figures in the formal report may, therefore, vary slightly from those above.

Different agencies dominate program activities at each education level. For five agencies, mathematics and science education programs comprise relatively small

portions of the budget yet fill important programmatic roles related to their missions. Many of these activities support training of specialists; expand and support traditional curricula; provide informal teacher enhancement programs; and make students aware of important issues such as energy conservation, nutrition, health education, aeronautics and space, and the environment. The list below includes only those agencies that contribute significant percentages of the total Federal expenditure by educational level.

**MATHEMATICS AND SCIENCE EDUCATION
PATTERN OF AGENCY RESPONSIBILITIES
FY 1991 CATEGORY 1 BUDGET**

A. By educational level

	<u>Total \$</u>	<u>Agency (% of total Federal support)</u>
K-12	\$526 million	ED (46%); NSF (40%)
Undergraduate	\$422 million	DOD (42%); NSF (25%); HHS (14%)
Graduate	\$769 million	HHS (52%); DOD (30%)

B. Formal and Informal

Precollege formal	ED (57%); NSF (39%)
Precollege informal	NSF (41%); DOI (22%); DOE (20%)
Undergraduate formal	NSF (37%); DOD (34%); HHS (19%)
Undergraduate informal	DOD (57%); NASA (15%); DOE (12%)

FCCSET/CEHR Activities in the Year Ahead

With the CEHR program inventory and priority framework in place, the FCCSET Committee on Education and Human Resources shortly will begin a more intensive review of the effectiveness of current Federal programs. This review will look at evaluations and other information on program outcomes, and will analyze program designs to determine which strategies are most likely to be successful. The results of this review will guide development of a coordinated strategy for reallocating resources, as appropriate, to programs that will be the most effective in addressing priority needs.

The Future

The FY 1992 Budget which the President sends to Congress will be developed with the FCCSET recommendations in mind and will be consistent with the overall requirements of the Omnibus Budget Reconciliation Act of 1990 (P.L. 101-508)

OSTP is committed to working with all elements of our society and all parts of Federal, State, and local governments to achieve our National Education Goals. As you are well aware, a coordinated, national effort is necessary to make American students first in the world in science and mathematics achievement. The Administration, the Congress, the States, local governments, teachers and other educators, as well as parents, will all have to work together to attain the National Education Goals. With your help and cooperation, we are convinced that these Goals can be met.

Sincerely,



D. Allan Bromley
Director

The Honorable Jake Garn
Ranking Minority Member
Subcommittee on Veterans Affairs,
Housing and Urban Development,
and Independent Agencies
Committee on Appropriations
U.S. Senate
Washington, DC 20510

M 657P

THE WHITE HOUSE
WASHINGTON

Date: 8/14/90

TO: *Zee/Down*

FROM: CHARLES E. M. KOLB

- Action
- Draft Response
- FYI
- Let's Talk

COMMENTS:

Please review and send Tom any suggestions you may have. Thanks!

DRAFT: DO NOT QUOTE OR CITE

[August 13, 1990]

SCIENCE, TECHNOLOGY, AND THE DEPARTMENT OF DEFENSE

J. THOMAS RATCHFORD

Associate Director for Policy and International Affairs

Office of Science and Technology Policy

Executive Office of the President

Department of Defense

Science and Technology Apprentice Program

George Washington University

Washington, D.C.

August 17, 1990

*CSB
Wednesday*

It is a great pleasure to be here.

Usually August is a pretty slow month in Washington, with half of the people out of town and the other half, like me, trying to catch up on work from the rest of the year. But as you well know from the news, this August has been anything but quiet at the White House.

The events of the last couple of weeks illustrate a point that the President made in a speech in Colorado earlier this month. We shall continue to need a military capability to respond to threats that arise, as the President put it, "suddenly, unpredictably, and from unexpected quarters." Many people have been calling for large cutbacks in defense forces, and there is little doubt that our armed forces are going to grow smaller. But we shall need a defense structure that preserves our security and supports the legitimate needs for self-defense of ourselves and of our friends and allies for a very long time.

To achieve this end, we are no doubt going to have to restructure our defense forces as their size declines. We don't have to worry as much about a surprise Soviet invasion of Western Europe. Much more likely are regional conflicts, such as Iraq's invasion of Kuwait, that pose threats both to the citizens and interests of countries outside the region and to the force of international law. These conflicts require a different kind of military capability. They require that the United States have a forward presence in key areas, that we be able to respond quickly and effectively to crises, and that we retain the national capacity to rebuild our forces as necessary.

There is another important factor in future defense capabilities which is often overlooked -- technology. In many future local or regional conflicts, America and its allies cannot hope to match the ground forces of an aggressor. So what are we to do? One answer is sophisticated technology -- in the form of advanced aircraft and radar, "smart" weapons with state-of-the-art guidance systems, and communications systems that assure coordination of our responses. History has shown that even small groups outfitted with the very best in weapons technologies can overcome much larger forces.

This, too, was a point that the President made in his speech earlier this month. He said, "Time and again, we have seen technology revolutionize the battlefield. The U.S. has always relied upon its technological edge to offset the need to match potential adversaries' strength in numbers." The President also pointed out the long time horizons involved in defense R&D. Most weapons systems take at least 10 years to move from the drawing board to the battlefield. So it is essential that this country take a very long view of our defense requirements, because the decisions we make today will determine what kind of military capability we have in the 21st century.

You have been working in Defense Department laboratories for the last eight weeks, so you've had some exposure to the kinds of technologies I'm talking about. You've probably noticed something else about those technologies -- that they have potential applications that range far beyond military purposes. Here in Washington we tend to talk about defense R&D and nondefense R&D as if they were completely separate categories. But in fact it is very difficult to think of a technology that does not have both defense and nondefense applications. Many of the United States' most

important commercial products -- such as computers and jet aircraft -- grew directly out of defense research and development in the 1930s, 1940s, and 1950s. The same may very well be true of the technologies that you have been working on this summer.

Support for Defense R&D

I want to focus for a few moments on funding for research and development, and our tendency to separate it into defense and civilian categories. For instance, the President's fiscal year 1991 budget proposes that the federal government spend \$38.7 billion on defense R&D during the fiscal year starting this coming October and \$32.5 billion on civilian R&D -- a total of \$71.2 billion.

That's a lot of money. There's a famous story up on Capitol Hill about Everett Dirksen, a Senator from Illinois, who was once discussing defense spending and said, "A billion [dollars] here, a billion dollars there, and pretty soon you're talking about real money." There's another story about David Bell, who was John F. Kennedy's budget director. One time before the Senate Appropriations Committee he gave an estimate for a particular set of outlays totalling \$366 billion. But a week later the committee called him back and said that his estimate was in error and that it should have been \$350 billion. Bell replied, "Well, give or take \$10 or \$15 billion, the estimate was substantially correct."

It's interesting to compare these R&D levels to some other quantities. If you look at the entire federal government, about one in every 20 dollars that the

government spends goes to research and development. For the Department of Defense, about one in every eight dollars supports research and development.

There is going to be a lot of pressure to reduce defense R&D spending as our total defense expenditures decline. But my boss, Allan Bromley, and a number of other people in the Administration are arguing that this is one part of the defense budget that should be examined very carefully. They point out that in a time of declining tensions we must continue to develop the basic knowledge and technologies that may be needed in the future, because it is very likely that any potential adversaries are doing so as well. In fact, a time of declining tensions may be the best time to lengthen the horizons of research, devoting more resources to basic and applied research that will have its practical payoff a decade or more into the future. We can't afford to be blindsided by technology in the hands - and in the laboratories - of our adversaries.

Future Employment for Scientists and Engineers

Of course, we in OSTP are not the only ones worrying about the level of defense R&D. The scientists and engineers who are engaged in defense activities also have reason to be concerned; you probably heard some of that this summer. A decline in defense R&D would undoubtedly mean fewer jobs in those areas, which is something that no one likes to see. But we don't yet know if or by how much defense

R&D will be cut. As I've said, many people would like to see it rise, at least on the research end of the spectrum.

Also, it's very likely that civilian R&D is going to continue to rise, as it has in real terms, for the past seven years. The President's 1991 budget before the Congress calls for an increase of 12 percent in nondefense federal R&D, and, if the current budget problems can be overcome, I believe you will see further increases in the future.

Finally, the concern among observers of science and research these days is not so much about a glut of scientists and engineers as about an impending shortage. You might already know this, but right now the number of people your age in the United States is as low as it has been for over 25 years. In other words, yours are the smallest high school classes to come through the educational system since the early 1960s.

Many people believe that this demographic trend is going to have a dramatic effect on the numbers of scientists and engineers in the United States during the next several decades. The National Science Foundation has estimated that the country is going to face shortfalls of hundreds of thousands of scientists and engineers over the next 15 years. Other people contend that the shortfalls won't be that bad, because more people will be attracted into science and technology as the demand grows. But, in general, we should look for undersupplies rather than oversupplies of scientists and engineers.

Of course, that news is not necessarily bad for you. Your timing -- over which I recognize you had remarkably little control -- is excellent. If you go on to become a

scientist or engineer, you will be in great demand. And great demand in our economy usually translates into higher salaries.

But at the same time, it is considerably more fun to be working in fields that are thriving, fields that are full of new people and new ideas. You, too, will experience the pain of personnel shortages, and the country will not be well served if there are not enough scientists and engineers to meet the demand for highly skilled and trained technical personnel.

A Focus on Education

These are some of the considerations that have led the Bush Administration to place a high premium on making changes in the precollege educational system in the United States. We need many more people who are attracted to careers in science and engineering, particularly among women and minorities, who have traditionally been underrepresented in science and engineering. We also need to teach more science and engineering to people who do not go on to become scientists or engineers, so they can perform the jobs that need to be done in an increasingly high-tech economy.

You have been going through the American educational system during a very interesting period. Since the early 1980s, there have been a large number of calls for reform of American education. American students were performing much more poorly on standardized tests than students from other countries. And it was clear that

people were coming out of high school without the skills that they both needed and deserved.

During the 1980s, a number of these reforms were instituted. Class size was reduced. Teacher salaries were increased. New graduation requirements were imposed. The schools are a different place now than they were 10 years ago.

In the last few years, as you might expect, people have started to look for the results of these reforms. The United States spends \$44 billion more on elementary and secondary education now than we did ten years ago. What are we getting for this investment?

Unfortunately, the results have been very slow in coming. We still graduate a relatively small group of very capable, highly skilled students, including those of you in this room. But test scores overall have remained more or less flat. About a quarter of the people who enter high school drop out before graduating, a percentage that has been roughly constant for the past 30 years. And teachers, who have in the past been the focus of the reforms, often report that they do not feel any more productive now than they did 10 years ago.

President Bush was well aware of this problem when he came into office, and he has developed three broad approaches to deal with it. First, he has sought to raise the visibility of education by emphasizing it in speeches and meetings, by visiting schools, and by convening last September's Education Summit with the nation's governors. He wants to get not only teachers involved but parents, businesses, and government at all levels, each of which must contribute if meaningful reforms are to be made.

Second, he has sought to interject new ideas into long-standing debates in education. These include giving schools more autonomy while making them accountable for results, removing restrictions on the use of federal funds in education, and making it possible for students to choose where they will go to school. This last idea is one of the most interesting. Say you were able to go to any school you wanted within your city or region, rather than just the school to which you are assigned because of where you live. How many of you would choose to go someplace else? In a recent experiment in Fall River, Massachusetts, nearly 40 percent of students went someplace other than the school where they would normally have gone, and because of the competition and independence this generated among the schools involved, the test results of Fall River students went up markedly.

The third approach the President has taken, working together with the nation's governors, has been to establish six national goals in education. One of these goals is making American students first in the world in mathematics and science by the year 2000. This is perhaps the most ambitious of the six -- some have referred to it as the "moonshot" of the education goals. But just as we managed to reach the moon just eight years after President Kennedy announced that goal, we have the national capacity to achieve this goal by the end of the decade.

I think the people in this room are a perfect example of what I mean. Clearly the American educational system has the ability to produce students that are second to none in mathematics and science. The strength of this country's science and technology enterprise attests to that. Now we need to extend the knowledge and skills you have achieved to a much larger group -- not just so we will continue to have

enough scientists and engineers, but so that our country can compete internationally in the 21st century.

Probably the most important factor in your success -- and by implication the most important factor in achieving the national goals -- is motivation. The only way for American students to be first in the world in science and mathematics education is for them to want to be first. We need to figure out the way to extend the motivation so apparent in your success to your classmates. Please let us have your thoughts on this.

There are a number of other things we need to do. We need to get businesses involved, so that students who come through the educational system are more responsive to the needs of the economy. We need to involve all parents in the education of their children, because no one can be as effective an advocate for a student as a parent. And we need to make sure that all levels of government are working together -- local, state, and federal -- each filling its appropriate role in a coordinated fashion.

The federal government also needs to be internally coordinated, since it has a number of agencies that are often doing very different things. One of the ways the Bush Administration has begun to provide this coordination is through the interagency Committee on Education and Human Resources, which is chaired by Admiral Watkins, the Secretary of Energy, with strong leadership from the Department of Education and the National Science Foundation as well. This interagency committee coordinates the activities of all of the different federal agencies -- and there are something like 16 altogether -- that are involved in mathematics and

science education. The committee is in the process of preparing a comprehensive, interagency approach to mathematics and science education, which will accompany the next budget that the President sends to Congress.

Conclusion

In considering the role of the agencies, I want to single out the Department of Defense for its accomplishments in education. The Defense Department recently did an analysis indicating that it spends about \$340 million a year on science and engineering education. The program you've been participating in is an excellent example of this forward-looking policy of the Department. This initiative and the commitment of Department leaders can make a huge difference, because it gives students an early exposure to the kinds of technologies and research that will later occupy a major portion of their careers, whether they stay in the military field or not. So I commend the DOD for sponsoring this program, and I hope they will continue to do so.

Meanwhile, you probably have only about two or three weeks of summer left and a lot to do. I've probably taken more of your time already than I should. So thanks for having me over today, and I wish you luck as you head back to school.