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Record Group/Collection: George H.W. Bush Presidential Records
Collection/Office of Origin: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: General Science Files

OA/ID Number: 62042
Folder ID Number: 62042-005

Folder Title:
Physical Sciences: General (1) [5 of 7] [1992]

Stack:

Row:

Section:

Shelf:

Position:

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"Document Control"

TYPE: ACTION

DOCUMENT NUMBER: 9202382

ORIGINATOR: 02

STATUS I

DIRECTORATE STATUS

FROM: OJSERKIS, Maurice

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/27/92

SUBJECT: HE IS FORWARDING HIS IDEAS FOR A NEW DESIGN FOR
COMBUSTION ENGINES, AND HE SEEKS OSTP'S ASSISTANCE
WITH GETTING THIS PROGRAM TO THE MARKET PLACE.

DIRECTORATE
ASSIGNED: PHYSICAL SCIENCES

STAFF
ASSIGNED: *Lee Schroeder*

ACTION
REQUIRED: *Direct Reply, if*
AS NECESSARY

STAFF
ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: 08/27/92
DATE COMPLETED:

STAFF DUE DATE
DATE COMPLETED/DEPT: 08/24/92

COPIES TO: D. Allan Bromley

WHITE HOUSE TRACKING #:

CONTACT PERSON:

PHONE:

EXT:

REMARKS: *Dr. Schroeder responded.*

OSTP RECEIVED: 08/14/92
FILE: P-PHYSICAL SCIENCES

DEPT RECEIVED: AUG 17 1992

CENTRAL FILES:



2382

Dr. D. Allan Bromley
Science Advisor to the President
OFFICE OF SCIENCE & TECHNOLOGY
Old Executive Office Building
17th Street & Pennsylvania Avenue, N.W.
Washington, D.C. 20506

27-July-1992

STATION 11:55

Dear Dr. Bromley:

MAIL ROOM

They say that Detroit automotive makers are not truly innovating and competing against the foreign Japanese competitors.

Per enclosed two page memorandum, I wish to perfect and place into volume production a new and revolutionary INTERNAL COMBUSTION ENGINE who will be very high-horsepower, be of low-pollution, be very efficient and be CHEAP to manufacture using American workers.

The engine will be Air-Cooled, 100% all aluminum and die-cast for low-labor-cost of manufacture. Besides the U.S. automotive industry, it should find excellent application to the Department of Defence, U.S. Army use in TANKS and combat vehicles.

My engine consists of a NEW combination of WELL-PROVEN concept and is based primarily on the Burt-MacCullom Single Sleeve Valve as was so successfully perfected and used in Bristol HERCULES and CENTAURUS aero engines before and during World-War-II. They made some 131,000 of these 1,200 H.P. engines using some 71,000 workers. With the advent of the JET ENGINE, this technology was shelved and forgotten till now. With the 1886 admonition of Sir Dugald Clerk, inventor of the Outboard motor two-cycle engine, for the first time in modern days, my engine will use BOTH SIDES OF THE PISTON to make power, and I will RECOVER the exhaust gases which are normally wasted, and make an additional 20% free power or more miles per gallon by using a power-recovery turbine to send this power DIRECTLY geared to the engine crankshaft.

They say that "Everyone talks about the Weather, but no one does anything about it." I am an ex-World-War II Bomber & Test Pilot who is an Aeronautical Engineer. I sincerely believe that with GOVERNMENT support such as the British had, that perfecting my engine can truly allow our U.S. auto industry to attain their former leadership and engineering superiority.

How can you and your office help me and this project? The patents are in progress with the patent office.

Thanking you for your early attention and reply, I beg to remain

Sincerely yours,

Maurice J. Ojserkis

Maurice J. Ojserkis
OJSERKIS CONSULTING ENGINEERS
RD6 115E Ocean Heights Av. #2050
Pleasantville, N.J. 08232
(609) 927-6593.

LSO:grs CC: 2-pg Memo.

Maurice J. Ojserkis
OJSERKIS CONSULTING ENGINEERS
RD6 115E Ocean Heights Av#205
Bargaintown, N.J. 08232
(609) 927-6593.

A PROJECT TO GIVE BIRTH TO A REVOLUTIONARY NEW INTERNAL COMBUSTION ENGINE WHICH SHOULD ALLOW THE AMERICAN AUTOMOTIVE INDUSTRY TO TRULY INNOVATE & COMPETE ON DOMESTIC & WORLD MARKETS.

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The Public is mislead and does not realize that in most cases the auto manufacturer reduced car weight (and in many cases car Safety) of a vehicle ~~and~~ thereby claimed more Miles per gallon, instead of making his car engines more efficient and using less fuel per power output. Instead of designing an engine to reduce Nitrogen Oxides and unburnt HydroCarbons, he adds on costly gadgets AFTER-THE-FACT, to reduce pollution after it has been generated instead of designing to prevent so in the first place.

Almost all auto vehicles utilize four stroke engines which use only one of the four strokes to make power, while allowing the other three strokes to WASTE power in one form or another. Seventy-five percent wastage is not very efficient.

While two stroke engines are used in some heavy-duty trucks and in small appliances, they have virtually no usage in the world auto industry due mostly to poor fuel utilization and excessive air pollution.

In 1886 before hardly any autos existed on the roads, the inventor of the Outboard Motor 2-cycle engine, Sir Dugald Clerk, in one of the first of his long line of his-authored textbooks, mandated that the auto industry and industry in general must avoid shortages of Petroleum; avoid polluting of the air; and he said that engines must use BOTH SIDES of the piston (as in Steam engine usage.)

A New Jersey Inventor, Maurice J. Ojserkis, founder of the new Minicord Motors Corporation, has heeded Dugald Clerk's admonitions and has patents in progress on an engine which utilized BOTH SIDES OF THE PISTON, and also COMPOUNDS and recuperates some 20% extra power or lower fuel consumption by gearing the exhaust energy back into the engine crankshaft while internally self-supercharging the engine for superior breathing and power output of the engine. It does this without needing external mechanically or exhaust driven superchargers to compress the mixture.

At the Flick-of-a-Switch, the Minicord engine changes from six cylinder mode to Twelve cylinders. The power increase is instantaneous and dramatic. It uses three of the four strokes to make power.

The basic MINICORD engine is of six cylinder flat-opposed format and air-cooled looking not unlike the old VOLKSWAGEN Beetle engine from the outside. The interior is radically different. It is smaller than conventional engines, has less weight, lower pollution, higher power and is of substantially lower cost to the auto manufacturer. It lasts longer with less care needed than conventional engines and debunks the misleading present car buyer advertising which touts the advantages of sixteen, twenty-four and thirty-two valve engines, when in truth, this just results in higher cost, more parts to clack around inside the engine, earlier and higher engine repair and replacement of parts.

For those who remember the old Willys-Knight silent six engine of the late 1920's, the Minicord engine is substantially more quiet despite being air-cooled.

The MINICORD engine utilizes well proven technology of the Burt-McCollum single sleeve valve as was so successfully used before and during World-War II in the British BRISTOL-HERCULES aero engines of some one thousand two hundred horsepower each. The British mass-produced some 131,000 of these engines which lasted about $3\frac{1}{2}$ -times longer than American Pratt & Whitney and Wright engines before needing overhaul. With the advent of the Jet Age, this technology was shelved and forgotten til now.

With active support of the British Air Ministry, they employed some 71,000 workers making Hercules engines, and this is a goal towards which MINICORD hopes to reach in the State of North Carolina.

The MINICORD engines will be 100% all-aluminum and will require the new utilization of thousands of tons of aluminum per year whilst employing thousands of new workers to make same to satisfy domestic and world-wide market requirements. This engine has the potential to rejuvenate American industry and make America more competitive while demonstrating true innovation.

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

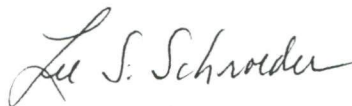
November 24, 1992

Dear Mr. Ojserkis:

Thank you for your recent letter regarding high-horsepower, energy-efficient, and low-pollution, internal combustion engines. The two-page description of your project provided interesting reading. Unfortunately, this office does not provide funds for pursuing research and development activities--that capability resides in other Federal agencies.

I wish you every future success with your project.

Sincerely yours,

A handwritten signature in cursive script, reading "Lee S. Schroeder".

Lee S. Schroeder
Assistant Director
Physical Sciences and Engineering

Mr. Maurice J. Ojserkis
RR 6 Box 115E Ocean Heights Ave.
Pleasantville, N.J. 08232

"Document Control"

TYPE: ACTION

DOCUMENT NUMBER: 9202382

ORIGINATOR: 02

STATUS I

DIRECTORATE STATUS

FROM: OJSERKIS, Maurice

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/27/92

SUBJECT: HE IS FORWARDING HIS IDEAS FOR A NEW DESIGN FOR
COMBUSTION ENGINES, AND HE SEEKS OSTP'S ASSISTANCE
WITH GETTING THIS PROGRAM TO THE MARKET PLACE.

DIRECTORATE

STAFF

ASSIGNED: PHYSICAL SCIENCES

ASSIGNED:

ACTION

STAFF

REQUIRED: AS NECESSARY

ACTION:

SENDER'S DUE DATE:

OSTP DUE DATE: 08/27/92

STAFF DUE DATE

DATE COMPLETED:

DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley

WHITE HOUSE TRACKING #:

CONTACT PERSON:

REMARKS:

PHONE:

EXT:

OSTP RECEIVED: 08/14/92
FILE: P-PHYSICAL SCIENCES

DEPT RECEIVED:

CENTRAL FILES:

2382

RECEIVED

27-July-1992

92 AUG 14 AM: 55

OSTP
MAIL ROOM

Dr. D. Allan Bromley
Science Advisor to the President
OFFICE OF SCIENCE & TECHNOLOGY
Old Executive Office Building
17th Street & Pennsylvania Avenue, N.W.
Washington, D.C. 20506

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Maurice J. Ojserkis
OJSERKIS CONSULTING ENGINEERS
RD6 115E Ocean Heights Av. #2050
Pleasantville, N.J. 08232
(609) 927-6593.

MJO:grs CC: 2-pg Memo.

1. The first part of the report deals with the general situation of the country and the progress of the work done during the year.

2. The second part of the report deals with the results of the work done during the year and the progress of the work done during the year.

3. The third part of the report deals with the results of the work done during the year and the progress of the work done during the year.

4. The fourth part of the report deals with the results of the work done during the year and the progress of the work done during the year.

5. The fifth part of the report deals with the results of the work done during the year and the progress of the work done during the year.

6. The sixth part of the report deals with the results of the work done during the year and the progress of the work done during the year.

7. The seventh part of the report deals with the results of the work done during the year and the progress of the work done during the year.

8. The eighth part of the report deals with the results of the work done during the year and the progress of the work done during the year.

9. The ninth part of the report deals with the results of the work done during the year and the progress of the work done during the year.

10. The tenth part of the report deals with the results of the work done during the year and the progress of the work done during the year.

Maurice J. Ojserkis
OJSERKIS CONSULTING ENGINEERS
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"Document Control"

TYPE: MEETING REQUEST DOCUMENT NUMBER: 9200531
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS

FROM: KOFF, Bernard L.: UNITED TECHNOLOGIES, PRATT & WHITNEY

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 02/14/92

SUBJECT: HE IS FORWARDING A COPY OF A PAPER WHICH SUMMARIZES
THEIR PROGRESS IN COMMERCIAL JET ENGINES AND
OUTLINES STRATEGIES FOR THE FUTURE. HE REQUESTS TO
MEET WITH DR. BROMLEY TO DISCUSS FUTURE PROSPECTS.

DIRECTORATE STAFF
ASSIGNED: PHYSICAL SCIENCES ASSIGNED:

ACTION STAFF
REQUIRED: AS NECESSARY ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: 03/05/92 STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley

WHITE HOUSE TRACKING #: CONTACT PERSON:
PHONE: EXT:
REMARKS: ENCLOSURE TO PHYSICAL SCIENCES.

OSTP RECEIVED: 02/20/92 DEPT RECEIVED:
FILE: P-PHYSICAL SCIENCES
CENTRAL FILES:



**UNITED
TECHNOLOGIES
PRATT & WHITNEY**

0521 A
P.O. Box 109600
West Palm Beach, FL 33410-9600
(407) 796-5285

RECEIVED
92 FEB 20 12:08
Bernard L. Koff
Executive Vice President
Engineering and Technology

14 February 1992

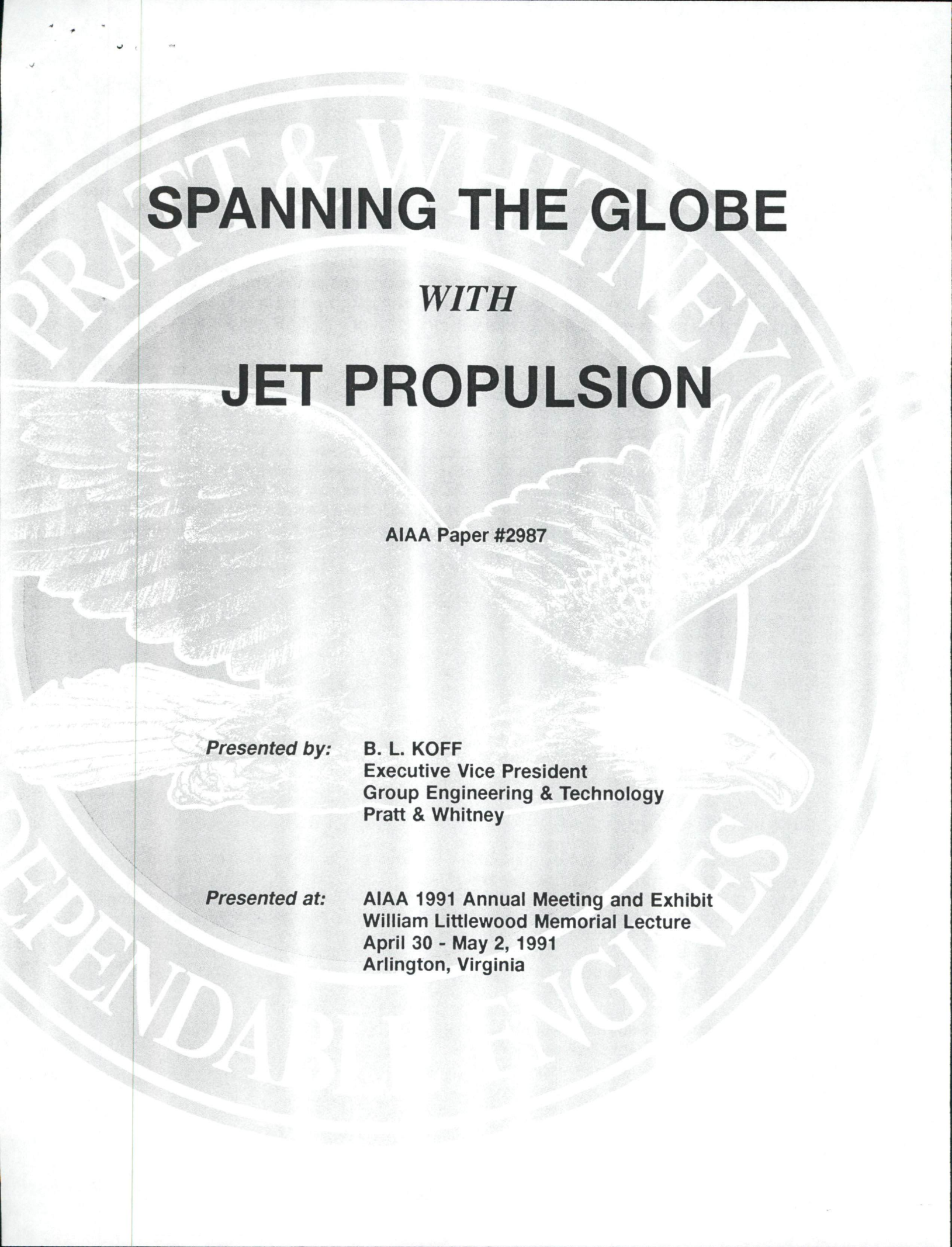
Hon. Dr. D. Allen Bromley
Assistant to the President for
Science and Technology
Old Executive Office Building
17th & Pennsylvania Avenue, N.W.
Room 358
Washington, D.C. 20506

Dear Dr. Bromley:

Attached is a paper presented last spring that summarizes how we made progress in commercial jet engines and outlines a strategic roadmap for the future. I would like to discuss the exciting future prospects with you at your convenience because of the importance to our aerospace industry and balance of trade.

Sincerely,

mmg
Attachment



SPANNING THE GLOBE

WITH

JET PROPULSION

AIAA Paper #2987

Presented by:

B. L. KOFF
Executive Vice President
Group Engineering & Technology
Pratt & Whitney

Presented at:

AIAA 1991 Annual Meeting and Exhibit
William Littlewood Memorial Lecture
April 30 - May 2, 1991
Arlington, Virginia

AUG 7 1992

"Document Control"

TYPE: ACTION DOCUMENT NUMBER: 9202237
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS

FROM: HIRAO, Yasuo: NATIONAL INSTITUTE OF RADIOLOGICAL SCIENCES

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/27/92

SUBJECT: HE IS WRITING REGARDING THE SHUTDOWN OF THE BEVALAC
FACILITY.

DIRECTORATE STAFF
ASSIGNED: PHYSICAL SCIENCES ASSIGNED:

ACTION STAFF
REQUIRED: FOR DAB'S SIGNATURE ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: 08/20/92 STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT: 9/14/92

COPIES TO: D. Allan Bromley
INTERNATIONAL/POLICY

WHITE HOUSE TRACKING #: CONTACT PERSON:
PHONE: EXT:
REMARKS:

Dr. Erik ...



OSTP RECEIVED: 08/06/92
FILE: P-PHYSICAL SCIENCES

DEPT RECEIVED:

CENTRAL FILES:



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

September 14, 1992

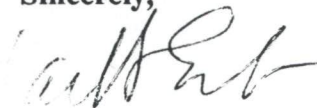
Dear Dr. Hirao:

I am writing in response to your letter to Dr. Bromley concerning plans by the Department of Energy to terminate BEVALAC operations.

The DOE is responding to the fact that its nuclear physics research program, which has provided most of the funding to operate the BEVALAC, is increasingly turning its attention to other facilities. Given this declining nuclear physics interest, the Department has attempted to ascertain whether other users of the BEVALAC find the facility sufficiently important to their activities to provide funds to sustain BEVALAC operation. To date, no other science community or funding agency has expressed that degree of interest.

If the situation changes and funds from medical or other programs become available to support the BEVALAC, the DOE will reevaluate its plans to close the facility. Thank you for your letter and the information it contains.

Sincerely,



Karl A. Erb
Associate Director for
Physical Sciences and Engineering

Dr. Yasuo Hirao
Director
Division of Accelerator Research
National Institute of Radiological Sciences
9-1, Anagawa-4-chome
Inage-ku, Chiba-shi 263,
JAPAN



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

June 16, 1992



Honorable D. Allan Bromley
Assistant to the President
for Science and Technology
The White House
OEOB, Room 358
Washington, DC 20506

OSTP
MAIL ROOM

Dear Dr. Bromley:

Attached is an article out of the New York Times dated June 11 which causes this Department some concerns (this is an understatement).

I assume that Dr. Tucker's expertise is in physical services; not biology, silvaculture, or forest management. I can find no evidence he shared his findings with this land management Department, nor those with expertise in biodiversity or ecosystems.

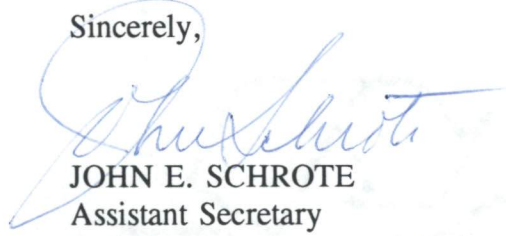
What I do note, is that Dr. Tucker used government resources, and "knowledge" gained from his job, to press forward his personal agenda. Even the timing of the release suggests this. He has done so in the name of science though the science is incomplete and, therefore, is not scientifically credible for policymaking purposes.

Our knowledge is limited to the article but with that in mind we question the legality and especially the ethics of Dr. Tucker's conduct.

The reason I am bringing this ethical matter to your attention is because you are the ranking scientist in this administration, and as such, you more than anyone, are probably concerned about the integrity of the scientific community and the conduct of government scientists.

I wish I could forward a recommendation or suggestion, but if you wish to address this specific problem, please know that this Department will enthusiastically support that endeavor.

Sincerely,



JOHN E. SCHROTE

Assistant Secretary
Policy, Management and Budget

Attachment

cc: Secretary

The Earth Summit:

A Closer Look at the Vanishing Forests

Space Photos Show Forests in Pacific Northwest Are in Peril, Scientists Say

By TIMOTHY EGAN
Special to The New York Times

SEATTLE, June 10 — A team of Government scientists mapping changes in the earth's surface says the latest satellite pictures show a surprising level of damage to the richest forests of the United States.

When compared particularly with the tropical rain forests of Brazil, the evergreen forests of the Pacific Northwest, although only a tenth the size, appear to be in danger of losing their biological vitality, the scientists said.

They said the pictures show the national forests in the Northwest so torn up by thousands of clear-cuts that the logging threatens the ability of the forests to support a diversity of species.

The scientists, from the National Aeronautics and Space Administration's Goddard Space Flight Center in Greenbelt, Md., are led by Dr. Compton J. Tucker. They base their conclusions on pictures from space of the tropical rain forest in Brazil and the temperate rain forests of Washington and Oregon.

'Severe Fragmentation' Found

"When you compare the situation in the Pacific Northwest to the Amazon of Brazil, the Northwest is much worse," Dr. Tucker said in an interview. "The pictures show this amazing, graphic situation — the severe fragmentation of the forest in the Northwest."

Because the continuity of the forest is so badly damaged, he said, such logging "has serious implications" for the diversity of plant and animal species needed to maintain a healthy biological system.

Officials of the United States Forest Service, which sets policy on such logging operations, say it is misleading to make judgments about forest practices based on pictures from space.

Almost all the cut-over Forest Service land has been replanted with new trees, they say, but this is not shown in the pictures from space because newly planted plots look the same as bald, deforested areas until the trees are about 10 years old.

The NASA pictures are bound to influence the debate in Congress over how much logging should be allowed in the national forests. The Bush Administration wants to open up logging on four million acres, in two areas of the state of Washington that contain large sections of old growth forest. Several bills pending in Congress would preserve most of the remaining forest.

Aerial tours of clear-cuts in the Northwest have proved to be one of the most convincing lobbying tools for groups opposed to extensive logging.

Dr. Tucker said he made his pictures available because he thought the comparison was relevant to the international debate.

Mapping Terrestrial Changes

Dr. Tucker, a senior fellow at the Goddard Center who has worked for the space agency for 17 years, heads a 15-member team that has been using satellite pictures to map changes in the earth's surface. He directs a unit of the Laboratory for Terrestrial Physics. His past studies have focused on the Amazon rain forest and on the growth of the Sahara Desert.

He has spent much of the past year comparing pictures of the Pacific Northwest with those of Brazil. Some of the pictures were shown to President Bush during his visit to the Goddard Center two weeks ago.

A White House spokesman said to-

day that the President saw many satellite photos that day and did not specifically recall the ones comparing deforestation.

In Brazil, Dr. Tucker said, most of the Amazon forest remains intact despite years of cutting and burning to clear land for agriculture and development. The forest's edges have been pushed back and some sections have been opened in the interior, but the vast expanse of forest is undisturbed.

By contrast, he said, in the Pacific Northwest a large portion of the forest has been cut into small segments by roads and development or logging. When loggers clear-cut a tract of land, they cut down all the trees on hundreds of plots of 40 to 60 acres each.

Cutting the Forest to Pieces

"What so astonished us when we started to do this comparison was the tremendous degree of fragmentation in the Northwest," Dr. Tucker said. "It appears that much of the forest has been literally cut to pieces."

Some biologists compare the forests of the Northwest to a shirt that has been perforated again and again; after awhile there are many holes and little shirt. They contend that the region's national forests have been so sliced up by small clear-cuts that the overall

health of the forest is at risk.

New Logging Methods

The Forest Service announced last week that it was retreating from its decades-old policy of clear-cutting. Under the new logging methods, some trees will be left standing as a means of encouraging a more natural regeneration of the forest.

The satellite analysis of the forests in the Pacific Northwest and Brazil adds a new dimension to a claim that many environmentalists have made about logging in the United States.

Extensive mapping by the Wilderness Society, for example, has concluded that a little more than 10 percent of the original 25-million-acre forest that once stretched from Northern California to the Canadian border is intact. This great swath of trees, including species like the Pacific yew, which contains a cancer-fighting compound, and many plants and animals in danger of being lost forever, is generally considered the biggest and richest of American forests.

In recent years, as other countries have stepped up their criticism of forestry practices in South American nations, some of these countries, including Brazil, have countered by citing the destructive logging of ancient forests in the Pacific Northwest.

As delegates met in Rio de Janeiro this week for the Earth Summit, leaders from the northern nations have continued to press for restrictions on logging in tropical forests.

The United States delegation arrived in Rio proclaiming protection of the world's forests as the main objective. As an incentive to developing countries, President Bush said the United States would increase its aid to other nations' forestry programs by \$150 million, to \$270 million, in the next fiscal year.

But the Bush Administration has opposed as too costly a proposed treaty

that would protect the world's plant and animal species.

In Dr. Tucker's analysis, the biggest threat from logging in the Pacific Northwest is to the diversity of species, a point on which many Forest Service officials agree.

Pictures Termed Misleading

But John Lowe, the deputy regional forester for the Pacific Northwest, said the satellite pictures do not show the replanting that has taken place in many areas.

"The big difference between us and Brazil is that we are trying to bring it back," Mr. Lowe said. "Deforestation is not the business we are in. It never

has been. We have been 99 percent successful in bringing in new forests after logging."

He acknowledged that the clear-cutting in the Northwest had left many experts concerned about a drop in the diversity of species. These people say that when a natural forest is replaced by commercially valuable trees, the plot becomes a farm, not a forest, and biological interaction is damaged.

But Mr. Lowe defended the practice. "Certainly, we have fragmented the landscape," he said, "but overall the forest is healthy enough to operate as an ecosystem that will foster species diversity."

THURSDAY, JUNE 11, 1992

THE WALL STREET JOURNAL

* * *

Earth Summit negotiators reached an accord on a compromise text that trims a request for financing commitments for environmental efforts, the Reuters news agency said. Reuters said the draft text, hammered out in all-night talks in Rio de Janeiro, substantially waters down an initial funding appeal. (Related story on Page A2)

* * *

"U.S. Finds Success In Rio With Oceans Pact"

"Popularity Puts Pacific Sharks At Risk" (Earth Summit)
(USA TODAY - 6/11/92)

"Purse-Strings Issue Snarls Ambitious Environment Plan"
(Washington Times - 6/11/92)

"U.S., Third World Reduce Gap At Rio" (Earth Summit A1)
"Critics Say U.S. Behind The Curve"
(Washington Post - 6/11/92)

"Bush's Badge Is Waiting" (Earth Summit - Editorial)
(Wall Street Journal - 6/11/92)

AUG 27 1992

"Document Control"

TYPE: ACTION

DOCUMENT NUMBER: 9202469

ORIGINATOR: 02

STATUS I

DIRECTORATE STATUS

FROM: TAMPLAIN, Julia B.

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/27/92

SUBJECT: SHE IS WRITING REGARDING THE SEIZURE OF THE
TYRANNOSAURUS REX REMAINS FROM THE BLACK HILLS
INSTITUTE.

DIRECTORATE

STAFF

ASSIGNED: PHYSICAL SCIENCES

ASSIGNED: *Dona*

ACTION

STAFF

REQUIRED: AS NECESSARY

ACTION: *Reply letter*

SENDER'S DUE DATE:

OSTP DUE DATE: 09/09/92

STAFF DUE DATE

DATE COMPLETED:

DATE COMPLETED/DEPT: 8/27/92

COPIES TO: D. Allan Bromley



WHITE HOUSE TRACKING #:

CONTACT PERSON:

REMARKS:

PHONE:

EXT:

OSTP RECEIVED: 08/26/92
FILE: P-PHYSICAL SCIENCES

DEPT RECEIVED:

CENTRAL FILES:



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

August 27, 1992

Dear Ms. Tamplain:

Thank you for your recent letter to Dr. Bromley regarding the recent seizure of the *Tyrannosaurus rex* skeleton from the Black Hills Institute of Geological Research. I am sure you realize that Dr. Bromley cannot get involved in a criminal investigation, but I thought you would like to know that we are inquiring as to the storage conditions and treatment that the skeleton receives while in the custody of the FBI. We will try to ensure that the scientific value of the remains are preserved while the courts decide the legal issues involved. Thank you for bringing this issue to Dr. Bromley's attention.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "David C. Cranmer", with a long horizontal flourish extending to the right.

David C. Cranmer
Fellow

Ms. Julia B. Tamplain
2289 Country Club Drive
Laplace, LA 70068

2469

RECEIVED

92 AUG 26 AM : 58

2289 COUNTRY CLUB DRIVE
LAPLACE, LOUISIANA 70068

July 27, 1992

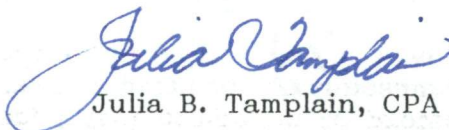
D. Allan Bromley
Assistant to the President for Science and Technology
Office of Science and Technology
Executive Office Building
Washington, D.C. 20240

Dear Mr. Bromley:

As a concerned citizen and taxpayer, I feel compelled to protest the seizure of "Sue", reputed to be the world's best preserved tyrannosaur, from the Black Hills Institute of Geological Research in Hill City, South Dakota. Rather than sealing the Institute's premises while legal questions are debated, the U.S. Attorney's office physically removed precious fossils without regard to proper handling or storage techniques.

It is unthinkable to me that the U.S. Attorney presumes his staff to be qualified in the highly specialized discipline of paleontology. I pray for "Sue" to be returned to the Black Hills Institute immediately before further damage is done to the fossil. In the interest of scientific research and as an outrage against the abuse of governmental power, I seek your assistance in achieving this goal.

Sincerely,


Julia B. Tamplain, CPA



AUG 12 1992
AUG 12 1992

"Document Control"

TYPE: ACTION DOCUMENT NUMBER: 9202270
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS

FROM: CASHMORE, R.J.: UNIVERSITY OF OXFORD

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/24/92

SUBJECT: HE IS WRITING REGARDING THE FUNDING CUT FOR THE SSC.

DIRECTORATE STAFF
ASSIGNED: PHYSICAL SCIENCES ASSIGNED: Lee Schrock

ACTION
REQUIRED: FOR DAB'S SIGNATURE

STAFF Common letter (Cashmore, Mkrtchyan,
ACTION: Davis) Handling them for Supporting SSC
+ Home (Senate funding for FY93 9/29/92 JSS)

SENDER'S DUE DATE:
OSTP DUE DATE: 08/21/92 STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley
INTERNATIONAL/POLICY

WHITE HOUSE TRACKING #: CONTACT PERSON:
REMARKS: PHONE: EXT:



OSTP RECEIVED: 08/07/92 DEPT RECEIVED:
FILE: P-PHYSICAL SCIENCES
CENTRAL FILES:



THE WHITE HOUSE
WASHINGTON

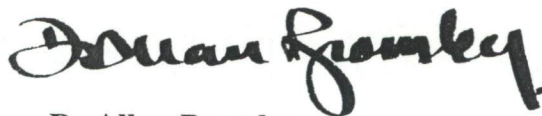
September 29, 1992

Dear Professor Cashmore:

Thank you for your recent letter regarding funding of the Superconducting Super Collider. We in the Administration, including the President, have worked very hard with Congress to turn the earlier House vote around. These efforts have been successful, and joint congressional action has restored funding to the SSC. The restoration, while substantial, is still under the President's request for fiscal 1993 but will allow us to move forward on constructing this forefront research facility.

Thank you again for your expression of interest and support.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "D. Allan Bromley". The signature is fluid and cursive, with the first name "D. Allan" and the last name "Bromley" clearly distinguishable.

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

Professor R. J. Cashmore
University of Oxford
Department of Physics
Nuclear Physics Laboratory
Keble Road
Oxford OX1 3RH
UNITED KINGDOM

2270

UNIVERSITY OF OXFORD

Department of Physics

Telephone: Switchboard (0865) 273333
Direct Line (0865) 273323
Secretary (0865) 273353
Telex: 83295 NUCLOX G
Fax: (0865) 273418
Email: CASHMORE@UK.AC.OX.PH

RECEIVED
92 AUG 7 11:53
OSTP
MAIL ROOM

PARTICLE & NUCLEAR PHYSICS
Nuclear Physics Laboratory
Keble Road
Oxford OX1 3RH

*Professor of Experimental Physics
and Head of Particle & Nuclear Physics*
R.J. CASHMORE

RJC/JR

24 July 1992

Dr D Allan Bromley
Science Advisor to the President
Old Executive Office Building, Room 360
17th and Pennsylvania Avenue, NW
Washington, DC 20506
USA

Dear Sir

I was both surprised and dismayed when results of the Vote of Congress on the support of the SSC were known. Many scientists in the United Kingdom have been keen to participate in this forefront scientific activity and have already deployed substantial resources in preparing for the experiments at the SSC. This development has made it essentially impossible to seek long term support for the construction of the experiments and a contribution to the SSC experimental programme, and only when a clear indication of commitment to the project is obtained from the United States will it be possible to seek long term funding.

At a somewhat different level, the whole of the world scientific community will be disappointed by what will undoubtedly be seen as a United States retraction from forefront science. This will be a sad event for a country which has, for so long, led our scientific activities and which has such a successful history in this area.

I do hope that the Senate and the House of Representatives can come to some agreement in support of the SSC and that this can become a long term commitment which can then in turn be supported by scientists and governments from outside the United States. I would like to wish everyone success in their efforts to reverse the existing situation.

Yours sincerely

A handwritten signature in cursive script that reads "R. J. Cashmore". The letters are fluid and connected, with a prominent "R" and "J".

R J Cashmore

cc: Dr Roy Schwitters
Dr Frank Press
Admiral James D Watkins
Dr William Happer

"Document Control"

TYPE: ACTION DOCUMENT NUMBER: 9202407
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS

FROM: HABRAND, J.L., ROSENWALD, J.C. and MAZAL, A.: CENTRE DE
PROTONTHERAPIE D'ORSAY

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/24/92

SUBJECT: THEY ARE WRITING TO EXPRESS THEIR CONCERN OVER THE
CLOSING OF THE BEVELAC FACILITY.

DIRECTORATE STAFF
ASSIGNED: PHYSICAL SCIENCES ASSIGNED:

ACTION STAFF
REQUIRED: FOR DAB'S SIGNATURE ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: 09/01/92 STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT: 9/4/92

COPIES TO: D. Allan Bromley
INTERNATIONAL/POLICY
LIFE SCIENCES

WHITE HOUSE TRACKING #: CONTACT PERSON:
PHONE: EXT:
REMARKS: Dr. EKB Responded.

OSTP RECEIVED: 08/18/92 DEPT RECEIVED:
FILE: P-PHYSICAL SCIENCES

CENTRAL FILES:



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

September 4, 1992

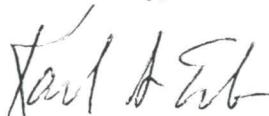
Gentlemen:

I am writing in response to your letter to Dr. Bromley concerning plans by the Department of Energy to terminate BEVALAC operations. I was interested to read your account of the contributions the BEVALAC has made in this area.

The DOE is responding to the fact that its nuclear physics research program, which has provided most of the funding to operate the BEVALAC, is increasingly turning its attention to other facilities. Given this declining nuclear physics interest, the Department has attempted to ascertain whether other users of the BEVALAC find the facility sufficiently important to their activities to provide funds to sustain BEVALAC operation. To date, no other science community or funding agency has expressed that degree of interest.

If the situation changes and funds from medical or other programs become available to support the BEVALAC, the DOE will reevaluate its plans to close the facility. Thank you for your letter and the information it contains.

Sincerely,



Karl A. Erb

Associate Director for
Physical Sciences and Engineering

Dr. J.L. Habrand
Dr. J.C. Rosenwald
Centre de Protontherapie D'Orsay
Centre Universitaire
Bat. 101-15
rue Georges Clemenceau
F 91400 Orsay
FRANCE

2407

CPO

RECEIVED

CENTRE DE PROTONTHERAPIE D'ORSAY

SYNDICAT INTERHOSPITALIER POUR L'UTILISATION MEDICALE DU SYNCHROCYCLOTRON D'ORSAY

CENTRE UNIVERSITAIRE - BAT. 101 - 15, rue Georges Clémenceau - F 91400 ORSAY

TELEPHONE : (33-1) 69 41 71 65 - TELECOPIE : (33-1) 69 41 71 66

SECRETARIAT MEDICAL : (33-1) 69 41 62 43

OSTP
MAIL ROOM

Dr Allan BROMLEY

Assistant To the President For
Science and Technology Policy
Room 360, Old Executive Office Building
17th & Pennsylvania Avenue, NW
Washington, DC 20500

Paris, 24 july 1992

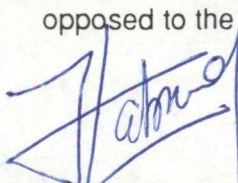
Dear Sir,

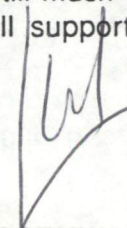
We have been strongly shocked after having heard about the intention of the US Department of Energy to shut down the Berkeley's Bevalac in the near future.

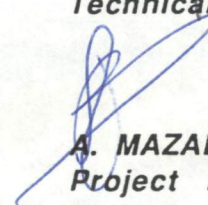
This information arrives at a time when the use of high energy heavy particles for radiotherapy is expanding, with initiation of several projects based on beams made of protons or heavier ions. A unique experience has been acquired by the group at Lawrence Berkeley Laboratory during the past 35 years. Further developments are still expected from this group, leading to an improvement of the therapeutic results, due in particular to the progress of radiobiology, medical imaging and computerized treatment planning and to the availability of deeply penetrating heavy ions.

Our center has just started a programme of protontherapy using a 200 MeV proton beam generated by a synchrocyclotron. A collaboration has been initiated between our group and the group at LBL concerning radiation protection and dose computation. In addition, we are all very interested in exploring, beyond the protons, the therapeutic capabilities of heavier particles.

Considering all these reasons we want to stress the need to continue the biomedical programme in LBL and, in this respect, to keep the Bevalac open. There is still much to do, for the benefit of scientific research and patient cure. We therefore give our full support to all those who are opposed to the shut down of the Bevalac


J.L. HABRAND, MD
Medical Coordinator


J.C. ROSENWALD, PhD
Technical Coordinator


A. MAZAL, PhD
Project Manager

TYPE: ACTION
ORIGINATOR: 02

DOCUMENT NUMBER: 9202177
DIRECTORATE STATUS

STATUS I

FROM: OSTRACH, Simon: CASE WESTERN UNIVERSITY

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/24/92

SUBJECT: HE IS WRITING REGARDING COMMENTS DR. BROMLEY MADE
REGARDING SCIENCE IN A MICROGRAVITY ENVIRONMENT AT
THE RECENT CONVOCATION OF PROFESSIONAL SOCIETIES AT
THE NATIONAL ACADEMY OF SCIENCES.

DIRECTORATE
ASSIGNED: PHYSICAL SCIENCES

STAFF
ASSIGNED: Doug (look at) minus of the vantage w/KE.

ACTION
REQUIRED: FOR DAB'S SIGNATURE

STAFF
ACTION:

SENDER'S DUE DATE:

OSTP DUE DATE: 08/17/92

STAFF DUE DATE

DATE COMPLETED:

DATE COMPLETED/DEPT: 8/3/92

COPIES TO: D. Allan Bromley
Steve Olson

WHITE HOUSE TRACKING #:

CONTACT PERSON:

PHONE:

EXT:

REMARKS:

Dr. Eub signed letter for DAB



OSTP RECEIVED: 08/03/92
FILE: P-PHYSICAL SCIENCES

DEPT RECEIVED:

CENTRAL FILES:



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

August 17, 1992

MEMORANDUM FOR THE FILES

FROM: DOUG BEASON 

SUBJECT: SIMON OSTRACH'S LETTER TO DAB ON
MICROGRAVITY MATERIALS SCIENCE
RESEARCH

- Main grievance is with a "no valid science" claim by OSTP for microgravity materials science
- His White Paper describes very generically the importance of microgravity research
 - He concludes it mostly benefits basic science
 - His arguments are limited to:
 - 1) Microgravity provides a unique environment
 - 2) Transport phenomena are significantly influenced by gravity
 - 3) Empirical means alone should not be used to develop space technologies
- From OSTP's internal paper, OSTP does not have a problem with this
 - OSTP argues that because microgravity materials research will mostly benefit basic research, it should therefore be judged according to standard basic research merit criteria
 - OSTP further found that there was no convincing evidence that space station experiments are dramatically superior to other materials science research
- OSTP's main point that microgravity science's value as fundamental science is not qualitatively superior still makes sense

RECOMMENDATION: OSTP's March 11, 1991 analysis stands -- OSTP does not argue the need for microgravity materials science research, we only argue that it be judged according to the same standards as other basic research . . . and microgravity experiments appear not to be dramatically superior to other materials science research

THE WHITE HOUSE
WASHINGTON

August 31, 1992

Dear Dr. Ostrach:

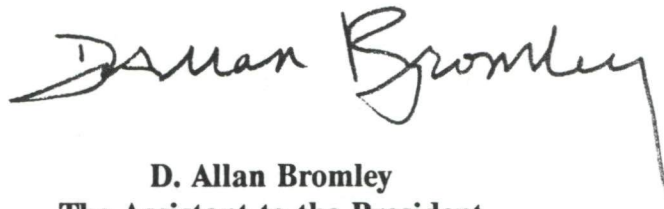
Thank you for your recent letter and accompanying materials. I am writing to correct a misunderstanding in your correspondence concerning the statement that "no valid science" could be performed in a microgravity environment.

Certainly I would not support such a statement. I have no doubt that both the validity and quality of science in a microgravity environment would be very good. I should add, however, that I do not believe that the \$40 billion space station program can be justified on the basis of microgravity science.

Rather, that justification is found in the space station's critical role in the manned exploration of space in my view. I do anticipate very interesting ancillary research as a byproduct of this endeavor.

I appreciate this opportunity to clarify my position.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "D. Allan Bromley". The signature is fluid and cursive, with a long, sweeping underline that extends to the right.

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

Dr. Simon Ostrach
Wilbert J. Austin Distinguished Professor of Engineering
Department of Mechanical and Aerospace Engineering
Case Western Reserve University
10900 Euclid Avenue
Cleveland, Ohio 44106-7222



CASE WESTERN RESERVE UNIVERSITY

2177

RECEIVED
JUL 24 3 16

July 24, 1992

OSTP
MAIL ROOM

Dr. D. Allan Bromley
Assistant to the President for
Science and Technology
Executive Office of the President
The White House
Washington, DC 20500

Dear Dr. Bromley:

At the recent Convocation of Professional Societies at the National Academy of Engineering I was distressed to hear you say that you and your staff know of no valid science that could be performed in a microgravity environment. As a scientist who has been involved with NASA's microgravity program for many years and just completed an outstanding series of experiments on the USML-1 shuttle mission, I would like to know the bases for your conclusions.

I would call your attention to three reports, Refs. 1 to 3, issued by the National Research Council which indicated many important and fruitful research areas for microgravity research. The members on the committees that developed those reports included distinguished space scientists and a Nobel laureate in physics in addition to people involved in microgravity research. Another report by the Space Studies Board, Ref. 4, has just been issued and still another SSB Committee is developing a report, "A Strategy for Microgravity Research for the 1990's," which is to be completed by the end of the year.

In short, this unusual multi- and cross-disciplinary research area has been evolving over the years and has received careful scrutiny and endorsement by a broad segment of the science community. This research is quite different in many ways from the space sciences and seems to be different things to different people.

I have enclosed a White Paper on microgravity research that was recently released which helps to describe the nature and importance of microgravity research. I believe it is a precursor for other cross-disciplinary research which is essential for the Nation's technological leadership and it impacts the lives of the citizens more directly than much of the research in the pure sciences.

Simon Ostrach
Wilbert J. Austin Distinguished Professor of Engineering
Department of Mechanical and Aerospace Engineering

MAILING ADDRESS
Case Western Reserve University
10900 Euclid Avenue
Cleveland, Ohio 44106-7222

VISITORS AND DELIVERIES
Glennan Building

Phone 216-368-2942
Fax 216-368-6445

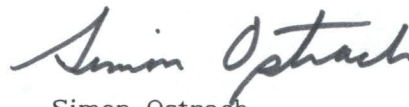
Dr. D. Allan Bromley

7/24/92

-2-

I hope that, in view of the above, you will re-examine your position on microgravity research. I would be happy to help in any way you deem desirable.

Very truly yours,

A handwritten signature in cursive script, reading "Simon Ostrach". The signature is written in dark ink and is positioned above the printed name.

Simon Ostrach

SO:oam

Enclosures: 2

References

1. Industrial Applications of the Microgravity Environment, Space Applications Board, 1988.
2. Space Science in the Twenty-First Century: Imperatives for the Decades 1995 to 2015: Overview, Space Studies Board, 1988.
3. Ibid: Fundamental Physics and Chemistry, Space Studies Board, 1988.
4. Towards a Microgravity Research Strategy, Space Studies Board, 1992.

WHITE PAPER ON NASA-WIDE MICROGRAVITY RESEARCH

EXECUTIVE SUMMARY

The NASA microgravity science and applications program is a fusion of the Office of Aeronautics and Space Technology (OAST) Physics and Chemistry Experiment (PACE) program and the then separate Office of Space Applications Materials Processing in Space program and was ultimately assimilated into the Office of Space Science and Applications (OSSA) as a separate discipline office. It has been managed by OSSA since 1983 as a separate science discipline division and, reflecting its origins, is still considered by many observers to be essentially a "materials processing in space program". In recent years it has become much more broadly based and scientifically oriented. It has been designated as one of the two main research activities for Space Station Freedom and has been receiving an increasing budget for flight hardware development.

Microgravity research is directed to such topics as materials science, combustion, fluid flows, heat and mass transfer, fundamental physics, and biotechnology. Thus, it represents interdisciplinary research activities in space and on the ground in which the underlying theme is the study of transport and interfacial phenomena and their effects on physical, chemical, and biological systems. Because of its inherent breadth and cross-disciplinary nature a strong and unified constituency has not yet developed. As a result of this and its early history as an applications program there is some skepticism and criticism of the program's scientific

integrity and merit.

A group of respected and experienced scientists (see Appendix) who represent most major areas of microgravity research and who participate in every major advisory group, both internal and external to NASA, together with a distinguished fluid and thermal scientist, who has had no personal involvement in NASA's microgravity research program, were assembled under the auspices of the Universities Space Research Association's (USRA) Microgravity Science and Applications Science Council to provide NASA with a more global view of the challenges and opportunities in developing a comprehensive world-class microgravity research program and to recommend what is required to meet them. This "White Paper" is a report of their deliberations and recommendations. In no way should this report be considered as an evaluation or criticism of any existing NASA programs. Such considerations were beyond the scope of the study. The purpose of the study was to take a forward-looking view, without constraints of existing NASA organizational structures, to identify rich and meaningful microgravity science and applications research so that the program can flourish and contribute to NASA's success and the Nation's welfare.

The scientific basis for microgravity research is often misunderstood and is articulated here to allay misconceptions and to entice high-quality researchers to the field so that a constituency can be developed to participate in the program and serve as its advocate. While the low-gravity environments of orbiting spacecraft and extra-terrestrial bodies present unique conditions for serious scientific study, an often overlooked critical

fact is that the reduction in gravity also directly and dramatically influences transport phenomena which play an essential role in a wide range of processes that are important in both space-based and terrestrial technologies. Furthermore, since space experimentation is both extremely costly and limited in accessibility, mission-enabling technologies (e.g., life- and operating-support systems) and commercial opportunities cannot be successfully developed unless the approaches are well coordinated and based on a scientifically sound foundation. A succession of primarily empirical investigations, however well justified each individual experiment may be, will not likely succeed. A broad-scope, well-coordinated microgravity research program is essential to provide the scientific and engineering base for such developments. Therefore, for NASA to accomplish its numerous and diverse, manned and unmanned, space missions it is essential that a productive microgravity research program should both serve the science community and also provide a practical knowledge base on which space technologies can be developed in a cost-effective, reliable, efficient, and timely manner. Such considerations will require broadening the scope of the present microgravity research program and will significantly enhance its value to NASA and contribute to the Nation's industrial competitiveness.

A number of direct needs that follow from such a viewpoint are identified herein. Some deal with scientific and technical issues, some with policy matters, and others with policy implementation and public relations. Together they indicate the need for enhanced continual interaction among the various NASA units, external scientists and engineers, and industry and advisory

bodies. To satisfy such needs working groups are recommended, viz.; discipline working groups to identify a broad range of relevant scientific topics, intra-agency groups supplemented by external scientists and engineers to define gaps in knowledge for which research is required for efficient space technology and commercial endeavors development, and interdisciplinary "tiger" teams of the most mature and experienced people in the program to help focus, prioritize, and give advice on top-level decisions which can satisfy both the desires of scientists and the needs of technologists. Cross-disciplinary workshops and special lecture series are recommended to stimulate interest in microgravity research and to disseminate the results to the various constituencies, such as industry. This will help ensure that the most significant and highest-quality research will be performed to accomplish NASA's many missions and that a constituency for the program will be molded to serve as the program's advocate, to give it credibility, and increase its visibility.

The main points made herein are that:

1. Microgravity provides an unique environment (not unlike that of ultra-high vacuum facilities, supercolliders and high-magnetic field laboratories) for conducting world-class scientific research.
2. Transport phenomena which play an essential role in many processes that are important in both space-based and terrestrial technologies are significantly influenced by gravity and the research on these phenomena in the current program is highly relevant to activities throughout NASA. This type of research is of an interactive laboratory type which requires scientists in space and is different from the observational-type research associated with the more traditional space sciences.
3. Because access to space is limited and costly, empirical means alone should not be used to develop space technologies and commercial

opportunities. Scientific scrutiny must be given to the associated processes to identify gaps in knowledge that require directed research which will enhance the timeliness, cost-effectiveness, reliability and efficiency of the developments. This scrutiny will broaden the scope of the present microgravity research program and it emphasizes that microgravity research is essential Agency-wide.

The essence of the recommendations made herein can be summarized by one word, interactions. There must be direct and continual interactions among all NASA units and with scientists and engineers both in academia and industry. Working groups (different from advisory committees) are suggested as one means of ensuring the interactions. There may well be other ways to accomplish the objectives. Time and resource limitations precluded extensive exploration of alternatives or of the implications of what is presented herein to existing NASA activities. Furthermore, it would be inappropriate to do so. What is intended herein is to bring to NASA's attention a more global and integrated view of microgravity research and to indicate its importance to the entire Agency. A great deal of experience and wisdom exists both within NASA and in the science and engineering communities and these should be integrated more closely than ever before to determine specific ways to meet the challenges and opportunities of the future.

FOREWARD

Despite three National Research Council reports^{1,2,3} that indicated numerous valid reasons for microgravity research, NASA's microgravity science and applications program has different connotations to the various constituencies on which it depends for support and implementation. To the Congress, some NASA administrators and scientists, and many researchers it is a "materials processing in space program," which reflects its early history. Space scientists (e.g., astronomers, planetary scientists, etc.) are skeptical of the microgravity program's scientific content and some openly assert that there is no scientific validity to the subject. The program has received relatively little support and visibility and, therefore, has been constrained to an effort of limited scope.

basic
science
only?!

In this White Paper the nature of microgravity research will be outlined and its scientific basis will be identified. It will be shown that microgravity research is broader in scope than presented in Refs. 1 to 3, is central to NASA's overall mission, and is of profound importance Agency-wide, not only to the Office Of Space Science and Applications (OSSA) but also to the Office of Commercial Programs (OCP), the Office of Aeronautics and Space

¹Industrial Applications of the Microgravity Environment, Space Applications Board, NRC, 1988.

²Space Science in the Twenty-First Century, Imperatives for the Decades 1995 to 2015: Overview, Space Studies Board, NRC, 1988.

³Space Science in the Twenty-First Century, Imperatives for the Decades 1995 to 2015: Fundamental Physics and Chemistry, Space Studies Board, NRC, 1988.

Technology (OAST), the Office of Space Exploration (OSE), and the Office of Space System Development (OSSD) which is responsible for Space Station Freedom (SSF).

In this way, the scientific relevance of microgravity research will be demonstrated and it will also be shown that applications are an essential part of those activities. The implications of this global viewpoint are that the microgravity research program must not only broaden its scientific scope but also must expand its activities to provide a knowledge-base from which space technologies and commercial applications can be more efficiently and economically developed. A corollary of this viewpoint is that the research activities and mission effectiveness in all the offices cited above (OSSA, OCP, OAST, OSE, OSSD) will be enhanced.

INTRODUCTION

The low-gravity environments aboard orbiting spacecraft and on extra-terrestrial bodies offer unique conditions for scientific inquiry and also present challenging problems and opportunities for commercial developments and for mission - enabling technologies, such as life- and operation-support systems. The main unique characteristic of low-gravity environments is that gravitational body forces are reduced. This leads to diminished buoyancy-driven flows and sedimentation and to the increased importance of surface tension at liquid interfaces. Thus, multiphase and multicomponent fluid behavior, e.g., mixing and separations, and interfacial phenomena are significantly affected. Almost all fluid transport phenomena (flows and heat, momentum, and mass transfer) are directly influenced by gravity. It must be recognized that such phenomena are vital elements in a wide range of physical, chemical, and biological systems, many of which are important in both terrestrial- and space-based technologies. Thus, if NASA's overall program in space science, exploration, transportation, and commercialization is to be successful, cost effective, reliable, and efficient it is essential that a comprehensive understanding be obtained of low-gravity fluid phenomena and extraterrestrial process operations.

Traditionally, NASA's microgravity research program has been centered in the Microgravity Science and Applications Division (MSAD) in OSSA. Although primary emphasis was originally given to materials processing, there now is an appreciation that microgravity science and applications comprise a broader

range of research activities that are to be conducted terrestrially and in space. The current microgravity research program includes such topics as materials science, combustion, fluid flows, heat and mass transfer, fundamental physics, and biotechnology.

An important aspect of microgravity research is its inherent breadth, which encompasses a number of sub-fields. Accordingly, microgravity science is not a distinct discipline, but rather is a set of interdisciplinary space research activities, in which a unifying and almost ubiquitous feature is the study of transport phenomena in physical, chemical, and biological systems. The fluid and thermal sciences, which are among the most highly developed areas in classical physics, constitute the core of such studies.

In considering new and important directions for microgravity research emphasis is given herein to transport phenomena because they are highly gravity dependent and occur in so many technologies. This focus is in no way meant to diminish the significance of other microgravity research topics. It should be noted that research on transport phenomena requires scientists to control and observe the experiments, i.e., it is of an interactive laboratory type in contradistinction to the observational research performed by space scientists.

It is the purpose of this White Paper to indicate that microgravity research is of vital importance Agency-wide, i.e., it both impacts and depends on activities not only in OSSA, but also in OCP, OAST, OSE, and OSSD. Thus, it will be shown herein that the microgravity science and applications program must be expanded in scope and depth specifically to include more emphasis on

the fundamental problems of extraterrestrial process operations. It follows then that the important microgravity research will need to be recognized and supported by all relevant offices within NASA.

CHALLENGES AND OPPORTUNITIES

The assertions made in the Introduction have implications for many offices and divisions within NASA.

Microgravity Science and Applications Division (MSAD) -

The goals of the microgravity fluids research program to be sponsored by MSAD are to:⁴

"Improve the understanding of those aspects of fluid dynamics and transport phenomena whose fundamental behavior is limited or affected by the presence of gravity, and where low-gravity experiments will allow insight into that behavior; Provide basic scientific and practical knowledge needed to design effective and reliable space-based systems and facilities which rely on fluid processes in their operations;

and,

Assist the other MSAD disciplines, such as materials processing and combustion science, by developing an understanding of those gravity-dependent fluid phenomena which could affect the success of the programs."

A number of promising research areas that were identified by the Fluids, Interfaces and Transport Discipline Working Group include capillary phenomena, multiphase flows and heat transfer, double-diffusive transport, magneto/electrohydrodynamics, colloids and nucleation phenomena, and solid-liquid interface systems. These topics are certainly interesting and highly gravity-dependent and, therefore, are of scientific significance. Moreover, to satisfy the need to broaden the microgravity research program a

⁴NASA Research Announcement, Microgravity Fluid Dynamics and Transport Phenomena, NRA-91-OSSA-17, pg. 5, August 23, 1991.

series of NASA Research Announcements was issued.^{4,5,6,7,8,9} However, if the goal of developing a knowledge base for the "design of effective and reliable space based systems and facilities" is to be satisfied then the gaps in knowledge that need to be filled to satisfy that goal must be clearly identified. This, especially with regard to technological needs, could lead to topics in addition to those cited above resulting in an enrichment of the overall program. Furthermore, the associated research must be done over the appropriate parametric ranges of operating conditions and configurations (directed research) so that the information will be meaningful for enhancing the technology design.

The direct implication is that there should be intimate and continual interaction among MSAD, the Life Sciences Division, OCP, OAST, OSE, and OSSD and also among both scientists and engineers in NASA, the universities, and industry. The last is particularly important because the industrial personnel who will design and fabricate the technologies are not as likely to read the scientific papers scattered among diverse journals and, thereby, will not be familiar with the nuances of the microgravity environment. Thus, another

⁵Combustion, NRA-89-OSSA-22

⁶Containerless Materials and Fluid Sciences, NRA-90-OSSA-23

⁷Biotechnology, NRA-91-OSSA-18

⁸Materials Science, NRA-91-OSSA-20

⁹Fundamental Science, NRA-91-OSSA-24

implication is that there must be directed outreach programs developed for industries so that they can be made aware of the differences between ground- and space-based operations and performance and include them in their designs.

Office of Aeronautics, and Space Technology (OAST) -

The mission statement for OAST¹⁰ is that it "shall provide technology for (present and) future civil space missions and provide a base of research and technology capabilities to serve all National space goals." A well managed and focused program will provide at least the following:*

Development uncertainties will be reduced so that mission safety and reliability would be increased.

Flight program development and operations costs would be reduced as would also, thereby, the cost of access to space.

Mission performance would be enhanced.

New missions would be enabled.

Developed technologies would be more broadly applicable so that national competitiveness would be improved.

¹⁰ Advanced Technology for America's Future in Space: A Review of NASA's Integrated Technology Plan for the Civil Space Program, Preliminary Draft, Space Systems and Technology Advisory Committee, June 24-28, 1991.

* Paraphrased from the cited source.

Although some of the technologies required for NASA missions, such as communications systems, robotics, and specialized instruments, do not directly involve transport phenomena, many others do. Examples are: various power systems; thermal management devices and systems; spacecraft fire hazard management, cryogenic engines, fluid systems, and tankage; physical and chemical life-support systems; and more mundane user-support subsystems, such as toilets and refrigerators. More specifically, multiphase flow phenomena which are highly gravity-dependent, are central to heat transfer in many space-based systems, gas-liquid contacting for air purification and energy generation, and also will play a major role in key space related and extraterrestrial chemical processes, such as catalysis and ore beneficiation. Fundamental studies are required to quantify the effects of gravity on such phenomena prior to their application to process designs for non-earth gravity levels. Therefore, as a specific example of the types of interactions proposed herein, the MSAD and the OAST should be in close continual contact so that the latter will be familiar with the on-going research in the former and utilize the expertise which has and will be developed as a resource in the development of OAST's long-range design considerations. Accordingly, OAST should identify its planned technology developments so that the gaps in the knowledge base required can be identified in order that the MSAD can be supported to extend its basic research to those areas that will most significantly assist OAST programs. If the basic knowledge is available, then the OAST should support the required directed research for immediate application.

As a specific example of the needed interaction between technology development and basic research, safe, rational, and efficient heat transfer design for reduced gravity applications is currently not possible because fundamental knowledge of very low Reynolds number forced convection, boiling and condensation in microgravity is lacking.

NASA's long-term mission to explore the universe is also clearly dependent on understanding and exploiting the behavior of materials and processes in reduced gravity. For example, the mining, winning, and processing of extraterrestrial materials will be essential for extensive exploration of the solar system. It would be too costly to transport earth-based materials to the moon and other planets and, consequently, in situ materials must be used. Current processing techniques based on terrestrial experience will not suffice for obtaining large masses of materials under the unusual conditions encountered in extraterrestrial environments. Technologies to enable processes such as fluidized bed hydrogenation, electrolysis and electrowinning, and vapor-phase pyrolysis must be developed and they all involve transport phenomena modified by gravity. In addition, the technologies for life- and operations-support systems, such as power generation and storage, water purification, oxygen production, fuel and fluids storage and management, all involve transport phenomena that are influenced directly by gravity.

Thus, if reliable, cost-effective, and efficient technologies are eventually to be developed to enable the NASA missions on the Shuttle, Space Station Freedom, and other spacecraft then acquiring a great wealth of

fundamental understanding regarding the effects of gravity on many transport phenomena becomes essential. This understanding should be pursued in NASA's microgravity science and applications program as soon as OAST and the mission offices have defined their technology and operations needs.

Office of Commercial Programs (OCP) -

The OCP sponsors industrial research and program initiatives that encourage the participation of U.S. industry in commercial space endeavors. The OCP-sponsored Centers for the Commercial Development of Space form partnerships in which universities, non-profit institutes, and industries participate in industry-driven focused and/or applied research.

Commercial microgravity programs require directed research on subjects not very different from those pursued under basic microgravity science (MSAD) and space-technology development (OAST) because biological, physical, and chemical transport phenomena, which are highly gravity-dependent, are vital elements in the chemical, pharmaceutical, food-processing, and biotechnical industries as well as in materials processing. These transport phenomena include: catalytic reactions, adsorption/desorption at solid and liquid surfaces, dissolution and precipitation of crystals from solutions and solidification of crystals from melts, electrochemical reactions, evaporation, sublimation, condensation, etc.

Although most industrial processes and their associated equipment were developed empirically, the same Edisonian procedures cannot be followed in the

costly, complex and limited access environments of orbiting spacecraft.

Microgravity research can enable preliminary evaluation to be made of the myriad of space commercialization possibilities to screen out and focus on those likely to benefit most from a low-gravity environment as well as to provide the knowledge base for subsequent developments which serve to accelerate commercial endeavors.

Life Sciences Division (Code SB) -

Life scientists have long appreciated the effects of gravity on the structure, function, and evolution of terrestrial organisms of both the plant and animal kingdoms. Geotropism in plants and the vestibular system in mammals are but two examples that have a long history of detailed study. Other effects such as calcium resorption from bones and lymphocyte activation in the immune system have emerged as important biomedical issues only since the entry of man into space.

It is already clear that if we are to carry biological systems into space, both human and otherwise, a substantially more detailed understanding must be acquired of the effects of gravity, and its absence, on living organisms. This knowledge must be acquired not only at the organism level, for the purpose of insuring human health, safety, performance and comfort, but also at the cellular and molecular level as well. Only by penetrating the fundamental biophysical and biochemical mechanisms by which cellular processes are influenced, can we ultimately control the most visible manifestations. Accordingly, the Committee on Space Biology and Medicine of the Space Science Board defined the major goals of the scientific program to be:¹¹

1. To describe and understand human adaptation to the space environment and the readaptation upon return to earth.
2. To use the knowledge so obtained to devise procedures that will improve the health, safety, comfort, and performance of the astronauts.

¹¹A Strategy for Space Biology and Medical Science, For the 1980s and 1990s, National Research Council, 1987.

3. To understand the role that gravity plays in the biological processes of both plants and animals.
4. To determine if any biological phenomena that arise in an individual organism or small group of organisms is better studied in space than on earth.

The structures and mechanisms by which all cells operate rely upon the same physicochemical processes of fluid flow and heat and mass transfer in nonliving systems. These processes are ubiquitous and extend to cells, tissues, organs, and entire living organisms.

To understand properly the higher physiological processes that govern, for example, fluid distribution, heat dispersion, or muscle strength it ultimately will be also essential to understand, in turn, the phenomena of transport at the fundamental level as well as the interrelationships among structure, stress and their biochemical consequences. If living organisms are eventually to be maintained in a microgravity environment for extended periods of time, then a far better appreciation and definition of how such processes are affected by gravity will be essential.

Even at this time, attempts to describe accurately fluid redistribution, bone resorption, and altered immune states in astronauts all suffer from a lack of understanding of the key physicochemical and biochemical processes operative in microgravity. Human health and protection of human physiology and tissue integrity will be the direct and important beneficiaries of microgravity research that is currently underway and planned for the future. The interrelationship of the microgravity research within the Life Sciences and the Microgravity Science and Applications Divisions (MSAD) programs should

be evident.

Another obvious area of interdependence of microgravity research between the Codes is in biotechnology. This is a classic case where the pursuit of the basic science and methodology is occurring in MSAD whereas the applications should be addressed by the Life Sciences Division. The implications of the combined activity are increasingly clear in that the rapidly emerging biotechnology industry, perhaps destined to become the prevailing industry of the early 21st century, is reliant on the development and understanding of new processes for the growth, separation and characterization of entities ranging from macromolecules to cells. Thus, techniques such as cell culture, electrophoresis, X-ray crystallography, chromatography, and isoelectric focusing have come to the forefront. Experiments are still in their early stages, but it is already clear that microgravity can be used in novel and important ways to understand and enhance these methodologies, and in some cases make possible entirely new technologies now unknown or unworkable in the presence of terrestrial gravity.

To cite one example, the value of preparing protein crystals of high states of perfection in the elucidation of protein and nucleic acid structure and the subsequent use of the conformational data for pharmaceutical design and protein engineering is now beyond question. Data are accumulating that demonstrate the benefits of a microgravity environment for growing certain macromolecular crystals which are essential for achieving rational drug design and therapeutic applications because the quality of the solid state depends on what occurs in the fluid state.

Of course, the ultimate impact of microgravity research on the improvement of human health, the development of novel treatments and medicines, the better understanding of plant responses, and the ultimate enhancement of our quality of life cannot be predicted. It is, however, certain even at this very early stage in the development of microgravity research that the information gained over the next decades can be applied to obtain benefits which may be profound and wide reaching.

SUMMARY

Microgravity science is highly interdisciplinary and broad. It consists of subjects as diverse as materials science, combustion science, physics, chemistry, and biotechnology. The common denominator are the phenomena affected by gravitational body forces, specifically, fluid flows, multiphase mixing and separations, heat and mass transfer, and interfacial behavior.

Space system designers, engineers and the ultimate users of those systems will continue to be confronted with the challenge of developing many new, enabling, and critical concepts and technologies that involve transport phenomena reacting to alien gravity environments. Unfortunately, predictive models for low-gravity performance and operation of those technologies are currently non-existent, inadequate, and potentially misleading. The same can be said of industrial programs attempting commercialization in low-gravity environments.

Normal-gravity mechanistic and/or empirical developments are not appropriate for low-gravity applications. In the past, empirical means were used to overcome difficult engineering problems encountered in the space environment, but these have been costly, time consuming, and have resulted in products or systems that are neither reliable, high-quality, nor efficient. In addition, flight opportunities are much too scarce for purely empirical approaches to advance technology in low-gravity environments. There is today a growing awareness that by giving scientific scrutiny to all technology developments many of those deficiencies could be overcome and, thereby, one

could enhance the Nation's global competitiveness. An important implication of this logic is that researchers and engineers should interact much more closely within a deliberate well-coordinated microgravity research program to identify and solve the unique problems imposed by space-based operations.

Microgravity research on transport phenomena is directed to studies in space which are of an interactive laboratory type and, therefore, differs from the observational type of space science research made of space. This indicates another significant role for "humans in space" in addition to those of exploration and spacecraft repair.

RECOMMENDATIONS

The foregoing is not meant to imply that NASA is unaware of the problems and challenges discussed. In fact, many steps have already been taken to address some of these issues. For example, MSAD has recently issued NRAs^{4 to 9} to broaden the scope of its research program. OAST has an In-Space Technology Experiments Program (INSTEP) and is suggesting the use of SSF for technology development and qualification; the OCP's CCDSs do foster the interaction of universities and industries. Also, NASA has sponsored a number of workshops dealing with some of the subjects discussed above. Therefore, what is to be presented in this section comes from an external and a more global viewpoint and is intended to identify Agency-wide needs that follow from the challenges and opportunities set forth earlier and the means of satisfying them. Also, some aspects of fostering the broader NASA-wide implications of microgravity research that have not been explicitly identified will be indicated below.

Although each of the NASA program offices mentioned above seem to be aware of the problems, there has not been a clear articulation of the fact that microgravity research is an Agency-wide necessity. Overt actions, with perhaps a few exceptions, have not been taken. The required continual and direct intra-NASA interaction are lacking. Also, only a relatively few high-qualified scientists and engineers who do research on transport and interfacial phenomena are involved in the microgravity research program either as investigators or as participants on advisory committees. The microgravity research program has low visibility to most technologists and scientists

because relatively few transport phenomena studies have been funded and there have been insufficient workshops disseminating information on such topics.

Thus, there is a great need for providing greater visibility to the microgravity research program so that people with the proper expertise and who are interested in interdisciplinary research become participants at all levels. (The recent MSAD NRAs are a good first step in this direction.)

There is also a critical need for greater involvement of engineers who can both identify the technological problems that will serve to broaden and focus the science program and then use the research results in their designs.

The responses recommended to meet the critical needs facing NASA are to:

- I. Recognize the relevance of low-gravity research to many of NASA's missions:
 - (a) Expand the scope of the current microgravity science program to new areas and increase its breadth in order to develop a knowledge base for mission-enabling technologies and to identify the best commercial possibilities and enhance their development.
 - (b) Develop inter-divisional and intra-Agency cooperation in microgravity research and identify scientists and engineers to help support and further such Agency cooperation.
 - (c) Obtain broader interaction and representation in all NASA units of distinguished scientists and engineers with expertise in disciplines vital to researching and resolving microgravity related problems.
 - (d) Determine the best uses of Space Station Freedom for microgravity research and for space qualification of critical technologies and testing of prototype systems for both life- and operating-support systems and for promising commercial enterprises.
 - (e) Establish a balance between fundamental and applications oriented research.
 - (f) Expand the applications for which microgravity can provide an advantageous environment.

- II. Improve NASA's flight experiment development and support structure so that it can operate in a more cost efficient and timely manner.
 - (a) Simplify and unify inter-Center and Headquarters interactions and ensure close and continual involvement of the principal investigators in all aspects.
 - (b) Explore opportunities for international cooperation and technology transfer.
- III. Improve assimilation and dissemination of low-gravity research results.
 - (a) Develop means of interacting with industry to obtain their input for relevant research areas and to impart to them the latest state of knowledge applicable to their responsibilities and concerns.
 - (b) Develop programs to support scientific manpower, training, and education.
 - (c) Develop user-accessible archiving of important research data and facilities information.
 - (d) Improve the visibility of the entire program by informing the appropriate scientific and engineering communities, Congress, other government agencies, and the public of microgravity research objectives and results.

Some of the above are concerned with scientific and technical issues, some with policy matters and others with implementation of policy and public relations. They all indicate the need to involve a broader range of people, e.g., more transport and biotechnology researchers, engineers, businessmen, etc., than have, heretofore, been associated with the program. Much more extensive interactions among these groups are essential, both within NASA and with an external community. Thus, the over-riding challenge is to mold a broad constituency of people with diverse disciplinary interests and scientific, technological, and industrial orientations for identifying and performing the highest-quality research and for providing the advocacy and expansion of the microgravity research program.

Discipline Working Groups have served NASA well in identifying important scientific topics. It is, therefore, recommended that other working groups (as contrasted to advisory committees) be formed as well to meet the broader range and scope of issues described above. For an example, intra-Agency groups could be formed supplemented by external scientists and engineers to define gaps in knowledge for which research is required for efficient and reliable space technology and meaningful commercial endeavors development. Interdisciplinary "tiger" teams of the most mature and experienced people in the program could help focus, prioritize, and give advice for top-level decisions. It would appear that the formation of such working groups is one good way to broaden, enrich, and enhance all aspects of NASA's microgravity research program and, at the same time, bring about the interactions among the various types of people, both within NASA and the external community, that are so necessary.

APPENDIX

USRA Microgravity Science and Applications Science Council

Dr. Simon Ostrach (Convener)

Department of Mechanical and Aerospace Engineering
Case Western Reserve University
Cleveland, OH 44106

Dr. Robert Bayuzick

Materials Science and Engineering
Vanderbilt University
Nashville, TN 37235

Dr. Martin Glicksman

Materials Engineering Department
Rensselaer Polytechnic Institute
Troy, NY 12181

Dr. Alexander McPherson

Department of Biochemistry
University of California, Riverside
Riverside, CA 92521

Dr. Franz E. Rosenberger

Physics Department
University of Alabama in Huntsville
Huntsville, AL 35899

Dr. William A. Sirignano

School of Engineering
University of California, Irvine
Irvine, CA 92717

Dr. Raymond Viskanta

School of Mechanical Engineering
Purdue University
West Lafayette, IN 47908

Also contributing:

Dr. Dudley Saville

Department of Chemical Engineering
Princeton University
Princeton, NJ 08540

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SCIENTIFIC RATIONALE FOR THE RESTRUCTURED SPACE STATION

INTRODUCTION

At the request of the Vice President, the Office of Science and Technology Policy has studied the restructured plan for the Space Station Freedom that was prepared by NASA at the direction of Congress. We have focussed our attention on the broad scientific and technological goals of the restructured program. In particular, we have reviewed the merits of the two scientific thrusts -- microgravity materials science, and life science -- that have been advanced as motivations for the Space Station project, and have attempted to place these in perspective with other goals of the program.

It bears emphasis that our study of this new design and its scientific rationale has been carried out under substantial time pressure and in many cases we have had to rely on previous reports and analyses. To the extent possible, in the time available, we have discussed these questions with a number of experts in the field. We cannot, and do not, however, claim to have conducted an exhaustive study of the questions involved; and we are perhaps more aware than most that the history of discovery in fundamental science is consistently marked by surprises.

In the FY 1991 appropriations process, Congress directed that NASA assign highest priority to the establishment of a fully equipped microgravity laboratory, in its redesign of the space station. This mandate contrasts strikingly with the Augustine

Committee's recommendation that the "Space Station Freedom be revamped to emphasize life sciences and human space operations, and include microgravity as appropriate." In view of these opposed recommendations, a careful evaluation of the motivations for the microgravity laboratory is essential.

MICROGRAVITY SCIENCE

The magnitude of the force due to gravity is a variable, together along with temperature, pressure, electric and magnetic field strength, etc., that can influence the outcome of an experiment in materials science. Any experiment that extends any of these variables into a new range is likely to yield new results. The influence of gravity is studied routinely in terrestrial experiments through the use of centrifuges that increase the force of gravity. The novelty of the space environment is that it permits researchers to study the effects of gravity at decreased levels, for extended periods of time. In the early 1980's, when the space station research program was initially formulated, there was considerable optimism for early commercial benefits. However, commercial interest in microgravity materials science experiments aboard the space station has waned over the years. Our review produced no evidence for a significant commercially-driven motivation for a space station microgravity facility, as well as a number of specific indications of decreasing interest. As a very recent (February 1991) CBO study put it, "the last ten years have confirmed that processing materials in space is an expensive, high-risk activity that is not likely to produce economic returns in the near future ... [and] consequently, the private sector has not invested substantial resources in microgravity activity".

With commercial applications no longer the driving force, interest in space station microgravity experiments has shifted to basic research. Here, the arguments for materials microgravity research aboard the space station are generically identical to those used to justify any other materials science basic research initiative, and thus the microgravity work should be evaluated according to the standard merit criteria. We have not attempted to compare in detail the scientific merits of the space station microgravity experiments with materials science experiments conducted on earth or on rockets, Spacelab, Spacehab or on other space vehicles, but we have found no convincing evidence that the space station experiments are dramatically superior to the other materials science research. (In fact, Nobel laureate and American Physical Society President Nicolaas Bloembergen recently stated, in testimony before the House Committee on Science, Space, and Technology, that "Microgravity, to be blunt, is of microimportance to science...."). It has been argued, however, that the space station will offer superior facilities, at little additional cost, for the research that will be underway aboard the Spacelab system in the mid 1990's. In this view, NASA's transfer of these activities from Spacelab to space station simply takes advantage of a "free ride", constitutes a programmatic decision, and poses no policy issues.

With regard to space station microgravity science, we conclude that (a) its commercial prospects are remote, (b) its value as fundamental science is not qualitatively superior to that of other research, (c) its attractiveness depends on the space station being constructed for other purposes. It is important to note, in addition, that many of the primary microgravity experiments cannot be conducted during periods when astronauts are assembling or inhabiting the station. Thus, materials microgravity

research would only represent a ~~transient use~~ of the space station. Given that microgravity research involves little incremental investment, that its benefits are similar to those offered by other basic research projects of comparable incremental cost, and that it will be a temporary activity aboard the station, this activity does not provide a significant rationale for the space station.

Having concluded that microgravity materials research is at most incidental to the space station, we turn now to the only remaining potentially important purely scientific rationale for proceeding with this project.

LIFE SCIENCE

The primary thrust of the life sciences research program for the space station is to support the manned space exploration program. There is widespread agreement that manned exploration of space depends on understanding the health effects of exposure to this environment and on developing the ability to counteract such effects. Issues of critical importance to the health of astronauts include bone and mineral metabolism (including loss of bone calcium resulting in osteoporosis); long terms results of cardiovascular adaptation to action under microgravity conditions; muscular atrophy from changes in exercise patterns; behavioral aberrations resulting from operating in a high-stress situation in a far from ideal working/living environment; and potential carcinogenicity or reproductive toxicity of exposure to radiation.

A number of studies have been conducted to identify the research that is needed to address these issues. Some of this research can be carried out on earth. However,

experience on manned missions to date, including accounts from the Soviet space program on flights of long duration, indicates that extensive manned exploration is not feasible without the support of a comprehensive clinical research program conducted in-flight. Long-term, well controlled trials, will be needed to determine whether serious, potentially irreversible effects on physiology may be avoided or ameliorated by exposure to artificial gravity, or by other means. These trials, as well as essential studies of life support systems, will require a permanently-manned space station. It is essential that data be obtained on a substantial number of human subjects to insure that effects of importance are not masked--or simulated by--individual peculiarities. Indeed, we find that a man-tended station, if that were the ultimate goal, would have little merit.

With the case for the redesigned space station thus resting squarely and solely, in our opinion, on its role, from a scientific point of view, in supporting manned space exploration, two issues require resolution. First, the current plan is ambiguous as to whether microgravity experiments would continue into the permanently-manned phase. We believe that they should not, and that the design should focus strictly on the critical space medicine experiments. In any event, the human habitation of the station is fundamentally incompatible with the requirement that the microgravity experiments be unperturbed, and the latter requirement should not be permitted to compromise the former. Second, it is the judgment of experts in the field that the questions related to supporting human life in space cannot be fully answered without the ability to control exposure to gravity. It may well be that some of the abovementioned effects will show thresholds or nonlinearities and in consequence, if

we are to be able to extrapolate observations made in the space station to longer duration exploration activities it is essential that at least one intermediate gravitational field value--between 0 and 1 g--be studied. Intermediate gravitational fields may, in themselves, be essential for long duration manned spaceflight.

We consider that the planned animal centrifuge is an essential feature of the station; however such studies must be extended to humans and thus it is essential that the design of the station not preclude a human centrifuge. The redesign has no such provision, at present.

INTERNATIONAL CONSIDERATIONS

From the outset of the space station program the U.S. has enjoyed active collaboration with scientists and engineers from Japan, Canada, Europe and Japan. In the most recent rescoping of the station, at Congressional direction, these international collaborators have been involved in detail and we are assured that the new design will satisfy their requirements.

This is an important consideration inasmuch as several of us in OSTP have been told personally--and pointedly--by the most senior representatives from Canada, Europe and Japan, that having renounced major components of their domestic space programs in order to participate in ours, should we fail to follow through on our commitments regarding the station it will be very difficult to arrange further cooperation in other areas of science and technology in the foreseeable future.

CONCLUSION

Given a national commitment to manned space exploration, the space station is needed to find means of maintaining human life during long space flights. This is its only scientific justification, in our view, and all future design efforts should be focused on this one purpose. Neither the commercial processes nor the scientific merit of the microgravity experiments come close to justifying the cost and effort required to build, deploy and operate the station; moreover, provision for neither processes nor experiments should, in any way, compromise the life science goals. The issue of compatibility of microgravity experimentation with human habitation makes it questionable whether microgravity experiments should be done at all in the space station, except during the few years when the station is being assembled, and before it becomes permanently manned. Finally, we recommend that high priority be given to including a human centrifuge in the implementation of the design.

Having considered all the above, we are convinced that the ultimate, compelling argument for the space station configured, as the Augustine Committee has suggested, is that of a first step in the great adventure that will take mankind away from the home planet for extended periods--and the true beginning of manned exploration of the solar system and beyond. Although we focus here on the importance of the life science data to be obtained from a permanently manned station, we should not forget, or minimize, the importance of developing much of the space technology and know-how required, for all subsequent exploration, in the relatively convenient low-earth orbit environment to be occupied by the station.

Without having examined the detailed engineering features of the redesigned station, we conclude that its conceptual design is appropriate to the goal of advancing man's exploration of space.

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"Report of the Committee on the Space Station of the National Research Council," National Academy Press, September 1987

"Industrial Applications of the Microgravity Environment," National Academy Press, 1988

"Space Station Engineering Design Issues, Report of a Workshop," November 7-11, 1988, Irvine, California, National Academy Press, 1989

"Report of the Committee on a Commercially Developed Space Facility," National Academy Press, 1989

National Academy of Public Administration

A Study of the Cost and Financing of a Commercially Developed Space Facility (CDSF), A Report for the National Aeronautics and Space Administration, April 1989

Office of Technology Assessment

Civilian Space Stations and the U.S. Future in Space, Summary and Study, November 1984 (OTA-STI-241)

Additional Documents

Letter of August 1, 1989 to Dr. Jack Fellows, OMB from Don L. Anderson, president, American Geophysical Union forwarding AGU position on Space Station

"Toward Effective International Cooperation for Science on Space Station Freedom," The Final Report of the Joint Science Utilization Study, December 1989

Letter of January 8, 1990 to Prof. Berrien Moore of the University of New Hampshire from Dr. Robert J. Bayuzick, Director, Center for the Space Processing of Engineering Materials, Vanderbilt University, re. December 6-8, 1989 meeting of the SSSAAS

Testimony of Professor Nicholaas Bloembergen, president, American Physical Society, to the Committee on Science, Space and Technology, U.S. House of Representatives, January 28, 1991

American Institute of Aeronautics and Astronautics (AIAA)

Final Report to the Office of Aeronautics, Exploration and Technology, NASA, on Assessment of Technologies for the Space Exploration Initiative (SEI), December 31, 1990

Space Station Science and Applications Advisory Subcommittee

Minutes, March 21-22, 1988, Greenbelt, Maryland

Final Report, 1988 Summer Workshop, June 20-24, 1988, Hyannis, Massachusetts, issued October 1988

Summary Minutes, October 13-14, 1988, League City, Texas, issued February 7, 1989

Overview of Meetings, Actions and Recommendations, presentation by P. Burnett Frankel, November 3, 1988

Summary Minutes, Summer Study, June 26-30, 1989, Woods Hole, Mass., issued December 29, 1989

Summary Minutes, December 6-8, 1989, Washington, D.C., issued February 23, 1990

Summary Minutes, March 7-9, 1990, Hampton, Virginia, issued May 25, 1990

Summary Minutes, Summer Study, June 11-15, 1990, Woods Hole, Massachusetts, issued September 14, 1990

International Forum on the Scientific Uses of the Space Station (IFSUSS)

Letter of November 24, 1986 to Dr. Burton I. Edelson, Associate Administrator for Space Science and Applications, NASA, from Dr. Peter M. Banks, chairman, forwarding the report from the SESAC Task Force on Scientific Uses of Space Station, October 15-17, 1986, Key Largo, Florida

Meeting Minutes, May 16-18, 1988, Trianon Palace, Versailles, France

Meeting Proceedings and Report, 8th Meeting, December 13-15, 1988, Toronto, Canada, issued March 1989

IFSUSS Sagami-hara Statement, October 19, 1989

TYPE: ACTION

ORIGINATOR: 02

DOCUMENT NUMBER: 9202578

STATUS I

DIRECTORATE STATUS

FROM: ENGLISH, George T.

TO: DR. D.A. BROMLEY

JUL 30 1992

DATE OF
CORRESPONDENCE: 07/21/92

SUBJECT: HE IS WRITING WITH HIS COMMENTS ON THE EARTHQUAKES
IN CALIFORNIA.

DIRECTORATE

STAFF

ASSIGNED: PHYSICAL SCIENCES

ASSIGNED:

ACTION

REQUIRED: AS/IF NECESSARY

STAFF

ACTION:

SENDER'S DUE DATE:

OSTP DUE DATE: 08/07/92

STAFF DUE DATE

DATE COMPLETED:

DATE COMPLETED/DEPT: 8/4/92

COPIES TO: D. Allan Bromley

WHITE HOUSE TRACKING #:

CONTACT PERSON:

PHONE:

EXT:

REMARKS:

Dr. E.A. responded, forwarded letter to V. Sutton.

OSTP RECEIVED: 07/24/92
FILE: P-PHYSICAL SCIENCES

DEPT RECEIVED:

CENTRAL FILES:



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

August 4, 1992

Dear Dr. English:

Thank you for your letter in which you discuss the possibility of triggering earthquakes through the use of controlled nuclear detonations. I am forwarding your letter to a Federal interagency committee which has been addressing the entire issue of naturally occurring hazards, for their information.

Sincerely,

A handwritten signature in dark ink, appearing to read 'Karl A. Erb', with a stylized, cursive script.

Karl A. Erb
Associate Director for
Physical Sciences and Engineering

Dr. George T. English, Jr.
3508 Woodridge Avenue
Silver Spring, MD 20902-2349

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20500

August 4, 1992

Dear Dr. Sutton:

I am attaching a letter sent by George T. English to Dr. Bromley concerning advance triggering of earthquakes by nuclear detonations. Would you please forward it to the appropriate FCCSET working group.

Sincerely,



Karl Erb

**Associate Director
for Physical Sciences and Engineering**

Attachment

**Dr. Vickie Sutton
Assistant Director
for Science Councils**

2578

RECEIVED

3508 Woodridge Avenue,
Silver Spring, MD 20902-2349
Tuesday, July 21, 1992

92 JUL 24

OSTP
MAIL ROOM

Dr. Allen Bromley
Advisor to the President
for Science and Technology
Old Executive Office Building
17th & Pennsylvania Avenue, N. W.
Washington, D. C. 20506

Dear Dr. Bromley:

I am writing to you about an idea which occurred to me when I read the 10 July 1992 issue of Science Magazine. On page 155, an article titled "Ominous Pattern Looms in California Earthquakes" describes the concern of seismologists about the Coachella Valley segment of the San Andreas fault.

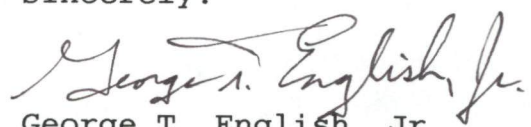
In other publications, I noticed estimates of perhaps 20,000 dead and injured persons in the Southern California region as a consequence of the forthcoming "big one". All the experts seem to agree that "it" will occur within the next decade or so.

My thought is "why should the nation wait for the inevitable to occur with the attendant massive human casualty toll when deliberate intervention might preclude these losses?" Specifically, I think that the "big one" could be deliberately triggered in advance of nature's timetable through the use of simultaneous nuclear detonations in drilled shafts placed every kilometer or thereabouts along critical sections of the San Andreas fault. In much the same way that avalanches are controlled in mountainous regions, the forthcoming earthquake could be triggered at a time when it would cause no loss of life. With adequate planning and advance preparations, evacuation of children, the elderly, and others could be accomplished before the event in addition to the completion of timely property damage mitigation measures such as the turning off of utility services and the buttressing of critical structures.

Politically, such an idea might seem preposterous, but the scientific community has the obligation to educate the populace about this hazard and develop a means to mitigate the human suffering that would result. I believe that former Surgeon General Koop's anti-smoking campaign is an outstanding example of scientific leadership in the public interest despite the personal criticism he experienced.

Thank you for your attention to this "suggestion"!

Sincerely:


George T. English, Jr.

"Document Control"

TYPE: ACTION

DOCUMENT NUMBER: 9202583

ORIGINATOR: 02

STATUS I

DIRECTORATE STATUS

FROM: SUNDERMAN, Duane N.: NATIONAL RENEWABLE ENERGY LABORATORY

TO: DR. D.A. BROMLEY

JUL 30 1992

DATE OF
CORRESPONDENCE: 07/21/92

SUBJECT: HE IS FORWARDING INFORMATION REGARDING RENEWABLE
ENERGIES IN RESPONSE TO DR. BROMLEY'S ARTICLE IN
"POPULAR SCIENCE" MAGAZINE. HE OFFERS TO BREIF DR.
BROMLEY ON THE SUBJECT.

DIRECTORATE

STAFF

ASSIGNED: PHYSICAL SCIENCES

ASSIGNED:

ACTION

STAFF

REQUIRED: FOR DAB'S SIGNATURE

ACTION:

SENDER'S DUE DATE:

OSTP DUE DATE: 08/07/92

STAFF DUE DATE

DATE COMPLETED:

DATE COMPLETED/DEPT: 11/30/92

COPIES TO: D. Allan Bromley

WHITE HOUSE TRACKING #:

CONTACT PERSON:

PHONE:

EXT:

REMARKS:

Des. Ent. & Schroeder met w/ him on 11/30/92.



OSTP RECEIVED: 07/27/92

DEPT RECEIVED:

FILE: P-PHYSICAL SCIENCES-ENERGY

CENTRAL FILES:



National Renewable Energy Laboratory

1617 Cole Boulevard
Golden, Colorado 80401-3393
(303) 231-1000



July 21, 1992

Dr. D. Allan Bromley
National Science Advisor
New Executive Office Building
Washington, D.C. 20506

Dear Dr. Bromley:

I have just finished reading, with great interest, your interview comments regarding environmental and energy concerns in the July issue of *Popular Science*. I was impressed not only with your environmental concern, but also the depth of your commitment regarding the problems of ozone depletion and global warming. It is reassuring to see this type of care and energy being devoted to these problems by the President's Science Advisor.

I was also gratified by your generally complimentary views on solar energy. As you may be aware, at NREL we share your view of renewables not as the single solution for the future, but as one component of a broad-based energy supply strategy. We may be biased toward renewables, but we also like to think we are realistic about their potential.

Some of your specific comments on renewables--particularly wind energy--were disappointing, however. As you accurately pointed out in the interview, there has been a failure (until quite recently) to get the word out on the real advantages and disadvantages of the various alternative energy sources. There are several reasons for this failure, but whatever the reason for the information not getting out, lack of accurate information was reflected in your comments on wind energy.

In the interview, you made three points regarding wind energy: 1) its reduced value because of the lack of adequate storage, 2) excessive noise emissions from wind turbine rotors, and 3) unacceptable safety hazards and human costs associated with the wind turbine life cycle. I'd like to discuss these points in turn, in the spirit of your call elsewhere in the interview to "get the message out" about alternative energy sources.

THE VALUE OF WIND ENERGY WITHOUT STORAGE

The wind turbines operating in Hawaii and in four areas of California (the Altamont, Tehachapi and San Geronimo passes and the Suisun Bay) have shown that wind technology does not need storage to be attractive to utilities. Pacific Gas & Electric has learned that the value of the energy produced by wind turbines is not its steadiness, but rather its statistical predictability. The diurnal pattern of energy output of the Altamont and Suisun Bay wind farms coincides fairly closely with periods of peak energy use. Carl Weinberg of PG&E has said that these wind farms "provide a proven concept for how to operate wind plants efficiently and economically." There are many other areas where similar resource and load matches occur. In still other areas, fuel-saving, reductions in emissions, or even its ability to create jobs will make wind energy very valuable. Of course, an economical electrical storage technology would enhance the value of wind and photovoltaics even further.

EXCESSIVE NOISE

Modern wind turbines do not create excessive amounts of noise. One or two of the large experimental machines tested 10 to 12 years ago did have severe noise problems because the rotors were located downwind of the tower. The low frequency sound created when the blades passed through the tower wake was objectionable to people whose homes were located in areas where terrain and atmospheric effects amplified the noise. As a result, designers have learned to locate the rotors of large wind turbines upwind of the tower. The typical modern 300-500 kW wind turbine is not noisy. At distances of 100 yards from such a wind turbine operating in high winds, a typical measurement would be 60 to 65 dBA, about the noise level of a busy office. At distances of a mile, even the "noisiest" machines are barely audible.

The subjective experience of being in the middle of a wind farm operating in high winds is much quieter than standing next to a busy commuter highway. Our wind engineers do not think it is wise to locate wind farms immediately adjacent to residential areas, but there is really no reason to do so. Recent surveys by Pacific Northwest Laboratory indicate that there is an abundance of usable, non-residential land with good wind resource.

Despite the lack of a real noise problem, we do have the perception of a noise issue. Because of this, we have been working with the American Wind Energy Association and with the International Energy Agency to create domestic and international noise standards for wind turbines. These standards are being closely coordinated with siting standards also under development. The International Electrotechnical Commission is presently adopting U.S. acoustics standards documents as working papers for new international standards.

SAFETY HAZARDS AND ENVIRONMENTAL FACTORS

We are extremely concerned by the occasional injuries (and even deaths) associated with the wind industry's operation of wind farms in California. These incidents are usually falls and electrical accidents. We have been working closely with U.S. and European industry and research groups to develop internationally recognized safety standards that will help eliminate these unfortunate incidents. But we are aware of no scientific study that would rate the danger of wind farms as higher than other types of

Dr. D. Allan Bromley
July 21, 1992
Page 3

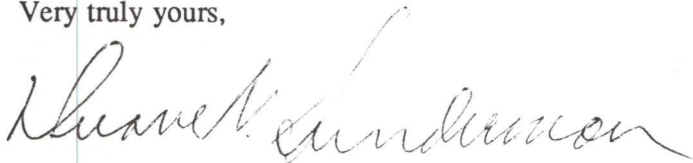
power plants. In fact, the industry is so new that a statistical study (favorable or unfavorable) would probably be misleading. Certainly, there is risk involved with all mechanical appurtenances of modern life. However, our recent experience with the DOE ES&H Tiger Team has reinforced our conviction that all accidents involving electrical and mechanical power systems are avoidable if the proper operating procedures and an active safety culture are in place. This would include the identification and analysis of safety hazards, education and training, safety-oriented design, appropriate use of safety equipment, and a "safety first" philosophy.

In addition, the environmental costs of wind energy are very low. The "energy payback period" of a wind turbine is between 6 months and a year, one of the lowest among all modern energy sources. The only metal used in modern wind turbines is in the tower and drive train components. There is no need to mine, transport and store fuel; or to dispose of spent fuel, tailings, or residue. Wind turbines directly offset hydrocarbon emissions (an estimated 2.7 billion pounds of CO₂ in 1991 alone). Wind farms are compatible with farming, ranching, and other low-intensity land uses. When they are removed from the land, they leave only superficial, easy-to-heal marks. Recently, we have been concerned about evidence that wind turbines are causing deaths of avian raptors in Altamont Pass. However, cooperative studies by industry and people from the State of California are indicating that this may be a largely avoidable, site-specific problem.

The foregoing is not to say that wind energy does not have problems (real or perceived) in the areas you discussed in the interview. However, we are convinced that these problems are solvable, given a positive policy environment that views the energy source in a fair and realistic manner. For a while, renewables like wind energy may be "niche" energy sources in isolation, but taken together they can have a real impact. In the near future, our analysts think that wind energy can be attractive to utilities in most areas of the U.S. If they're right, wind plants can help eliminate the negative effects that CO₂ reduction may have on the Western economies.

We would be more than happy to discuss these issues with you in more detail or to provide additional information on wind energy and other renewables. We would be most happy to provide a personal briefing if your travels take you close to NREL.

Very truly yours,



Duane N. Sunderman
Director

cc R. Stokes
 R. Thresher
 D. Dodge
 M. Davis
 P. Kearns
 J. McKelvey

"Document Control"

TYPE: ACTION DOCUMENT NUMBER: 9202581
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS

FROM: KAWACHI, Kiyomitsu: NATIONAL INSTITUTE OF RADIOLOGICAL SCIENCES

TO: DR. D.A. BROMLEY

JUL 30 1992

DATE OF
CORRESPONDENCE: 07/20/92

SUBJECT: HE IS WRITING REGARDING THE SHUTDOWN OF THE BEVALAC
OPERATION.

DIRECTORATE STAFF
ASSIGNED: PHYSICAL SCIENCES ASSIGNED:

ACTION STAFF
REQUIRED: DIRECT REPLY ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: 08/07/92 STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT: 8/31/92

COPIES TO: D. Allan Bromley

WHITE HOUSE TRACKING #: CONTACT PERSON:
PHONE: EXT:

REMARKS: Dr. Ent responded.

OSTP RECEIVED: 07/27/92
FILE: P-PHYSICAL SCIENCES

DEPT RECEIVED:

CENTRAL FILES:



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

August 31, 1992

Dear Dr. Kawachi:

I am writing in response to your letter to Dr. Bromley concerning plans by the Department of Energy to terminate BEVALAC operations.

The main consideration is that the nuclear physics research program, which provides most of the funding to operate the BEVALAC, is increasingly turning its attention to other facilities. With the declining nuclear physics interest, the Department has been assessing whether the other users of the BEVALAC find the facility sufficiently important to their activities to contribute funds from their programs for its operation. To date, no other science community expressed that degree of interest, which led to DOE's decision to phase out this facility.

If the situation changes and funds from medical or other programs become available to support the BEVALAC, the DOE will reevaluate its plans to close the facility. Thank you for your letter and the information it contains.

Sincerely,



Karl A. Erb

Associate Director for
Physical Sciences and Engineering

Dr. Kiyomitsu Kawachi
Head of Heavy Ion Medical Physics
National Institute of Radiological Sciences
9-1, Anagawa 4-chome
Inage-ku, Chiba-shi 263
JAPAN

2581

NATIONAL INSTITUTE OF RADIOLOGICAL SCIENCES
Division of Accelerator Research

9-1, Anagawa 4-chome, Inage-ku, Chiba-shi 263, Japan

Dr. Allan Bromley
Assistant to the President for Science and Technology, and
Director, Office of Science and Technology Policy
Room 360, Old Executive Office Building
17th & Pennsylvania Avenue, NW
Washington, DC 20500
U. S. A.

RECEIVED
JUL 28 11:28
OSTP
MAIL ROOM

July 20, 1992

Dear Dr. Bromley:

I am writing this letter to entreat you to reconsider the decision of the shutdown of BEVALAC operation. It is deplorable that US DOE has decided to shutdown the BEVALAC in next January. The BEVALAC is not only used for nuclear science research, it is also a very important facility for clinical trials of heavy ion cancer therapy. The decision of the shutdown of the BEVALAC will be a great disappointment for all the patients for whom this therapy is the best hope of cure.

The BEVALAC, which was formerly used as Bevatron, may have finished to perform its function as a nuclear science research, but it still plays an important role in the clinical trials of cancer therapy. The use of heavy ions, as compared to conventional radiation techniques, has several significant advantages in the cancer treatment. The heavy particles are expected to be very effective in treating radiation resistant tumors, due to their high biological effectiveness. They are also expected to reduce the radiation complications and hazards, due to their excellent physical dose localization, compared to conventional radiation therapy. Therefore, here in Japan, the Heavy Ion Medical Accelerator in Chiba (HIMAC) is now under construction. This construction is based on the health and welfare policy, "Comprehensive 10 years strategy for cancer control", of the Japanese government.

The research works about medical application of heavy ions, and the clinical trials, are very important. We have designed the devices of the HIMAC irradiation system, such as multileaf collimator for shaping an irradiation field to treat a patient, based on the experimental result using the heavy ion beams from the BEVALAC. At this moment, the BEVALAC is the only machine in the world which can provide the heavy ion beams needed for medical use. I am very worried about your untimely decision, and I would strongly ask you that US DOE will reevaluate the shutdown of the BEVALAC operation.

Sincerely yours,

河内清光

Kiyomitsu Kawachi, Ph.D.
Head of Heavy Ion Medical Physics
Fax No. : Int.+81-43-287-0417

"Document Control"

TYPE: ACTION

DOCUMENT NUMBER: 9202164

ORIGINATOR: 02

STATUS I

DIRECTORATE STATUS

FROM: BOND, Warren: SOCIETY OF VERTEBRATE PALEONTOLOGY

TO: DR. D.A. BROMLEY

AUG 4 1992

DATE OF
CORRESPONDENCE: 07/20/92

SUBJECT: HE IS WRITING REGARDING THE SEIZURE OF THE
TYRANNOSAURUS REX REMAINS FROM THE BLACK HILLS
INSTITUTE.

DIRECTORATE

STAFF

ASSIGNED: PHYSICAL SCIENCES

ASSIGNED: *Dore Cronner*

ACTION
REQUIRED: AS NECESSARY

STAFF
ACTION:

SENDER'S DUE DATE:

OSTP DUE DATE: 08/17/92

STAFF DUE DATE

DATE COMPLETED:

DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley

WHITE HOUSE TRACKING #:

CONTACT PERSON:

PHONE:

EXT:

REMARKS:

OSTP RECEIVED: 08/03/92
FILE: P-PHYSICAL SCIENCES

DEPT RECEIVED:

CENTRAL FILES:



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

August 10, 1992

Dear Mr. Bond:

Thank you for your recent letter to Dr. Bromley regarding the recent seizure of the Tyrannosaurus rex skeleton from the Black Hills Institute of Geological Research. I am sure you realize that Dr. Bromley cannot get involved in a criminal investigation, but I thought you would like to know that we are inquiring as to the storage conditions and treatment that the skeleton receives while in the custody of the FBI. We will try to ensure that the scientific value of the remains are preserved while the courts decide the legal issues involved. Thank you for bringing this issue to Dr. Bromley's attention.

Sincerely yours,



David C. Cranmer
Fellow

Mr. Warren Bond
26 Underhill Drive, #304
Don Mills, ON M3A 2J3 CANADA

July 20, 1992

REC.

92 AUG 21

Mr. Warren Bond
26 Underhill Drive, #304
Don Mills, Ontario
M3A 2J3
CANADA

D. Allan Bromley
Assistant to the President for Science
& Technology
Office of Science and Technology
Executive Office Building
Washington, D.C. 20240
U.S.A.

MAIL ROOM

Dear Mr. Bromley:

On May 14, 1992, Federal Agents raided the Black Hills Institute of Geological Research in Hill City, South Dakota, seizing "Sue", the world's best preserved Tyrannosaurus Rex.

"Sue" was discovered on August 14, 1990 on privately owned, deeded land near Faith, South Dakota. The landowner gave the Black Hills Institute permission to excavate the fossil remains for which he was paid \$5,000.00.

A dispute arose between the Black Hills Institute and the Cheyenne River Sioux Tribe, of which the landowner is an enrolled member, over the ownership of the dinosaur.

The landowner's property is held in Trust by the Federal Bureau of Indian Affairs. The Federal Antiquities Act and Title 25 of the U.S. Code prohibits outsiders from making contracts with people of the Indian Community without permission of the Federal Government. The Tribe's claim to the fossil and the fact that it came off of land held in Trust by the Federal government is what prompted the seizure.

The Black Hills Institute dealt with the landowner in good faith, (the fact the land is held in Trust does not appear on the deed).

36 CFR Ch.11 (7-1-91 Edition), Part 296, Sec. 296.3(4)II lists PALEONTOLOGICAL REMAINS as material remains, not to be considered ARCHEOLOGICAL RESOURCES. Note: the Cheyenne River Sioux Tribe have now dropped their law suit.

Dr. Donald Wolberg, Secretary of the (National) Paleontological Society and Paleontologist for the state of New Mexico stated in a Baltimore news release that "Pete Larson and his group (Black Hills Institute) are among the best collectors in the world...they have an international reputation".

Mr. Bromley
July 20th, 1992
Page 2

The Black Hills Institute of Geological Research have invested over \$100,000 in the project, opened their doors to Paleontologists from around the world, have donated "Sue" to a non-profit museum they are building in Hill City, and have stated "The fossil is not for sale, never, ever."

The seizure places the fossil in great jeopardy of being permanently damaged due to improper storage, has interrupted scientific study, and the ensuing legal battle has financially hurt the Black Hills Institute.

The Black Hills Institute are clearly entitled to "Sue" and it should be returned to them and allow the scientific study of this important find to continue. I urge you to work to this end.

The "confusion" over Antiquities/Archeological Resources and Paleontological Remains must be cleared up so misuse/abuse of the law will not continue.

Your support will be very much appreciated.

Yours truly,

A handwritten signature in blue ink, appearing to be 'J. S. S.', with a long horizontal stroke extending to the right.

Member Society of Vertebrate Paleontology

"Document Control"

TYPE: ACTION DOCUMENT NUMBER: 9202554
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS

FROM: HETRICK, David L.

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/16/92

SUBJECT: HE IS WRITING TO ASK DR. BROMLEY TO HELP PREVENT THE
CLOSING OF THE LOS ALAMOS CRITICAL EXPERIMENTS
FACILITY.

DIRECTORATE STAFF
ASSIGNED: PHYSICAL SCIENCES ASSIGNED:

ACTION STAFF
REQUIRED: FOR DAB'S SIGNATURE ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: 08/06/92 STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley

WHITE HOUSE TRACKING #: CONTACT PERSON:
REMARKS: PHONE: EXT:

OSTP RECEIVED: 07/23/92 DEPT RECEIVED:
FILE: P-PHYSICAL SCIENCES
CENTRAL FILES:

Withdrawal/Redaction Sheet

(George Bush Library)

Document No. and Type	Subject/Title of Document	Date	Restriction	Class.
01a. Letter	To: Allan Bromley From: David Hetrick Re: Potential closing of Los Alamos Critical Experiments Facility (1 pp.)	7/16/92	(b)(1)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: General Science Files
WHORM Cat.:
File Location: Physical Sciences: General (1) [5 of 7] [1992]

Date Closed:	3/22/2010	OA/ID Number:	62042-005
FOIA/SYS Case #:	2005-0336-F	Appeal Case #:	
Re-review Case #:		Appeal Disposition:	
P-2/P-5 Review Case #:		Disposition Date:	
AR Case #:		MR Case #:	
AR Disposition:		MR Disposition:	
AR Disposition Date:		MR Disposition Date:	

RESTRICTION CODES

Presidential Records Act - [44 U.S.C. 2204(a)]

P-1 National Security Classified Information [(a)(1) of the PRA]
P-2 Relating to the appointment to Federal office [(a)(2) of the PRA]
P-3 Release would violate a Federal statute [(a)(3) of the PRA]
P-4 Release would disclose trade secrets or confidential commercial or financial information [(a)(4) of the PRA]
P-5 Release would disclose confidential advice between the President and his advisors, or between such advisors [(a)(5) of the PRA]
P-6 Release would constitute a clearly unwarranted invasion of personal privacy [(a)(6) of the PRA]

C. Closed in accordance with restrictions contained in donor's deed of gift.

PRM. Removed as a personal record misfile.

Freedom of Information Act - [5 U.S.C. 552(b)]

(b)(1) National security classified information [(b)(1) of the FOIA]
(b)(2) Release would disclose internal personnel rules and practices of an agency [(b)(2) of the FOIA]
(b)(3) Release would violate a Federal statute [(b)(3) of the FOIA]
(b)(4) Release would disclose trade secrets or confidential or financial information [(b)(4) of the FOIA]
(b)(6) Release would constitute a clearly unwarranted invasion of personal privacy [(b)(6) of the FOIA]
(b)(7) Release would disclose information compiled for law enforcement purposes [(b)(7) of the FOIA]
(b)(8) Release would disclose information concerning the regulation of financial institutions [(b)(8) of the FOIA]
(b)(9) Release would disclose geological or geophysical information

Withdrawal/Redaction Sheet

(George Bush Library)

Document No. and Type	Subject/Title of Document	Date	Restriction	Class.
01b. Letter	To: James Watkins From: David Hetrick Re: Potential closing of Los Alamos Critical Experiments Facility (3 pp.)	7/13/92	(b)(1)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: General Science Files
WHORM Cat.:
File Location: Physical Sciences: General (1) [5 of 7] [1992]

Date Closed:	3/22/2010	OA/ID Number:	62042-005
FOIA/SYS Case #:	2005-0336-F	Appeal Case #:	
Re-review Case #:		Appeal Disposition:	
P-2/P-5 Review Case #:		Disposition Date:	
AR Case #:		MR Case #:	
AR Disposition:		MR Disposition:	
AR Disposition Date:		MR Disposition Date:	

RESTRICTION CODES

Presidential Records Act - [44 U.S.C. 2204(a)]

P-1 National Security Classified Information [(a)(1) of the PRA]
P-2 Relating to the appointment to Federal office [(a)(2) of the PRA]
P-3 Release would violate a Federal statute [(a)(3) of the PRA]
P-4 Release would disclose trade secrets or confidential commercial or financial information [(a)(4) of the PRA]
P-5 Release would disclose confidential advice between the President and his advisors, or between such advisors [(a)(5) of the PRA]
P-6 Release would constitute a clearly unwarranted invasion of personal privacy [(a)(6) of the PRA]

C. Closed in accordance with restrictions contained in donor's deed of gift.

PRM. Removed as a personal record misfile.

Freedom of Information Act - [5 U.S.C. 552(b)]

(b)(1) National security classified information [(b)(1) of the FOIA]
(b)(2) Release would disclose internal personnel rules and practices of an agency [(b)(2) of the FOIA]
(b)(3) Release would violate a Federal statute [(b)(3) of the FOIA]
(b)(4) Release would disclose trade secrets or confidential or financial information [(b)(4) of the FOIA]
(b)(6) Release would constitute a clearly unwarranted invasion of personal privacy [(b)(6) of the FOIA]
(b)(7) Release would disclose information compiled for law enforcement purposes [(b)(7) of the FOIA]
(b)(8) Release would disclose information concerning the regulation of financial institutions [(b)(8) of the FOIA]
(b)(9) Release would disclose geological or geophysical information