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FOIA MARKER

**This is not a textual record. This is used as an
administrative marker by the George Bush Presidential
Library Staff.**

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: Correspondence Files

OA/ID Number: 62002
Folder ID Number: 62002-007

Folder Title:
D. Allan Bromley Correspondence - J-S [3 of 4] [1992]

Stack:

Row:

Section:

Shelf:

Position:

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THE WHITE HOUSE

Nov 5, 1992

Dear Mr. President-

I thought that you might find
the article beginning on page 41
of some interest.

Again let me say what a
privilege it has been to serve as
a member of your team.

Sincerely, Allan

THE WHITE HOUSE

WASHINGTON

October 22, 1992

MEMORANDUM FOR:

C. BOYDEN GRAY
EDE HOLIDAY
NICK E. CALIO
ROGER B. PORTER
DAVID DEMAREST
TIM MCBRIDE
GREGG PETERSMEYER
KATHERINE SUPER (FYI)
BRENT SCOWCROFT
D. ALLEN BROMLEY

FROM:

Joan Gibson for
SHIRLEY GREEN
93 OEOB

SUBJECT:

(Draft Proclamation)
World Population Awareness Week,
1992

Attached for your review is the above-mentioned proclamation designating October 25-31, 1992, as "World Population Awareness Week."

It was submitted by the Department of State and edited/revised by this office.

IMMEDIATE ATTENTION REQUIRED. Written or oral response required by no later than 10 a.m., Monday, October 26, 1992.

For questions, discussion or routine clearance, contact Joan Gibson, via phone or interoffice mail, in room 93/ extension 2276. Thank you.

*Confirming telephone
conversation with Joan
Gibson - 10-26-92.
cc: Ron Geisler*

*Original State Dept draft much preferable
to the edited version. In particular, Para 2 restating
The Julian Simon view that population growth
is a "neutral phenomenon" is not
consistent with a recent letter from President
Bush to David Packard. I strongly urge
use of the State Dept. draft.
D. Allen Bromley
OSTP.*



EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

OCT 20 1992

MEMORANDUM FOR THE PRESIDENT

FROM: Bernard H. Martin *Bernard H. Martin*
Assistant Director for
Legislative Reference

SUBJECT: World Population Awareness Week

Attached is a proclamation which, in accordance with House Joint Resolution 458, would designate the week of October 25 through October 31, 1992, as "World Population Awareness Week." House Joint Resolution 458 passed the House on October 5, 1992, and the Senate on October 8, 1992.

The proposed proclamation was submitted by the Department of State, and editorial and format changes made in this Office are marked on the draft.

Attachment

WORLD POPULATION AWARENESS WEEK, 1992

- - - - -

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

In the Declaration on Population and Development that was issued during the 1984 International Conference on Population, the United States and other signatories agreed that "to be realistic, development policies, plans, and programs must reflect the inextricable links between population, resources, environment, and development." Recognizing that population goals and policies should be part of more comprehensive efforts to improve the standards of living of all peoples, signatories also expressed their commitment "to promote social and economic development, human rights, and individual freedom." This week, as we focus on the links between economic development, environmental degradation, and demographic trends among the world's population, we also reaffirm the United States' long-standing dedication to the rights and dignity of individuals.

Because people are producers as well as consumers, because every human being represents hands to work and not just "another mouth to feed," the United States has consistently held that population growth, in itself, is a neutral phenomenon. It may be an asset or a liability depending on factors such as government economic policies, agricultural practices, and a nation's ability to put people to work. Today rapid population growth is occurring in nations where inadequate infrastructure, large public sector debt, and economic stagnation -- often the bitter legacy of totalitarian rule -- make them least able to cope with the challenges that result. In other, more developed nations, birthrates are so low that populations are not replacing themselves. While the implications of both trends merit consideration, this week we focus on those nations where, as the G-7 leaders stated during the 1990 Houston Economic

Summit, "sustainable development requires that population growth remain in some reasonable balance with expanding resources." Supporting the efforts of developing countries to maintain this balance is a priority.

As part of a comprehensive economic development assistance program, the United States continues to take a strong position in the global community to address, cooperatively and effectively, issues of poverty, illiteracy, population pressures, environmental degradation, and human health. Recognizing the sovereign right of each nation to respond to its specific needs, and respecting the fundamental rights and cultural and religious beliefs of parents, the United States supplies nearly half of all international assistance provided to support safe, effective, and voluntary family planning programs. In light of worldwide demand for such assistance, we now look to each nation to do its fair share in aiding voluntary population programs, not as ends in themselves, but as measures in support of sustainable development.

Massive urban migration poses a special challenge to the international community today, as urbanization leads to increased demands for infrastructure and services while exacerbating problems such as crime, inadequate health care, and pollution. Ensuring environmental sustainability and slowing population growth where it threatens the economic progress that all of us seek are among the commitments that the United States has made together with other members of the international community.

Sustainability is impossible, however, without a healthy, well-educated population -- hence the United States supports programs to improve maternal and child health; to expand education, skills training, and disease prevention; to integrate women more fully into the political and economic life of nations; and to target the specific health problems of the poor, which are often aggravated by conditions such as poor sanitation and lack of safe drinking water.

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA
A PROCLAMATION

STATE
DRAFT

~~PROCLAMATION [BY PRESIDENT GEORGE HERBERT WALKER BUSH]~~

~~designating~~ ^{THROUGH} ~~October 25-31, 1992 [as]~~

WORLD POPULATION AWARENESS WEEK, 1992

Expanding world population, surpassing 5.4 billion, cannot be overlooked for its intrinsic linkage to solving the international problems of environmental degradation and economic development. Rapid population growth is occurring in those nations where inadequate infrastructure, large public sector debt, and economic stagnation make them least able to cope with its economic and environmental challenges. The momentum of population growth, occurring primarily in the developing world, threatens the economic advances we collectively seek. Sustainable development requires that population growth remain in some reasonable balance with expanding resources. Supporting the efforts of developing countries to maintain this balance is a priority.

The U.S. continues to take a strong position in the global community to effectively and cooperatively address poverty, population pressures, environmental degradation, environmental health, education and training as part of a comprehensive economic development assistance program. Recognizing the sovereign right of each nation to respond to its specific needs, cultural and religious values, we support the right of individuals and couples to choose voluntarily the number and spacing of children as a basic human right. In support of that right, the United States actively provides nearly half of all international assistance provided to support effective, safe, and voluntary family planning programs. Worldwide the demand for these services is outpacing our ability to provide them, and we now look to each nation, each to its own capacity, to do its fair share in aiding voluntary population programs in support of sustainable development. ✓

Population growth as a factor for sustainable development, is an issue which affects all nations, developing and developed alike. Rapid population growth strains the available financial and government resources at all levels needed to satisfy concomitant increases in demand for infrastructure and services. Massive urban migration has contributed to increased populations in cities in the

-2-

developed world, which have grown from 698 million in 1970 to more than 875 million in 1990; while in the developing world the figure has doubled from 675 million to almost 1.4 billion in the same twenty-year period. By the year 2000 it is predicted that 77% of Latin America's population, 41% of Africa's population, and 35% of Asia's population will be living in cities. Already 74% of Europe's population is urban, and our own figure is approximately 74%.

222
(not very readable)

Along with the opportunities of urbanization, come the social and economic problems associated with overcrowding such as crime, unemployment, crises in health care, sanitation, and environmental quality. In coastal and rural areas, urbanization affects the biological diversity of our plant and animal life and reduces the amount of farmland and open space. Ensuring environmental sustainability and slowing population growth where it is too high for sustainable development are among the stated shared commitments the United States has made along with its colleagues in the international community.

Yet, sustainability is impossible without a healthy population, and we must strengthen our efforts to provide and promote programs which foster better and more effective health care. These include methods of improving maternal and child health, programs which target the alleviation of poverty and the health problems of the poor, often aggravated by such environmental factors as the lack of safe drinking water and poor sanitation.

However, concerns remain that continued rapid growth in world population, the pressures it creates for increased public services, for migration and urbanization and the degradation of the environment everywhere, could threaten the quality of life which we will collectively pass on to future generations. We seek a future where population is in reasonable balance with expanding and safeguarded resources, promoting the sustainable development of the global community. We seek a community where women are more effectively and more fully integrated into the economy of nations; where education and opportunities are widely available to all segments of the population; and where maternal and infant mortality are lowered due to the availability of quality, affordable services which promote improved health and responsible parenthood.

missing:
importance of
individual freedom/free
enterprise
to economic development

should be more
succinct while covering
main pts
(urbanization, education,
health care)

1992, ✓
In recognition of the importance of world population awareness, the Congress, by House Joint Resolution 458, designated the week beginning October 25, as "World Population Awareness Week" and authorized and requested the President to issue a proclamation in observance of this week.

✓ ^{cut}
NOW, THEREFORE, I, GEORGE ~~HERBERT WALKER~~ BUSH, President of the United States of America, do hereby proclaim October 25-31, World Population Awareness Week and call upon all nations to work to effectively integrate population, economic development and environmental resource management principles into a strategy for global sustainability for the 21st century. I also call upon the people of the United States, to take this opportunity to avail ourselves of programs and information which promote responsible parenthood and sustainable development.

IN WITNESS WHEREOF, I have hereunto set my hand
this day of October, in the year of our Lord
nineteen hundred and ninety-two, and of the Independence of
the United States of America the two hundred and seventeenth.

Too long!
(would be 16
pages double
space)

Withdrawal/Redaction Sheet

(George Bush Library)

Document No. and Type	Subject/Title of Document	Date	Restriction	Class.
01a. Letter	To: Roberto Peccei From: Allan Bromley Re: Letter of Recommendation for Charles Whitten [personal information redacted] (2 pp.)	10/7/92	(b)(6)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: Correspondence Files
WHORM Cat.:
File Location: D. Allan Bromley Correspondence - J-S [3 of 4] [1992]

Date Closed:	2/5/2010	OA/ID Number:	62002-007
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: Allan Bromley From: Roberto Peccei Re: Request for letter of recommendation for Charles Whitten [personal information redacted] (2 pp.)	7/30/92	(b)(6)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: Correspondence Files
WHORM Cat.:
File Location: D. Allan Bromley Correspondence - J-S [3 of 4] [1992]

Date Closed:	2/5/2010	OA/ID Number:	62002-007
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

THE WHITE HOUSE
WASHINGTON

August 12, 1992

Dear Martin:

Many thanks for sending me the wonderful photographs taken on the occasion of the commencement when I received my degree from U Mass-Boston. They provide excellent mementos of what was a remarkably pleasant occasion and I am indebted to you not only for them, but for your warm hospitality throughout my visit.

I hope that your summer has been a pleasant one and know that you will be busy back at classes in the near future. This is something of a crazy season in Washington in an election year but fortunately I am at the point of leaving for a vacation in Canada and am certainly at a state where I will benefit from it.

With all best wishes,

Sincerely yours,



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

Professor Martin Posner
Physics Department
The University of Massachusetts-Boston
Harbor Campus
Boston, Massachusetts 02125

"Document Control"

TYPE: INFORMATION

DOCUMENT NUMBER: 9202287

ORIGINATOR: 02

STATUS C

DIRECTORATE STATUS

FROM: POSNER, MARTIN: THE COMMONWEALTH OF MASSACHUSETTS

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/29/92

SUBJECT: ENCLOSED PHOTOGRAPHS OF THE COMMENCEMENT AT UMB.

DIRECTORATE
ASSIGNED:

STAFF
ASSIGNED:

ACTION
REQUIRED:

STAFF
ACTION:

SENDER'S DUE DATE:

OSTP DUE DATE:
DATE COMPLETED:

STAFF DUE DATE
DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley

WHITE HOUSE TRACKING #:

CONTACT PERSON:
PHONE:

EXT:

REMARKS:

OSTP RECEIVED: 08/10/92
FILE: DAB-TKU

DEPT RECEIVED:

CENTRAL FILES:

THE WHITE HOUSE
WASHINGTON

August 12, 1992

Dear Heinrich:

Many thanks for sending me a copy of your remarks at the International House of Chicago entitled **The American Research University and the International Student**. This reaches me at a most opportune time because I have just initiated a major study of the interface between our research universities and our federal government both from the outside looking in and from the inside looking out. In the former case, the President's Council of Advisors on Science and Technology is operating as a committee of the whole under the chairmanship of David Packard, the Chairman of the Board of Hewlett-Packard and the Vice-chairmanship of Dr. Harold Shapiro, the President of Princeton University. In this activity we have been holding regional meetings across the nation hosted by some of our major universities to take testimony from the full spectrum of individuals involved; from undergraduate students through the most senior professors and administrators as well as industries having close connections with the universities in question.

In support of this activity viewing from inside the federal government we have put together a committee that is chaired by Mr. David Kearns, the former Chief Executive Officer of Xerox Corporation who is now the Deputy Secretary of Education with Vice-chairman Walter Massey of NSF, and Bernadine Healy of NIH. Since between them, these latter two folk are responsible for more than 85 percent of the entire funding of university research activity here in the United States, we have rather complete coverage. I have been delighted to find that essentially all of our some 30 federal agencies that are involved with the universities in active fashion are willing participants in this study.

In order to avoid any confusion about partisanship politics, it is my goal to have this pair of reports available for the new Administration -- the second Bush Administration --- in early December.

I have taken the liberty of making copies of your remarks available to both groups where they have been read with great interest.

Again thanks for sending them to me and warmest personal best wishes,

Sincerely yours,

A handwritten signature in black ink, appearing to read 'D. Allan Bromley', with a stylized, flowing script.

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

**Dr. Heinrich Pfeiffer
Executive Director
Alexander von Humboldt Foundation
Jean Paul Strasse 12
D 5300 Bonn 2
Germany**

"Document Control"

TYPE: INFORMATION

DOCUMENT NUMBER: 9202099

ORIGINATOR: 02

STATUS C

DIRECTORATE STATUS

FROM: PFEIFFER, HEINRICH: INTERNATIONAL HOUSE OF CHICAGO

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 07/27/92

SUBJECT: ENCLOSED PAPER "THE AMERICAN RESEARCH UNIVERSITY AND
THE INTERNATIONAL STUDENT"

DIRECTORATE

ASSIGNED:

STAFF
ASSIGNED:

ACTION
REQUIRED:

STAFF
ACTION:

SENDER'S DUE DATE:

OSTP DUE DATE:

STAFF DUE DATE

DATE COMPLETED:

DATE COMPLETED/DEPT:

COPIES TO: INTERNATIONAL/POLICY
D. Allan Bromley

WHITE HOUSE TRACKING #:

CONTACT PERSON:

REMARKS:

PHONE:

EXT:

OSTP RECEIVED: 07/27/92
FILE: INTERNATIONAL

DEPT RECEIVED:

CENTRAL FILES:

THE WHITE HOUSE

WASHINGTON

August 11, 1992

Dear Tom:

I have just nominated J. Thomas Ratchford for membership in the Council on Foreign Relations and would much appreciate it if you would be good enough to provide a seconding letter on Tom's behalf to:

Mr. Kempton Dunn
Director of Membership and Fellowship Affairs
Council on Foreign Relations, Incorporated
58 East 68th Street
New York, New York 10021

For your convenience, I am enclosing herewith a copy of a recent curriculum vitae that Tom prepared. As you know, the Council's membership group in particular is interested in international experience and the letters are particularly helpful when they contain some personal experience or anecdote that might add to the formal sort of material that usually comes to the committee with the nominating initiative itself.

Tom has done an outstanding job as my Associate Director for Policy and International Affairs and I believe that he would be a very effective and interesting member of the Council on Foreign Relations. Your support would be much appreciated.

With warmest best wishes,

Sincerely yours,



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

Enclosure

The Honorable Thomas R. Pickering
American Ambassador
New Delhi, India

THE WHITE HOUSE
WASHINGTON

July 29, 1992

Dear Enid:

Many thanks for sending me a copy of your new book entitled **Neurobiological Disorders in Children and Adolescents** as well as the copies of the article in **Personnel Journal** and the information about the Yale NIMH Conference.

The work that you and Dick are doing in this vitally important area is having a very significant impact and it is clear that the areas you raise are ones that deserve substantial attention in this decade of the brain. My congratulations to you for your leadership in bringing these problems to the attention of not only the public, but also the research community where further work is so badly needed.

With warmest best wishes to you both,

Sincerely yours,



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

Dr. Enid Peschel
Country Club Drive
Woodbridge, Connecticut 06525

THE WHITE HOUSE
WASHINGTON

July 6, 1992

Dear Mr. Poree:

Thank you for your kind invitation to be your guest and participant in the "Journess de l'ANVAR" scheduled for December 10 and 11, 1992, in Nantes.

I am happy to accept your invitation but must caution you that occasionally I have to cancel engagements at the last moment due to Presidential scheduling that requires my presence. I sincerely hope this does not happen.

As the time of the forum approaches, my staff will contact you to work out details for the event. The date is on my calendar and I hope that I will be available to be with you and your colleagues during this special occasion.

I am pleased that you thought of me and look forward to the occasion.

Sincerely yours,

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

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

Mr. Jean-Claude Poree
Director of International Affairs
ANVAR
43, Rue de Carmartin
75436 Paris Cedex 09
France

TYPE: INVITATION

DOCUMENT NUMBER: 9202225

ORIGINATOR: 02

SPEECH: YES NO

FROM: POREE, Jean Claude: ANVAR

DATE OF EVENT: 12/10/92 THRU: 12/11/92

TENTATIVE DATES:

LOCATION OF EVENT: NANTES, FRANCE

TIME OF EVENT:

SUBJECT: AN INVITATION TO ATTEND THEIR CONFERENCE TO DISCUSS
MANAGEMENT OF TECHNOLOGY ON A NATIONAL LEVEL.

RSVP: 07/06/92

CONTACT PERSON:

CONTACT NUMBER:

INVITATION ACCEPTED?

YES

NO

COPIES TO: INTERNATIONAL/POL

REMARKS:

Could be okay

*Could be a
much-needed
trip to France
after the
election.*

*May coincide
with
Carnegie Group?*

DATE OF LETTER: 06/16/92

DATE RECEIVED: 06/22/92

FILE: P-INVITATION

THE WHITE HOUSE
WASHINGTON

July 29, 1992

Dear Jim:

Many thanks for your news filled letter of June 28. I have been traveling much of the time since then, hence my delayed response. I was delighted to see the article in last fall's **Miami Alumni** magazine with the cover story about your program and again would like to congratulate you on the innovative and important work that you are doing in the education field. There is very little that is more important in the country at the moment than this particular kind of work.

I have known Ken Wilson, of course, for many years and have talked to him a number of times about his education ideas; he is obviously a brilliant individual and I am sure that you will enjoy working with him. I had a chance to learn more about the SSI project in Ohio when I was at Ohio State for a commencement address last year.

It seems hard to believe that your children are as grown up and are doing so many good things as you indicate in your note. I remember them as babies. I am sure that you and Alice will very much enjoy your trip to Europe and recognize that if all is going to plan you will be there as I dictate this letter.

If your travels ever bring you to the Washington area please do let me know so that I invite you to lunch at the White House Mess. It would be great to see you again.

With warmest best wishes to both you and Alice,

Sincerely yours,



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

Professor James E. Poth
Department of Physics
Miami University
Oxford, Ohio 45056

491 White Oak Dr.
Oxford, OH 45056
June 28, 1992

Dear Allan,

Thank you for the kind words in your last letter about my work with in-service teachers. I'm still at it and am enclosing a copy of last fall's Miami Alumni Magazine with a cover story about our program. Also enclosed is a copy of my page from the ballot to elect the first officers of the new APS Forum on Education. I thought you might be interested in a summary of what I've been up to lately.

We have now completed the first academic-year offering of our Teaching Science With Toys Workshop under a new three-year grant from NSF and are presently engaged in the first summer offering. This is the first time we have gone nationwide, and we have teachers here from all over the country - plus three college professors we are training.

My in-service work has increased this year through my involvement with Ohio's SSI Project. It's called Project Discovery here in Ohio and is under the direction of Ken Wilson at Ohio State and Jane Butler Kahle here at Miami. I am currently teaching the physics course to the first group of teachers from

throughout the state to go through the program. We are using materials developed at the University of Washington and actually started last semester with a group of pre-service teachers at Miami.

Miami was selected as one of the original sites for the Goodlad project, and I have been working on the Steering Committee all year getting that project underway here. I also continue to function in the Physics Dept. and have been involved in the re-design of the introductory courses for majors under another NSF grant.

Enough about me. The kids are doing fine. Army graduated from Miami in May and is in South Africa for 6 weeks offering Conflict Resolution Workshops with Dudley Weeks, the professor she studied with at American Univ. last year. Betsy graduated the same day with a masters in Audiology from UNC Chapel Hill and has accepted a position as instructor in the medical school of South Carolina at Charleston.

Mike is still stationed with the Air Force in Aviano, Italy, and came back to get married in April. We haven't been over to see him yet, but we plan to leave here on July 14 to visit him on our first trip to Europe since 1968.

We send our best to you and hope to get together again sometime. Sincerely yours,
Tim and Alice

THE WHITE HOUSE
WASHINGTON

February 21, 1992

Dear Eugene:

Many thanks for your letter of December 10 which I regret has been sitting on my desk for far too long.

You are undoubtedly correct that the topic of solar physics was not completed as well by the Bahcall NRC Panel as were other topics in astronomy and astrophysics.

It bears attention, however, that solar science and its impact on terrestrial climate, for example, are certainly not being neglected in the overall Federal R&D program. In particular, the US Global Climate Change Program this as a specific item of importance as does NASA's Space Plasma Programs.

Nonetheless, I understand your concern and sympathize with it and it seems to me that your best strategy in support of solar science would be to argue that it was not ranked highly by the Bahcall Panel precisely because it is not pure astrophysics and therefore, in some sense, fell outside the main thrust of Bahcall's group.

I am aware of the difficulties in the solar science field because of those that are being encountered by my old colleagues at Yale, Sophia Sabatino and Pierre Demarque.

Many thanks for writing me such an information filled letter. My colleagues and I will certainly make good use of this information in the days ahead.

With all best wishes,

Sincerely yours,

A handwritten signature in dark ink, appearing to read 'D. Allan Bromley', with a long, sweeping horizontal line extending to the right.

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

Professor Eugene N. Parker
The Enrico Fermi Institute
The University of Chicago
933 East 56th Street
Chicago, Illinois 60637

"Document Control"

DOCUMENT NUMBER: 9125129
DIRECTORATE STATUS

TYPE: INFORMATION
ORIGINATOR: 02

STATUS C

FROM: PARKER, Eugene N.: UNIVERSITY OF CHICAGO

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 12/10/91

SUBJECT: A LETTER TO ACQUAINT DR. BROMLEY WITH A CONFLICT
THAT HAS ARISEN IN CONNECTION WITH THE BAHCALL
REPORT AND THE TIMLEY PURSUIT OF SOME PRESSING
PROBLEMS IN SOLAR PHYSICS AND ENVIRONMENTAL CHANGE.

DIRECTORATE
ASSIGNED:

STAFF
ASSIGNED:

ACTION
REQUIRE

STAFF
ACTION:

OSTP D
DATE C

STAFF DUE DATE
DATE COMPLETED/DEPT:

COPIES

WHITE H

REMARKS:

OSTP RECE
FILE: P-E

CENTRAL F

2/1/92
Parker is right, in that
Solar physics was not
treated well by Bahcall.
However, solar science &
it's impact on terrestrial
climate aren't being
neglected - viz Global change
program, and NASA space
plasma program - Karl
(Parker's best strategy
would seem to be
to argue that solar
science wasn't
ranked highly by
Bahcall precisely
because it is not
pure astrophysics.)

CONTACT PERSON:
PHONE:

EXT:

RECEIVED:

12.19.91

Karl Gab
Comment
must reply
JLS

THE WHITE HOUSE
WASHINGTON

April 30, 1992

Dear Ms. Perkes:

I have had an opportunity to review the copy of your resume.

Unfortunately, at the present time we do not have any positions for a person with your particular background and expertise. This is a small office and our budget does not permit the luxury of expertise in every discipline--thus the reality of fiscal constraint.

I have, however, taken the liberty of sharing the information you provided with members of my senior staff and, if an opportunity presents itself, I have asked them to keep you in mind.

I wish you every success in your search for an appropriate position.

Sincerely yours,

A handwritten signature in black ink, reading "D. Allan Bromley". The signature is fluid and cursive, with a large initial "D" and "B".

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

Ms. Lindy J. Perkes
7301 Sunrise Court
Greenbelt, Maryland 20770

Lindy J. Perkes
7301 Sunrise Court
Greenbelt, Maryland 20770
(301) 441-3315

April 24, 1992

Dr. D. Allan Bromley
Office of Science and Technology Policy
Old Executive Office Building, Room 358
Washington, D. C. 20506

Dear Dr. Bromley:

I am writing you at the recommendation of Mr. George Butler, Executive Director of McDonnell Douglas Space Systems Division in California.

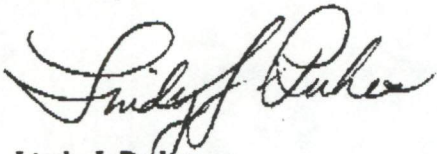
Currently, I am in the process of looking for a new career opportunity that will allow me to use my skills in research and technology analysis; issues management; government, industry, and education liaison; communications and media relations; seminar development; marketing and management. It is my intention to identify where my background and experience would best fit into an organization and also satisfy my career and personal goals.

Please understand, Dr. Bromley, I know about the government crunch on positions, and therefore, I do not expect you to have a position nor do I expect you to know of any openings. What I seek is information as to where my skills and expertise will best fit.

Enclosed is a copy of my profile for your review. When we meet you may have suggestions as to where my experience may best fit to meet the needs of an organization. My search is for an interesting, challenging, and rewarding career while using my skills and talents in the field of science and technology. I have also enclosed a tentative agenda of specific questions and concerns that I would like to discuss with you.

Again, Dr. Bromley, I am merely seeking information that will help me determine where my best career fit lies. I will call you on Wednesday, April 29th, to schedule a brief meeting at a time that is mutually convenient.

Sincerely,



Lindy J. Perkes

Enclosures

"Document Control"

TYPE: ACTION

DOCUMENT NUMBER: 9201534

ORIGINATOR: 02

STATUS I

DIRECTORATE STATUS

FROM: PERKES, Lindy J.

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 04/24/92

SUBJECT: REQUESTS A MEETING WITH DR. BROMLEY TO SEEK ADVICE
ON CAREER ALTERNATIVES.

DIRECTORATE

STAFF

ASSIGNED: DIRECTOR'S OFFICE

ASSIGNED:

ACTION

STAFF

REQUIRED: AS APPROPRIATE

ACTION:

SENDER'S DUE DATE:

OSTP DUE DATE: 05/13/92

STAFF DUE DATE

DATE COMPLETED:

DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley

WHITE HOUSE TRACKING #:

CONTACT PERSON:

REMARKS:

PHONE:

EXT:

OSTP RECEIVED: 04/30/92

DEPT RECEIVED:

FILE: P-DAB-PERSONAL

CENTRAL FILES:

THE WHITE HOUSE
WASHINGTON

February 24, 1992

Dear Jary:

I was delighted to get your greetings from Aberdeen and am looking forward to the occasion when you publish your Gifford lectures. This, of course, is a singular honor and one that you richly deserve. It was good to hear that J. Maxwell Irvine has become Principal and Vice Chancellor at Aberdeen; I had not been aware of his elevation. It was also good to know that the sun never really sets on the Dissenters.

I have not yet fully given up hope that, in fact, the Dissenters Group will agree to accept my invitation to join me for dinner in the Executive Mess at the White House and will keep urging this upon you and my other old friends in the group. I assume that the problem is that a number of our colleagues are becoming somewhat long in the tooth and therefore not terribly enthusiastic about the thought of travelling from New Haven to Washington.

I recall with very real pleasure, however, the time when we accepted Dillon's invitation to meet at the Alibi Club and would very much look forward to hosting a meeting here whenever it could be arranged.

In the meantime, let me wish you a wonderfully rewarding time in Aberdeen as I know it will be for your audiences. I hope that Sylvia was able to accompany on what I am sure must be a wonderful trip. Pat and I for many years tried to spend 10 days or so in northern Scotland and enjoyed every moment of those visits. Somehow I doubt that I will ever go back however, because life is clearly not the same without her. I will always be deeply indebted to you for the moving and perceptive tribute you paid to her memory in the Dwight Hall ceremony.

From all that I hear our university is in substantial turmoil. I had talked at length with Frank Turner about the problem and planned solutions but I am afraid that, although the decisions being made were, in my opinion, entirely correct, the implementation has been rather flawed because Benno backed off from his original 15% cut to something smaller. What then happened is that in engineering, for example, instead of a merciful slaughter, we have just a mortally wounded surviving group that will die slowly over the years screaming, yelling and causing an enormous amount of difficulty in the process.

As an old engineer and as someone who is fully aware of the tremendously distinguished reputation that Yale had in engineering prior to the 1960s, I understand fully the feelings of our alumni in that area, but the hard facts of life are simply that it would have taken between \$100 and \$150 million dollars to even begin to put engineering back to a level of quality that would have been commensurate with the rest of Yale and I am assured that such funds are simply not available. That being the case, the appropriate move, in my view, would have been to give it a surgical death with the tenured professors being distributed as appropriate throughout the existing departments. As it stands, Yale engineering is considered a major insult by the entire engineering community and its continued existence in its present state hurts everyone.

I am sure you have a much better view of what is going on in Sociology and Linguistics but I suspect that a rather similar situation holds.

As in the case of the School of Organization and Management, I get the distinct feeling that Benno makes reasonable decisions but then falls substantially behind the curve when it comes to implementation.

With warmest regards,

Sincerely yours,



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

Professor Jaroslav Pelikan
Department of Philosophy
King's College
University of Aberdeen
Old Aberdeen
United Kingdom
AB9 2UB



RECEIVED

92 FEB 20 P2:10
13 February 1992

OSTP
MAIL ROOM

Dear Allan,

Greetings from Aberdeen. I am here to deliver the first ten of my twenty Gifford lectures (the second series will be a year hence).

For the inaugural lecture I was introduced by the Principal and Vice Chancellor, J. Maxwell Irvine, who turns out to be a colleague and collaborator (and admirer!) of yours. And just to show that the sun never sets on the Dissenters, I have met a young environmental biologist from India, who as a graduate student was chauffeur for Dillon Ripley when Dillon was working on the multi-volume Birds of India!

I trust this finds you well, and I send you my warm regards - also to the President.

Cordially,
Dan.

Withdrawal/Redaction Sheet

(George Bush Library)

Document No. and Type	Subject/Title of Document	Date	Restriction	Class.
02. Letter	To: Dallas Peck From: Allan Bromley Re: Response to 2/27/92 letter [personal information redacted] (1 pp.)	4/15/92	(b)(6)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: Correspondence Files
WHORM Cat.:
File Location: D. Allan Bromley Correspondence - J-S [3 of 4] [1992]

Date Closed:	2/5/2010	OA/ID Number:	62002-007
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



United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA 22092

In Reply Refer To:
WGS-Mail Stop 915

RECEIVED
92 MAR 6 PM 12:17
FEB 27 1992

MAIL ROOM

Dr. D. Allan Bromley
Director, Office of Science
and Technology Policy
17th Street and Pennsylvania Avenue, N.W.
Washington, D.C. 20506

Dear Dr. ^{Alan}Bromley:

The U.S. Geological Survey (USGS) has recently published deep-water seafloor atlases of the Bering Sea and Atlantic Coast. The "Atlas of the U.S. Exclusive Economic Zone Bering Sea" surveyed area encompasses all of the Aleutian Basin and Bowers Basin deeper than 200 meters east of the U.S.-U.S.S.R. Convention Line of 1867. The "Atlas of the U.S. Exclusive Economic Zone Atlantic Continental Margin" represents sonar images of 200,000 square nautical miles of ocean floor off the coasts of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, and Florida. The images and interpretations in the new atlases will provide industry and scientific researchers with the basic tools with which to focus on more detailed exploration in the future. In addition, they will assist in the protection of our seafloor resources, aid in the delineations of potential energy and mineral resource targets, and enhance our understanding of the magnitude and timing of seafloor hazards.

The atlases were produced as part of the overall Department of the Interior responsibility for the basic assessment, management, and protection of the public lands and their resources, both onshore and offshore. The USGS, in a long-range cooperative venture with the British Institute of Oceanographic Sciences, has completed deep-water mapping surveys of more than two-thirds of the 3 million square nautical miles of seafloor under U.S. jurisdiction. The enclosed news releases describe the atlases and provide information for the public purchase of copies.

If you would like a complimentary copy of these atlases, please call the USGS-National Oceanic and Atmospheric Administration Joint Office at (703) 648-6525.

Sincerely yours,

Dallas L. Peck
Director

Enclosures

"Document Control"

TYPE: ACTION
ORIGINATOR: 02

DOCUMENT NUMBER: 9200725
DIRECTORATE STATUS

STATUS I

FROM: PECK, Dallas L.: U.S. DEPARTMENT OF THE INTERIOR

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 02/27/92

SUBJECT: HE IS WRITING TO OFFER COMPLIMENTARY COPIES OF THEIR
"ATLAS OF THE U.S. EXCLUSIVE ECONOMIC ZONE BERING
SEA".

DIRECTORATE STAFF
ASSIGNED: ENVIRONMENT ASSIGNED:

ACTION STAFF
REQUIRED: AS NECESSARY ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: 03/20/92 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: 03/06/92 DEPT RECEIVED:
FILE: ENVIRONMENT

CENTRAL FILES:

Withdrawal/Redaction Sheet

(George Bush Library)

Document No. and Type	Subject/Title of Document	Date	Restriction	Class.
03a. Letter	To: Tom Pinkston From: Allan Bromley Re: Letter of Recommendation for J.H. Hamilton [personal information redacted] (1 pp.)	4/13/92	(b)(6)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: Correspondence Files
WHORM Cat.:
File Location: D. Allan Bromley Correspondence - J-S [3 of 4] [1992]

Date Closed:	2/5/2010	OA/ID Number:	62002-007
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.
03b. Letter	To: Allan Bromley From: Tom Pinkston Re: Request for letter of recommendation for J.H. Hamilton [personal information redacted] (1 pp.)	4/2/92	(b)(6)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: Correspondence Files
WHORM Cat.:
File Location: D. Allan Bromley Correspondence - J-S [3 of 4] [1992]

Date Closed:	2/5/2010	OA/ID Number:	62002-007
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

"Document Control"

TYPE: ACTION
ORIGINATOR: 02

DOCUMENT NUMBER: 9201170
DIRECTORATE STATUS

STATUS I

FROM: PINKSTON, W.T.: VANDERBILT UNIVERSITY

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 04/02/92

SUBJECT: A REQUEST FOR A LETTER OF REFERENCE FOR J.H.
HAMILTON.

DIRECTORATE
ASSIGNED: D. Allan Bromley

STAFF
ASSIGNED:

ACTION
REQUIRED: AS APPROPRIATE

STAFF
ACTION:

OSTP DUE DATE: 04/21/92
DATE COMPLETED:

SENDER'S DUE DATE: 05/01/92
STAFF DUE DATE
DATE COMPLETED/DEPT:

COPIES TO:

WHITE HOUSE TRACKING #:

CONTACT PERSON:
PHONE:

EXT:

REMARKS:

OSTP RECEIVED: 04/07/92
FILE: DAB-REFERRAL

DEPT RECEIVED:

CENTRAL FILES:

THE WHITE HOUSE
WASHINGTON

February 7, 1992

Dear Dr. Pandolfi:

In the context of our ongoing exchange of views on science and technology under the U.S.-European Communities Consultative Group, I bring to your attention a matter of deep concern, amendments to the Cosmetics Directive that is very soon scheduled for consideration (Roth-Behrendt) by the European Parliament, perhaps early next week. This amendment would prohibit the use of a cosmetic ingredient or product that has been tested in animals.

I appreciate that many members of the public are concerned about the humane use of animals in research and safety testing. I share those concerns and am deeply committed to the humane care of animals in research and testing. In the U.S., strict guidelines must be followed and the use of animals is monitored carefully. However, I am also deeply concerned that without adequate and appropriate safety testing of consumer products we run the risk of jeopardizing the health and safety of our citizens.

Proposals similar to the ones being considered have come before the U.S. Congress and several State legislatures. Advocates of those proposals have asserted that animal testing is no longer necessary to ensure product safety because valid non-animal test methods exist. This is simply not the case. Although it is true that a number of non-animal safety tests are under development, it is not accurate to say that such tests have been validated and are fully acceptable as replacements for animal tests. In vitro tests cannot fully replace animal testing for products intended for human use. We encourage the development and validation of alternate test methods but until valid, accurate and reliable non-animal tests are available, the use of animal tests will continue to be essential to establish the safety of both drugs and cosmetics.

We of course continue to be committed to increased cooperation between health officials of the U.S., the Member States of the EC, and the EC. Such cooperation already has led to a number of successes, and will, I am sure, continue to be effective in promoting and protecting the health and safety of all of our citizens. It is in that spirit of cooperation that I offer you my views and express my concerns about this pending amendment.

Sincerely,



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

The Honorable Fillippo Maria Pandolfi
Vice President
Commission of the European Communities
200 rue de la Loi Brussels
Belgium

bcc: Dr. William F. Raub
Dr. David A. Kessler, FDA

Withdrawal/Redaction Sheet

(George Bush Library)

Document No. and Type	Subject/Title of Document	Date	Restriction	Class.
04. Letter	To: Elizabeth Pentecost From: Allan Bromley Re: letter of Recommendation for Bernard Phlips [personal information redacted] (2 pp.)	2/5/92	(b)(6)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: Correspondence Files
WHORM Cat.:
File Location: D. Allan Bromley Correspondence - J-S [3 of 4] [1992]

Date Closed:	2/5/2010	OA/ID Number:	62002-007
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)]

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

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]
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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.

(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

"Document Control"

TYPE: ACTION
ORIGINATOR: 02

DOCUMENT NUMBER: 9200326
DIRECTORATE STATUS

STATUS I

FROM: PENTECOST, Elizabeth: UNIVERSITIES SPACE RESEARCH ASSOCIATION

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 01/29/92

SUBJECT: SHE REQUESTS A LETTER OF RECOMMENDATION FOR MR.
BERNARD PHILLIPS.

Phillips

DIRECTORATE
ASSIGNED: D. Allan Bromley

STAFF
ASSIGNED:

ACTION
REQUIRED: AS APPROPRIATE

STAFF
ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: 02/18/92
DATE COMPLETED: STAFF DUE DATE
DATE COMPLETED/DEPT:

COPIES TO:

WHITE HOUSE TRACKING #:

CONTACT PERSON:
PHONE:

EXT:

REMARKS:

OSTP RECEIVED: 02/03/92
FILE: P-DAB-REFERRAL

DEPT RECEIVED:

CENTRAL FILES:

*Deputy
Director
at Los Alamos*



UNIVERSITIES SPACE RESEARCH ASSOCIATION

MICROGRAVITY SCIENCES/ASTRONOMY AND ASTROPHYSICS

409 THIRD STREET, SW, SUITE 330 • WASHINGTON, DC 20024

TELEPHONE: 202-479-2609 • FAX: (202) 479-2613

29 January 1992

MAIL ROOM

Dr. D. Allan Bromley
Executive Office of the President
Office of Science & Technology Policy
Old Executive Office Building, Room 360
17th & Pennsylvania Avenue, NW
Washington, DC 20506

Dear Dr. Bromley:

USRA is assisting the Naval Research Laboratory by providing astronomers and astrophysicists who will conduct research in high energy astrophysics.

Mr. Bernard Philips has applied for a position in this program and has given your name as a reference. We would appreciate your sending us a letter of recommendation for Mr. Philips at your earliest convenience.

A copy of our notice in the *AAS Job Register* is attached. Thank you for your help.

Sincerely,

Elizabeth Pentecost
Deputy Director
Space Astronomy & Astrophysics

Attachment

independent international survey), 30 minutes from beaches, 90 minutes from vineyards, 120 minutes from ski fields and 20 minutes from downtown.

Applicants should send a CV, list of publications and current research interests, together with at least two letters of reference, to arrive at the above address by February 28, 1992.

Salary range is \$ (A) 27,060 - 37,618. EOE.

No. 4089

Postdoctoral Position - Radio Astronomy
HAYSTACK OBSERVATORY
Route 40
Westford, MA 01886

Attention: Director

Massachusetts Institute of Technology and the Harvard-Smithsonian Center for Astrophysics invite applications for a post-doctoral research appointment in radio astronomy at the Haystack Observatory. The position is open to candidates with a background and interest in observational spectral-line astronomy applied to studies of interstellar matter, star formation and extragalactic molecules. The Haystack Observatory has available a 37m diameter radio telescope equipped with sensitive radiometers spanning wavelengths from 2.6mm to 18cm. Involvement in the continuing upgrade, calibration and performance tests of the capabilities of the radiotelescope will be expected of the successful candidate. The Observatory is located in Westford, Massachusetts, 35 miles northwest of Cambridge, and is close to major astronomical research centers as well as cultural and sports activities in the Boston area. The appointment is for one year starting in September 1992, and is renewable for a second year. Applicants should send curriculum vitae and three reference letters by February 15, 1992 to the above address. Inquiries can be made by calling Dr. J.E. Salah at 508-692-4764. EOE/AEE.

No. 4090

Gamma Ray Astrophysicist
NAVAL RESEARCH LABORATORY
C/O Universities Space Research Association
409 Third Street, SW
Suite 330
Washington DC 20024

Attention: Elizabeth Pentecost

The Universities Space Research Association (USRA), in association with the Naval Research Laboratory in Washington, DC, invites applications for a research position in the Gamma and Cosmic Ray Astrophysics Branch at NRL. The branch is responsible for a broad program of research in gamma-ray astrophysics, cosmic-ray physics and theoretical high energy astrophysics. Major branch programs include the Oriented Scintillation Spectrometer Experiment (OSSE) on NASA's Compton Gamma Ray Observatory Satellite, NRL's Heavy Ions in Space (HIIS) experiment, analysis of data from NASA's Solar Maximum Mission and theoretical research in high energy astrophysics. The candidate will participate in analysis of OSSE data and work in the development of advanced gamma ray detectors with high spectral resolution and/or imaging capabilities. The detector development work may involve investigation of position-sensitive solid state detectors and/or superconducting detection techniques which would be applicable to coded-aperture imaging systems and

high resolution Compton Telescopes. Applications to new missions for high resolution spectroscopy will also be investigated.

Applicants must have a Ph.D. in astronomy, physics or a closely related field. The position will be for one year with possible extensions for up to three years.

Applications received by March 15, 1992 will be given full consideration. Scientists interested in pursuing this opportunity should send their resumes along with the names of three references to the above address.

No. 4091

Postdoctoral Positions: Theoretical Astrophysics
NORTHWESTERN UNIVERSITY
Department of Physics and Astronomy
2145 Sheridan Road
Evanston, IL 60208

Attention: Professor L.S. Finn

The Northwestern University Theoretical Astrophysics group has openings for two postdoctoral fellows in astrophysics and relativity beginning in September 1992. Theoretical astrophysics at NU is carried out by Professors L.S. Finn (relativistic astrophysics, general relativity and sources of gravitational radiation), G. Miller (high-energy astrophysics and radiation hydrodynamics) and R. Taam (hydrodynamics, stellar structure and evolution).

The NU astrophysics group is engaged in theoretical studies of gravitational radiation sources, accretion physics, gamma- and X- ray bursts and the nature, origin and evolution of close binary systems. Observational work at NU includes research on the galactic center, star-forming regions, gamma- and X- ray sources and cosmology.

Computational facilities in the astrophysics group include high-end Sun and IBM workstations. Time is available at national facilities (NCSA and CNSF) for more extensive computations.

Applicants should arrange that a CV, statement of research interests and three letters of recommendation be sent to the attention of L.S. Finn at the above address by February 1, 1992. We particularly encourage candidates with an interest in sources of gravitational radiation, accretion physics, radiation processes and hydrodynamics. EOE.

No. 4092

Assistant Research Astrophysicist
UNIVERSITY OF CALIFORNIA
Center for Particle Astrophysics
301 Le Conte Hall
Berkeley, CA 94720

Attention: Professor Bernard Sadoulet

The Center for Particle Astrophysics, an NSF Science and Technology Center, invites applications for the position of Center Fellow.

The Center is investigating the dark matter problem through four lines of experimental attack: using conventional and cryogenic detectors to detect the interaction of dark matter particles in the laboratory; studying the diffuse radiation from the early universe (particularly the 3K microwave background); using distant supernovae to determine how much dark matter exists; and studying the role of dark matter in the evolution of large-scale structure. The Center Fellowship is

THE WHITE HOUSE
WASHINGTON

December 18, 1992

MEMORANDUM FOR JOHN ROBSON
TREASURY

FROM: ALLAN BROMLEY
OSTP



SUBJECT: DEPRECIATION RATES FOR SEMICONDUCTOR
MANUFACTURING EQUIPMENT

Enclosed herewith is a copy of a report that George Scalise, a Senior Vice President of National Semiconductors and Chairman of the National Policy Committee of the Semiconductor Industry Association (SIA) has made available to me.

The conclusion of this report is that the depreciable life of the modum equipment is 3 to 5 years.

As I discussed with you earlier, a group of senior semiconductor industry executives that met with Sununu, Darman, Boskin and me have told us that the most helpful single thing that we as a Federal Government could do to enhance the competitiveness of our semiconductor manufacturing industry would be to allow the industry to depreciate its production line equipment at a more realistic rate than that now allowed which is based on an assumed 5 year useful lifetime.

I believe that the enclosed report makes a convincing case for the shorter useful lifetime. How can we most effectively respond?

Thanking you in advance for your help and with all best wishes for the holiday season and the New Year. I am heading back to Yale in mid-January.

Enclosure

THE WHITE HOUSE
WASHINGTON

November 24, 1992

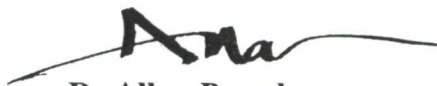
Dear Pat:

Congratulations on the Cortelyou-Rust Professorship. I am delighted that I was able to play a part in making this possible. It most certainly is very much merited.

I too had hoped that we would have an opportunity to continue our work through a second term but the ways of democracy are such that this has not been possible. As it is I am happy that I think that we have been able to make some changes for the better and from my discussions thus far it appears that the Clinton/Gore Administration will continue in much the same directions as those that have been established during the Bush Administration.

With warmest best wishes,

Sincerely yours,

A handwritten signature in dark ink, appearing to read 'D. Bromley', with a long, sweeping horizontal line extending to the right.

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

Professor Patrick Richard
Director
J.R. Macdonald Laboratory
Kansas State University
Cardwell Hall
Manhattan, Kansas 66506

"Document Control"

TYPE: INFORMATION

ORIGINATOR: 02

DOCUMENT NUMBER: 9203426

STATUS C

DIRECTORATE STATUS

FROM: RICHARD, PATRICK: J.R. MACDONALD LABORATORY

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 10/22/92

SUBJECT: A THANK YOU FOR PROVIDING HIM A RECOMMENDATION FOR
THE CORTELYOU-RUST PROFESSORSHIP.

DIRECTORATE

ASSIGNED:

STAFF

ASSIGNED:

ACTION
REQUIRED:

STAFF
ACTION:

SENDER'S DUE DATE:

OSTP DUE DATE:

DATE COMPLETED:

STAFF DUE DATE

DATE COMPLETED/DEPT:

COPIES TO: D. Allan Bromley

WHITE HOUSE TRACKING #:

CONTACT PERSON:

REMARKS:

PHONE:

EXT:

OSTP RECEIVED: 10/30/92

DEPT RECEIVED:

FILE: DAB-REFERRAL

CENTRAL FILES:

THE WHITE HOUSE

January 13, 1992

Jackie:

Here with a copy of a talk I gave recently to the Chapman VII meeting in Baltimore. It includes, in pages 2-4, much of the new information that I mentioned to you this afternoon.

If you wish I can get you much more detail.

We do, indeed, miss you!

Sincerely

Alan

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

AN APPROACH TO GLOBAL CLIMATE CHANGE:
A U.S. PERSPECTIVE

*John Sumner
best regards
D. Allan Bromley*

D. ALLAN BROMLEY
Assistant to the President for Science and Technology
Executive Office of the President

CHEMRAWN VII
Baltimore, Maryland
December 3, 1991

THE WHITE HOUSE

January 27, 92

Dear
Summer

Dear John:

Just in case you missed this
one. Sanity is reasserting itself!

Best regards

Alan

Science Fights Back

Scientists, who claim to have above-average powers of insight, probably should have seen what they were in for on that first Earth Day in 1970. When people started to chant and sway at gatherings dedicated to "saving" everything from water to whales and the air, one might have assumed that the scientific method was going to come under a bit of pressure. After 20 years of much silliness, many lawsuits by Jeremy Rifkin, the degradation of science in liability suits, and too many TV shows calling apples a public-health catastrophe, serious scientists are finally starting to fight back.

This nonunion of concerned scientists doesn't object to environmentalism. Frankly, no one does. But they do object to slipshod science and apocalyptic science. They object to "studies" that in fact don't prove what they say they prove. They object to an intellectual absolutism that tries to close out reassessments of available data.

We also suspect that you are seeing more rigorous scientific minds entering the policy debates simply because restoring balance is in their self-interest. If "scientific" studies are the reason that ever-larger slices of the tax base get dedicated to grandiose and oversold environmental goals, less money will be left to support serious scientific research.

There is also the matter of the credibility of science. If the public comes to believe that "science" is responsible for school budgets destroyed by asbestos mandates, or for property values lowered by radon studies, or the higher living costs passed along by firms complying with the Clean Air Act, or jobs destroyed because "science" ordered the rescue of the spotted owl, then the public may become less sympathetic to the research community's pleas for ever more financial support.

Besides, can all this bad news possibly be true?

The answer in most cases is that there may be a kernel of truth in the warnings but there's often an undisclosed reservoir of mitigating details that deserve to be aired.

After a large survey of the literature on greenhouse warming last year, most of the scientists on a panel of the National Academy of Sciences said that the probable rise in global temperatures wouldn't be dire. Moreover, the panel drew attention to a truth that both environmentalists and most of the reporters who cover these subjects ignore: Humanity's record of technological innovation and adaptation in the face of challenges such as global warming is excellent. We're still here, aren't we?

Dioxin. Two efforts—a study published in the New England Journal of Medicine last January and a symposium at Cold Spring Harbor Laboratory—acknowledged that dioxin is a carcinogen but concluded that regulation of the chemical needs to incorporate data suggesting its effects are not necessarily dangerous under all circumstances.

Endangered Species. The Endangered Species Act is up for reauthorization this year. The battle between loggers' jobs and advocates of the spotted owl in the Northwest makes it clear that current enforcement practices have implications for people, property and jobs. As with global warming, this highly publicized issue is drawing the attention of scientists who know something about the complex subject of species survival and differentiation. Some of their caveats were discussed in the August 16 issue of Science ("Extinction: Are Ecologists Crying Wolf?"). The reauthorization debate should shed further light.

Other examples accumulate of a richer scientific debate over public policy. In May, the Chronicle of Higher Education described scientists at the last meeting of the American Physical Society who have serious doubts about the widely publicized claim that electrical power-transmission lines pose a significant cancer risk.

A July 6 article in the New England Journal of Medicine by three physicians from Columbia University, "Physicians and the Animal-Rights Movement," concluded: "Having seen the lives of the sick and their families savaged by illness, doctors must help prevent ideology from blocking medical progress."

For all of this interest, Elizabeth Whelan, an epidemiologist who heads the New York-based American Council on Science and Health and who has been a leader in the effort to involve working scientists in these subjects, has made an intriguing observation about the behavior of scientists. She notes that while it's often easy to get scientists mobilized against the misuse of their own disciplines, they can be as flaky as a flower child over some airy cause that is undermining an unrelated discipline.

Scientists need to appreciate that they're all in this together. They have a common interest in stepping back from the workbench long enough to support colleagues who've stepped forward to examine publicly the nightmarish claims made in the name of science. The good news is that more scientists are doing just that.

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THE WHITE HOUSE

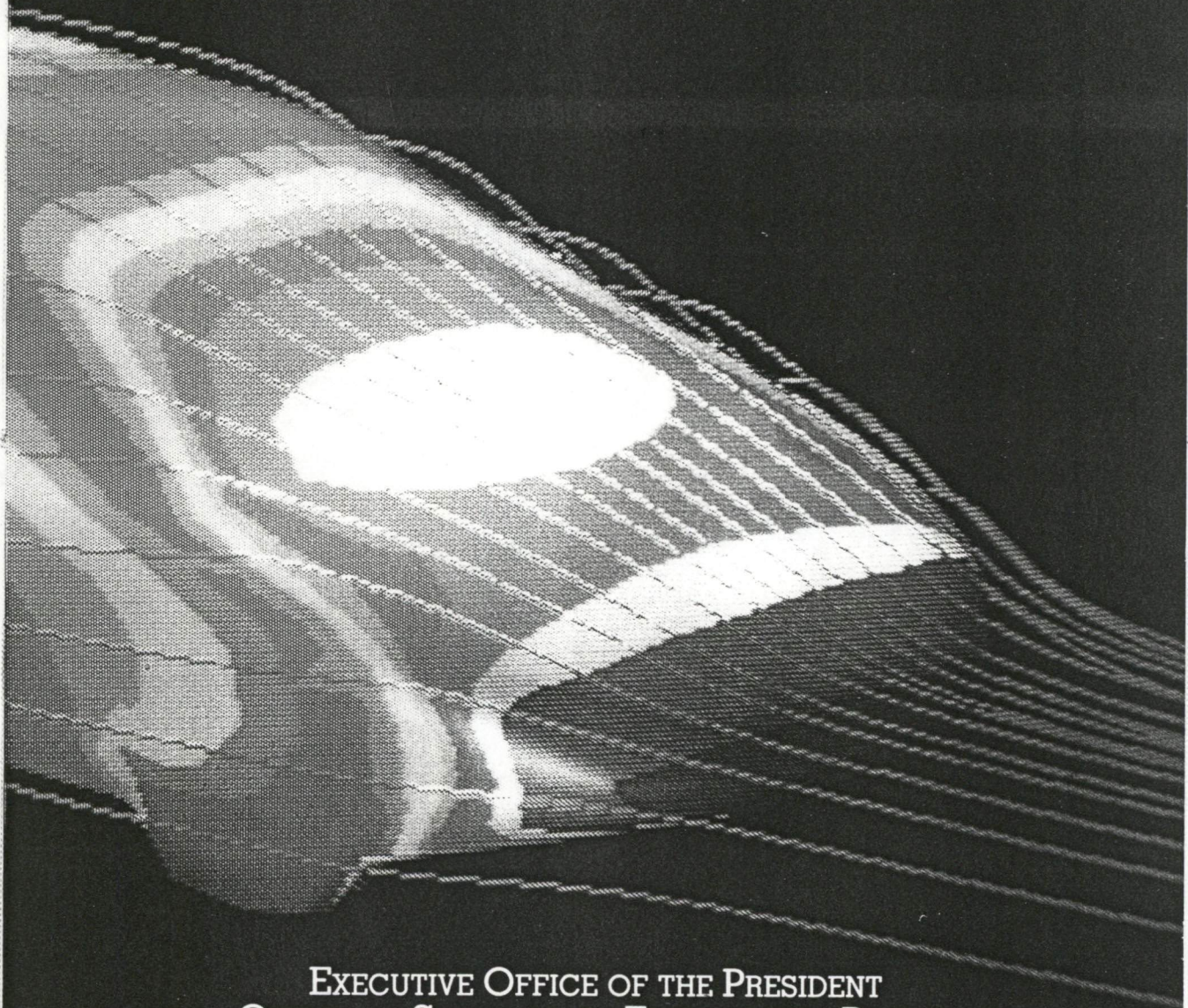
July 20, 1992

Dear John:

Enclosed are copies of the President's
SOT report to the Congress and of a
brochure that we put together to
give interested folks some idea of what
O&T did. Thought that you might
find them of interest.

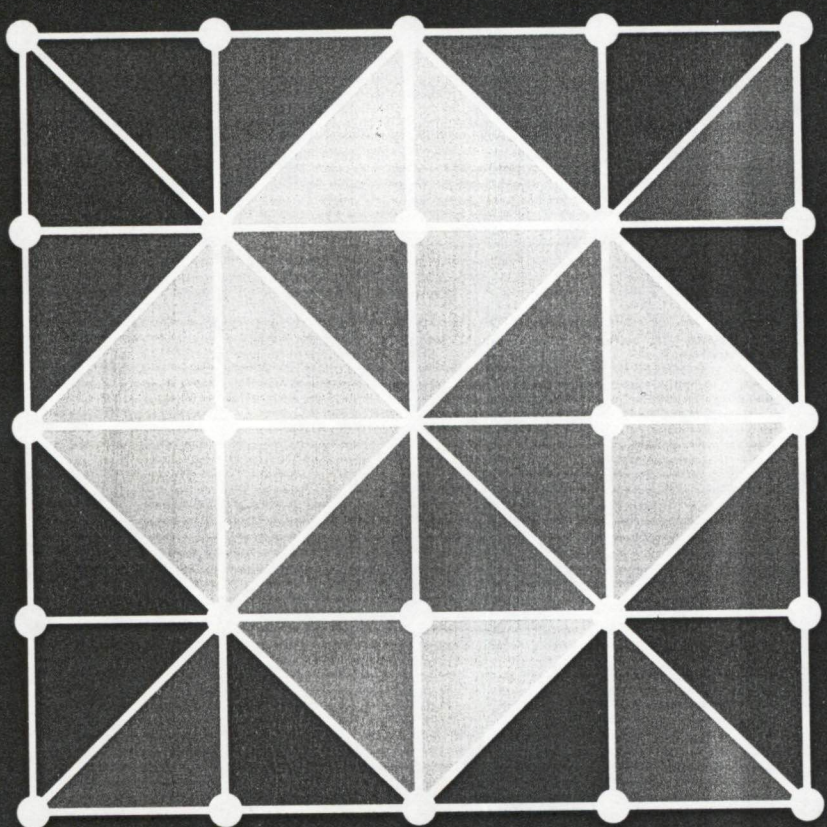
Best regards. Allan

Science and Technology



EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY

Science and Technology



Withdrawal/Redaction Sheet

(George Bush Library)

Document No. and Type	Subject/Title of Document	Date	Restriction	Class.
05. Letter	To: Boris Saltykov From: Allan Bromley Re: Basic Sciences Joint Commission (1 pp.)	12/21/92	(b)(1)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: Correspondence Files
WHORM Cat.:
File Location: D. Allan Bromley Correspondence - J-S [3 of 4] [1992]

Date Closed:	2/5/2010	OA/ID Number:	62002-007
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:	

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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

THE WHITE HOUSE
WASHINGTON

December 18, 1992

Dear Soey:

It was good to hear from you and to get the copies of your papers. I will of course be delighted to respond to any requests for a letter of reference concerning your promotion to the rank of Chief Research Scientist.

After four years here at Washington I've decided that -- with help, of course, from the recent election at least temporarily -- I will go back to Yale and decide what I really want to do when I grow up! After mid-January I can then be reached back in the Physics Department at Yale, although my title is being changed from Henry Ford II Professor of Physics to Henry Ford II Professor of the Sciences -- the first such title at Yale. I am reminded of the fact that it was Arther Williams Wright who was the first man in the world to hold the title of Professor of Physics and in a way I feel badly about giving up on that, but by the same token, it is interesting to recognize that I am heading back in the direction in the old traditional title and Professor of the Sciences is getting closer to Natural Philosophy -- which is what I would really like.

I find it almost impossible to believe that your children are as old as you say they are. But time does indeed fly.

As you can perhaps imagine, the transition period of two quite distinctly different Administrations is one of considerable chaos and in consequence I shall only have time now to acknowledge your letter and wish you a very happy holiday and a very rewarding and successful 1993.

Please do keep in touch.

Sincerely yours,



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

Dr. Soey H. Sie
Group Leader, Division of Experimental Geoscience
51 Deli Road
P.O. Box 136 Northridge NSW
2113 AUSTRALIA

THE WHITE HOUSE
WASHINGTON

December 16, 1992

Dear Mr. Schiavo:

I am very sorry to have to tell you that, even though I initially accepted your kind invitation to participate in the Guest Speaker Series scheduled to be held in March 1993 in Washington, D.C. I must cancel my visit. I will be returning to Yale in mid-January and plan to assess my future options.

With all best wishes for a happy holiday season.

Sincerely yours,

A handwritten signature in black ink, appearing to read "D. Allan Bromley". The signature is fluid and cursive, with a prominent "D" and "B".

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

Mr. Richard G. Schivo
Assistant Dean for Executive Programs
and Professorial Lecturer
Simon Graduate School of
Business Administration
University of Rochester
Rochester, New York 14627

3/18 or 3/19

THE WHITE HOUSE
WASHINGTON

October 9, 1992

Dear Mr. Schiavo:

Thank you for your letter of September 30 inviting me participate in the Executive Development Program's biennial Guest Speaker Series scheduled in March 1993 to be held in Washington, D.C.

With the understanding that it is always possible that Presidential scheduling may force a change in my plans, I would be delighted to accept your invitation.

As the time of the series draws closer, my staff will contact you to work out details for the event.

I am looking forward to the occasion.

Sincerely yours,



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

Change to (No.)
RFB
12/11/92

Attachment

Mr. Richard G. Schiavo
Assistant Dean for Executive Programs
and Professorial Lecturer
Simon Graduate School of
Business Administration
University of Rochester
Rochester, New York 14627

"INVITATION FOR DR. BROMLEY"

TYPE: INVITATION-SPEECH

DOCUMENT NUMBER: 9202999

ORIGINATOR: 02

SPEECH: YES NO

FROM: SCHIAVO, Richard G.: UNIVERSITY OF ROCHESTER

DATE OF EVENT: 03/18/93 THRU: 03/19/93
TENTATIVE DATES:

LOCATION OF EVENT: WASHINGTON, DC

TIME OF EVENT: 8:00 A.M.-5:00 P.M.

SUBJECT: AN INVITATION TO PARTICIPATE IN THEIR EXECUTIVE
DEVELOPMENT PROGRAM'S BIENNIAL WASHINGTON D.C. GUEST
SPEAKER SERIES.

RSVP: 10/21/92

CONTACT PERSON:

CONTACT NUMBER: 716-275-3439

INVITATION ACCEPTED?

YES

NO

COPIES TO: INDUSTRIAL

REMARKS: 10.8.92 accepted to Maggie Maraz!
MN

DATE OF LETTER: 09/30/92

DATE RECEIVED: 10/05/92

FILE: P-INVITATION-SPEECH

September 30, 1992

Honorable D. Allan Bromley
Assistant to the President for Science and Technology
Old Executive Office Building
17th Street and Pennsylvania Avenue NW
Washington, DC 20506

Dear Honorable Bromley:

We would like to extend an invitation to you to participate in the Executive Development Program's biennial Washington, D.C. Guest Speaker Series. Your participation would be particularly significant because you are a University of Rochester alumnus.

The Executive Development Program is a rigorous two-year MBA program for experienced managers. The 113 individuals now pursuing this course of study hold top and middle management positions with more than 30 organizations in Western New York. Their nomination to participate in the program signals the expectation that they will advance to higher levels of management within their organization. Since the program's inception in 1966, many of our graduates have gone on to senior positions at American Express Company, Carrier Corporation, Chase Lincoln First Bank, Corning Incorporated, Eastman Kodak Company, General Electric, General Railway Signal, IBM, Xerox Corporation and other prominent firms in the Rochester, Buffalo and Syracuse areas.

The two-day Washington, D.C. Guest Speaker Series is an integral part of our executive MBA program. Our curriculum is designed to demonstrate how economic analysis can be used to structure managerial decisions. The insights gained from the Washington, D.C. seminar are intended to help students anticipate those changes in economic policy that will have a significant impact on their firms' operating environments. Specifically, our objectives are to provide:

- An overview of the public policy process and an understanding of how federal actions impact management decisions.
- An improved perspective of how management can incorporate public policy in business planning.
- A useful understanding of how government functions and the role of participants in the process including interest groups, trade associations and lobbyists.

The 1993 Washington, D.C. Guest Speaker Series will be held at the Hyatt Regency—Capitol Hill. Your participation will add an important dimension to our event and will provide a valuable exposure to key individuals from a representative cross section of leading institutions and businesses in New York State. We would like you to consider speaking on either Thursday, March 18, 1993, between 8:00 a.m. and 5:00 p.m. or on Friday, March 19, 1993, between 8:00 a.m. and 12:30 p.m. We suggest a 60 minute

September 30, 1992
Page 2

Friday, March 19, 1993, between 8:00 a.m. and 12:30 p.m. We suggest a 60 minute presentation to allow ample time for questions and response. Your remarks, of course, can be informal and will be off the record.

If you have any questions, please contact me at (716) 275-3439. I will call your office in the next few weeks to learn of your decision and to follow-up with any administrative details. Thank you for your consideration.

Sincerely,

A handwritten signature in cursive script, reading "Richard G. Schiavo". The signature is written in dark ink and is positioned above the printed name and title.

Richard G. Schiavo
Assistant Dean for Executive Programs
and Professorial Lecturer

THE WHITE HOUSE
WASHINGTON

December 16, 1992

Dear Michael:

I have sent off the letter of recommendation that you requested to Michael Van Horn at the University of Rochester and hope that you are able to work out a mutually attractive situation. Rochester has, as I think you know, really excellent facilities for the kind of experimental research that you would have in mind but not anything like an adequate faculty to carry out exportation of those facilities.

With all best wishes,

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." being small and the last name "Bromley" being more prominent.

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

Dr. Michael S. Smith
Oak Ridge National Laboratory
Physics Division, MS-6371
Post Office Box 2008
Oak Ridge, Tennessee 37831

THE WHITE HOUSE
WASHINGTON

November 13, 1992

Dear Friedel:

Warmest congratulations on the award of the Max Planck Forschungs Prize that you will share with Achim Richter. This is a much deserved recognition and a very important one. I am only happy that I was able to play a small part in making it possible.

You asked how the election effects my position and the answer is simple: it eliminates my occupancy of that position because each President obviously will want to have an inner circle of advisors selected by himself with a firm overlap in terms of agenda and policies. The Bush Administration will continue functioning fully until January 20 at which time we turn over the responsibilities of government to the new Clinton-Gore Administration. I have been pleased to learn from various sources that, at least at present, there is no plan to make substantial changes in the structure of the office as we have put it together over the past four years, nor in any of the major programs that we have initiated. Indeed, the statement is made that the Clinton-Gore Administration intends to strengthen the activities of the OSTP and its associated councils. Only time will tell.

I am, of course, on leave from my endowed chair at Yale University but am not yet entirely clear as to whether I will be returning there or whether I will be taking up some other opportunities that are developing in the meantime.

Unfortunately, these developments mean that I no longer will have an official government role and therefore will probably not be traveling to South Africa next spring as I had planned to do and looked forward to doing.

Wherever I end up I know that our paths will continue to cross and in the meantime my warmest best wishes to both you and Sue.

Sincerely yours,



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

Professor Friedel Sellschop
Office of the Deputy Vice-Chancellor
University of the Witwatersrand
Private Bag 3
Wits 2050
Johannesburg
South Africa



Office of the Deputy Vice-Chancellor (Research)

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Private Bag 3, Wits 2050, South Africa

Telegrams 'Uniwits'

Fax: (011) 339-7740

Telephone (011) 716-4186

DATE : 921109

(To) FAX # : 091 - 202 - 395 3261

TO : Dr D Allan Bromley

FROM : Friedel Sellschop
Fax #: (+ 27)-(11)-339 7740
eMail : 099SELL@WITSVMA.WITS.AC.ZA

Number of pages: 1

Dear Allan,

I trust you are well.

You may recall that in regard to the Max Planck Society and the Deutsche Forschungsgemeinschaft jointly sponsored prize, the Max Planck Forschungs Prize, you kindly agreed that your name could be used as a reference. I do not know if they ever contacted you, but I am happy to tell you that I have just been informed telephonically that the Max Planck Forschungs prize has indeed been awarded to Achim Richter and myself ! If you were party to this as I indeed suspect, thank you very much indeed ! I feel truly honored and very appreciative, and dare I say it greatly stimulated to use accelerators and diamonds to every greater value (and beauty !) in physics.

We all followed the recent election campaign with great interest. How does the outcome affect your position ?

I was delighted to learn from Rein Arndt that you are to visit us next year — if possible let me have the dates as soon as you have finalized them so that I can diarize and make suggestions I look forward to seeing you on my home turf again very much indeed !

With kind regards,

A handwritten signature in cursive script, reading 'Friedel', followed by a horizontal line.

THE WHITE HOUSE

October 27, 92.

Dear Dennis:

From time to time it's nice to have friends! This appeared in the most recent issue of The Scientist and thought you might be interested.

Duan

COMMENTARY

Science And The Presidency: 1993

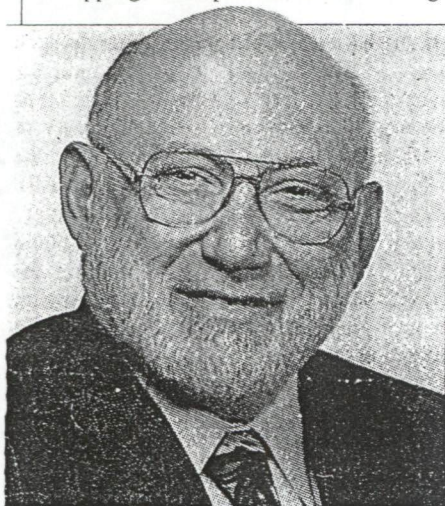
by Joshua Lederberg and Jesse Ausubel

Each four-year presidential election cycle frames an era of United States politics, including science in high politics.

The greenhouse effect, the *Valdez* oil spill, and biodiversity; AIDS, tuberculosis, and other emerging diseases; fetal tissue research, genome mapping, DNA patents, and DNA fingerprinting; chemical weapons and

unemployed Soviet bomb scientists; the space station and the supercollider: The past term has been a busy one for science in the White House.

The next term will be busy, too. Outstanding challenges include stopping the proliferation of high-tech weapons, rationalizing medical care systems, building a civilian technology agency, and effecting widespread improvements in secondary school education in math and science. Scientists will be particularly concerned about an informed sensitivity to the consequences of budget restrictions on investigator-initiated ("small") science.



JOSHUA LEDERBERG

Can the accomplishments and lessons of the past presidential term help set goals for the next?

The incumbent administration has given high priority to improving the processes of governmental decision-making about science, with notable and, it is hoped, durable accomplishments, among them:

- An articulate, accessible, vigorous presidential science adviser. Embedded in the complex political environment of the Oval Office, Allan Bromley has displayed command of many issues and worked constructively with diverse constituencies in academia and industry. He has energetically sought a balance in dealing with other White House units, the executive branch agencies, and the Congress; and he has immersed himself in budget battles when necessary. He has pioneered means for international cooperation in science by networking with science advisers to other governments and forming the Forum on Megascience in the Office of Economic Cooperation and Development.

- A strengthened White House Office of Science and Technology Policy (OSTP). With support from both the Congress and the president, OSTP has grown from a handful to a score of professionals, including extraordinarily well-qualified and respected associate directors.

- An active, high-level coordination of government programs of research. The Federal Coordinating Committee on Science, Engineering, and Technology (FCCSET) has successfully been reconstituted as the way the top R&D officials in all major government agencies work together. FCCSET has been notably effective in building better and more coherent government programs in global environmental change, supercomputing, data networking, and materials science.

Regardless of who wins the election, what should lead the science agenda during the presidential term that begins in 1993?

The main theme, in our opinion, is to take full advantage of the renovated capacity of the White House to obtain science advice, to analyze problems, and to apply scientific insights in government programs. For example:

- To direct the enhanced governmental decision-making apparatus for science to be as helpful in "science for policy" as in "policy for science." During the past four years, the moderating influence of the science adviser on the threats to the \$70 billion federal budget for research and development—the heart of federal policy for science—has been evident. The government's science and technology leadership should now exercise a constructive influence at the highest level on federal policies for environment, health, education, national security, and economic performance.

- To assemble a full, top-flight government science and technology team. Outstanding individuals must be recruited in a more timely way to the key posts calling for skills in science, engineering, and medicine. Sources such as John Trattner's *The Prune Book: The 60 Toughest Scientific and Technical Jobs in the Federal Government* (Lanham, Md., Madison Books, 1992) point out that dozens of the men and women whom the president appoints and the Senate confirms hold federal science and engineering leadership posts. But too often there has been "room at the top"—posts unfilled owing to lagging efforts to attract candidates, frustration and confusion over conflict-of-interest rules, and needlessly lengthy bureaucratic procedures. The science adviser, White House personnel office, Cabinet heads, and key members of Congress must work together to make sure the U.S. government is always putting a full, top-flight science and technology team on the field. The No. 1 priority for the president in 1993 is either the early reaffirmation of Bromley or the appointment and confirmation of his successor.

- To use the President's Council of Advisers in Science and Technology (PCAST) more effectively. This group, re-established three years ago, is a remarkable concentration of knowledge and experience from many fields and a unique resource for the president. A recently initiated PCAST study on American research universities and their relationship with the federal government, for example, is desperately needed if this critical and frayed partnership is to be repaired. Increasingly, PCAST should be challenged to advise on similarly difficult and important questions facing the next administration, such as how to convert technical military assets

in the U.S. economy to new purposes and how science and technology can be better applied to achieve both economic development and improved environmental quality.

Science and technology now pervade government. And the president had best be prepared.



JESSE AUSUBEL

Joshua Lederberg is co-chairman and Jesse Ausubel is director of studies of the Carnegie Commission on Science, Technology, and Government. In 1993, the commission will complete a five-year examination of organization and decision-making in science and technology in all branches of American government.

THE WHITE HOUSE
WASHINGTON

May 8, 1992

MEMORANDUM FOR DR. BROMLEY
FROM: KATHERINE L. SUPER *K.S.*
DEPUTY ASSISTANT TO THE PRESIDENT
FOR APPOINTMENTS AND SCHEDULING
SUBJECT ATTACHED SCHEDULE PROPOSAL

The attached request was declined due to time constraints on the President's schedule on the requested date.

I am forwarding a copy to you for your information and any further follow-up you deem appropriate.

Allan — we've not been doing departure photos of staff because of the large number of departures as well as the time limitations. This has been our policy since last summer.

Too bad!

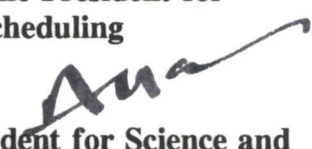
THE WHITE HOUSE
WASHINGTON

May 8, 1992

92 MAY 8 P12: 57

SCHEDULE PROPOSAL

TO: Kathy Super
Deputy Assistant to the President for
Appointments and Scheduling

FROM: D. Allan Bromley 
Assistant to the President for Science and
Technology and Director, OSTP

REQUEST: Presidential Photo Opportunity for Sara Bowden,
Senior Policy Analyst, OSTP

PURPOSE: That the President meet and have his picture taken with
Sara Bowden

BACKGROUND: Ms. Bowden has been a policy analyst in OSTP for over
three years, during which time she has performed an
outstanding job as a representative of the White House. She
leaves OSTP service on June 19, 1992.

DATE AND TIME: At the President's pleasure, before July 30, 1992

LOCATION: The Oval Office

PARTICIPANTS: The President, D. Allan Bromley and Sara Bowden

OUTLINE OF EVENT: Photo opportunity only

RECOMMENDED BY: D. Allan Bromley

Withdrawal/Redaction Sheet

(George Bush Library)

Document No. and Type	Subject/Title of Document	Date	Restriction	Class.
06. Letter	To: Aleksandr Skrinsky From: Allan Bromley Re: Visit to Institute of Nuclear Physics (1 pp.)	6/13/91	(b)(1)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: Correspondence Files
WHORM Cat.:
File Location: D. Allan Bromley Correspondence - J-S [3 of 4] [1992]

Date Closed:	2/5/2010	OA/ID Number:	62002-007
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]
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(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

THE WHITE HOUSE

October 27, 92

Dear Phil:

Many thanks for all your effort
in producing such an excellent
report on relations with Russia.
I'll be generous help when
we meet Dec. 8-9 with Sattyskor
etal.

Sincerely Allan

TYPE: INFORMATION

ORIGINATOR: 02

STATUS C

DOCUMENT NUMBER: 9203179

DIRECTORATE STATUS

FROM: SCHAMBRA, Philip E.: DEPARTMENT OF HEALTH AND HUMAN SERVICES

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 10/06/92

SUBJECT: HE IS FORWARDING A COPY OF THE FINAL REPORT ON U.S.
GOVERNMENT S&T RELATIONS WITH RUSSIA.

DIRECTORATE STAFF
ASSIGNED: ASSIGNED:

ACTION STAFF
REQUIRED: ACTION:

SENDER'S DUE DATE: STAFF DUE DATE
OSTP DUE DATE: DATE COMPLETED/DEPT:
DATE COMPLETED:

COPIES TO: D. Allan Bromley
FCCSET
INTERNATIONAL/POLICY

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

OSTP RECEIVED: 10/10/92
FILE: FCCSET

DEPT RECEIVED:

CENTRAL FILES:

THE WHITE HOUSE
WASHINGTON

October 9, 1992

Dear Mr. Schiavo:

Thank you for your letter of September 30 inviting me participate in the Executive Development Program's biennial Guest Speaker Series scheduled in March 1993 to be held in Washington, D.C.

With the understanding that it is always possible that Presidential scheduling may force a change in my plans, I would be delighted to accept your invitation.

As the time of the series draws closer, my staff will contact you to work out details for the event.

I am looking forward to the occasion.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "D. Allan Bromley". The signature is fluid and cursive, with a large, stylized "B" at the end.

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

Attachment

Mr. Richard G. Schiavo
Assistant Dean for Executive Programs
and Professorial Lecturer
Simon Graduate School of
Business Administration
University of Rochester
Rochester, New York 14627

"INVITATION FOR DR. BROMLEY"

TYPE: INVITATION-SPEECH

DOCUMENT NUMBER: 9202999

ORIGINATOR: 02

SPEECH: YES NO

FROM: SCHIAVO, Richard G.: UNIVERSITY OF ROCHESTER

DATE OF EVENT: 03/18/93 THRU: 03/19/93
TENTATIVE DATES:

LOCATION OF EVENT: WASHINGTON, DC

TIME OF EVENT: 8:00 A.M.-5:00 P.M.

SUBJECT: AN INVITATION TO PARTICIPATE IN THEIR EXECUTIVE
DEVELOPMENT PROGRAM'S BIENNIAL WASHINGTON D.C. GUEST
SPEAKER SERIES.

RSVP: 10/21/92

CONTACT PERSON:

CONTACT NUMBER: 716-275-3439

INVITATION ACCEPTED?

YES

NO

COPIES TO: INDUSTRIAL

REMARKS: 10.8.92 accepted to Maggie Maraz!

MN

DATE OF LETTER: 09/30/92

DATE RECEIVED: 10/05/92

FILE: P-INVITATION-SPEECH

September 30, 1992

Honorable D. Allan Bromley
Assistant to the President for Science and Technology
Old Executive Office Building
17th Street and Pennsylvania Avenue NW
Washington, DC 20506

Dear Honorable Bromley:

We would like to extend an invitation to you to participate in the Executive Development Program's biennial Washington, D.C. Guest Speaker Series. Your participation would be particularly significant because you are a University of Rochester alumnus.

The Executive Development Program is a rigorous two-year MBA program for experienced managers. The 113 individuals now pursuing this course of study hold top and middle management positions with more than 30 organizations in Western New York. Their nomination to participate in the program signals the expectation that they will advance to higher levels of management within their organization. Since the program's inception in 1966, many of our graduates have gone on to senior positions at American Express Company, Carrier Corporation, Chase Lincoln First Bank, Corning Incorporated, Eastman Kodak Company, General Electric, General Railway Signal, IBM, Xerox Corporation and other prominent firms in the Rochester, Buffalo and Syracuse areas.

The two-day Washington, D.C. Guest Speaker Series is an integral part of our executive MBA program. Our curriculum is designed to demonstrate how economic analysis can be used to structure managerial decisions. The insights gained from the Washington, D.C. seminar are intended to help students anticipate those changes in economic policy that will have a significant impact on their firms' operating environments. Specifically, our objectives are to provide:

- An overview of the public policy process and an understanding of how federal actions impact management decisions.
- An improved perspective of how management can incorporate public policy in business planning.
- A useful understanding of how government functions and the role of participants in the process including interest groups, trade associations and lobbyists.

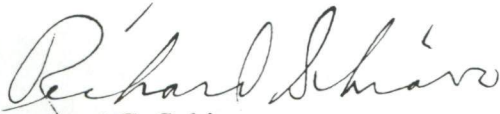
The 1993 Washington, D.C. Guest Speaker Series will be held at the Hyatt Regency—Capitol Hill. Your participation will add an important dimension to our event and will provide a valuable exposure to key individuals from a representative cross section of leading institutions and businesses in New York State. We would like you to consider speaking on either Thursday, March 18, 1993, between 8:00 a.m. and 5:00 p.m. or on Friday, March 19, 1993, between 8:00 a.m. and 12:30 p.m. We suggest a 60 minute

September 30, 1992
Page 2

Friday, March 19, 1993, between 8:00 a.m. and 12:30 p.m. We suggest a 60 minute presentation to allow ample time for questions and response. Your remarks, of course, can be informal and will be off the record.

If you have any questions, please contact me at (716) 275-3439. I will call your office in the next few weeks to learn of your decision and to follow-up with any administrative details. Thank you for your consideration.

Sincerely,

A handwritten signature in cursive script, reading "Richard G. Schiavo". The signature is fluid and elegant, with a prominent initial "R".

Richard G. Schiavo
Assistant Dean for Executive Programs
and Professorial Lecturer

THE WHITE HOUSE
WASHINGTON

September 30, 1992

Dear Jim:

Many thanks for sending me the information on the Russian plans for a solar sail prototype test. I will be watching with great interest and was pleased to see that Ivan Bekey is our contact with the Soviets in the NASA domain. He is an impressive individual and will certainly carry forward our best interests within the NASA frame of possibilities.

I have talked briefly with Dan Goldin about our discussion at the Bohemian Grove and, although he is certainly interested, he is so constrained by his budget and the necessity to keep so many existing programs aloft that he finds it very difficult to even consider picking up anything new.

Since I last contacted you I have read through the book you gave me with great interest. It is, as you have noted, a pity that we were unable to move forward with your original plans because it would certainly have been a fitting celebration of the 500th anniversary of Columbus' arrival in America.

With warmest best wishes,

Sincerely yours,



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

James W. Symington, Esquire
O'Connor & Hannan
Suite 800
1919 Pennsylvania Avenue, N.W.
Washington, D.C. 20006



National Aeronautics and
Space Administration

Washington, D.C.
20546

Office of the Administrator

June 17, 1992

The Honorable James W. Symington
Co-Chair
Columbus 500 Space Sail Foundation
O'Connor and Hannan
Suite 800
1919 Pennsylvania Avenue, NW
Washington, DC 20006-3483

Dear Mr. Symington:

Thank you for your letter of April 24, 1992, regarding the Columbus Space Sail Project and the Russian plan to launch a small sail from the MIR space station this fall.

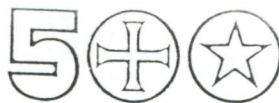
As you know, NASA has followed the planning for Space Sails and the Regatta with interest since its inception. Our principal point of contact has been Mr. Ivan Bekey, Special Assistant to the Deputy Administrator, who is familiar with the status of the Regatta and the Russian plans you mention.

Solar sails are among several innovative and highly promising techniques for future spacecraft propulsion, particularly for unmanned inner solar system applications. I welcome innovation and commend you and your team for the private sector initiative you have shown.

I recommend that you continue your discussions with Mr. Bekey, as well as with Mr. Richard Kline of our Office of Aeronautics and Space Technology, and keep them apprised of further developments.

Sincerely,

Daniel S. Goldin
Administrator



QUINCENTENARY
JUBILEE
COMMISSION

November 27, 1991

Mr. Nikolay N. Sevastianov
General Director
Space Regatta Consortium
Moscow, Russia

Dear Mr. Sevastianov:

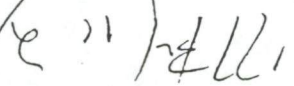
On behalf of the Columbus Quincentenary Commission, I wish to congratulate you and your colleagues of the Space Regatta Consortium for your grand initiative in the design, preparation and construction of a solar powered space sail to be launched in October, 1992. The Commission was advised three years ago by Dr. Klaus Heiss, Chairman of the Columbus 500 Space Sail Foundation, of plans to elicit worldwide competition in this imaginative manner of celebrating and projecting the spirit of navigation and discovery into the next dimension, space and the universe. The Commission received this report with enthusiasm, and encouraged the Foundation to proceed with such plans.

The purpose of this letter is to assure you that the Commission continues to give its wholehearted encouragement to the Space Sail project in general and in particular, welcomes the considerable progress made under your direction and that of your distinguished colleague, Vladimir S. Syromiatnikov.

The attached memorandum signed by you both represents our understanding of the events contemplated to occur on or about October 12, 1992. We note with satisfaction that the American coordinating entity will continue to be the Columbus 500 Space Sail Foundation. There could be no more appropriate way of marking the 500th anniversary of Columbus' voyage than by the launch and deployment of a sun-powered sail in space. If the first such sail were to fly under the banner of Russia's Space Regatta Consortium, it would be an historic milestone in mankind's eternal quest for new knowledge and understanding.

Again, on behalf of the members of the Columbus Quincentenary Commission, I convey to you heartiest congratulations and very best wishes for success.

Sincerely,


Frank J. Donatelli
Chairman

Energia will make an effort to seek Russian suppliers for Mir 2 hardware and components because of what Blagov claimed are "exaggerated prices" being charged by companies elsewhere in the Commonwealth of Independent States.

He noted that before the Soviet Union's breakup, Energia had in certain cases been asked by the centralized Communist government to allow outside subcontractors to work in the various republics. "We were told in the past to diversify our contracts, but today the prices charged outside Russia are skyrocketing, and there is not a corresponding increase in quality or capability," Blagov said.

"Since we no longer can have honest business arrangements with those people, we will go to a more closed circle of suppliers within Russia."

Mir 2 will have a Russian-supplied computer for station control that will be an updated version of the original com-

puter. Blagov said this resulted from the price hikes of Ukraine's Kiev Radio Factory, which is supplier of the station control computer used on Mir 1.

A new computer for Mir 1 has been ordered from the Kiev Radio Factory as a follow-on to the station's existing unit. The memory of the computer now on Mir 1 is reaching its storage capacity, and the new computer also will need to have the capability to be able to control the new thruster package installed atop Mir 1's Sofora mast.

PRICE HIKES

According to Blagov, the new computer is similar to the one now in use on Mir 1, but the price now charged by the Kiev Radio Factory has increased about 10 times.

"We paid 2.5 million rubles for the other computer on Mir 1, and the Ukrainian company is now charging 20 million rubles, [approximately \$117,600],

following their independence, the republics began demanding prices that are crazy—that have absolutely nothing to do with actual development and production costs."

Such price increases are complicating Energia's efforts to manage the financial aspects of its new and ongoing space programs.

"We're fed up with spending too much money [in other republics], and we will contract as much as possible with companies inside Russia," he said.

Mir 1 is 6½ years old, and Russian program officials said they believe the station will continue operating at least into 1995 without major problems.

The station was operating last week with five cosmonauts on board, including French crewman Michel Tognini. Tognini is scheduled to return to Earth Aug. 10 with mission commander Alexander S. Viktorenko and engineer Alexander Y. Kaleri, who were launched to Mir 1 in March. □

Russia Exploring Solar Sail Applications; Prototype Test Scheduled This Fall

KALININGRAD, RUSSIA

Russia will test a prototype solar sail this year as the first step in an ambitious program aimed at using such sails for spacecraft propulsion and other applications.

The prototype sail will be carried by a Progress cargo spacecraft scheduled for launch to the Mir 1 station in late October or early November.

After the Progress completes its scheduled resupply mission at Mir, cosmonauts will install a drum containing the solar sail on the docking mechanism of Progress. The resupply spacecraft will undock from Mir in November or December, be pointed away from the station and maneuvered to provide sufficient operating clearance.

Development of the sail was made possible through an industry grouping called the Space Regatta Consortium, which is led by the Energia Scientific and Industrial Enterprise. A total of 15 companies are involved in the consortium.

Nikolai N. Sevastianov, the Space Regatta Consortium's general director, said deployment of the sail will begin when Progress is a distance of 160 meters from Mir. The unfurling process will take three to five minutes, and should be completed when the Progress is a distance of 320 meters from the station.

Deployment of the sail will be monitored by the cosmonauts on board Mir. As part of the experimentation, there will

be an attempt to orient the sail in such a way to reflect sunlight toward a spot on the Earth.

The round, eight-segment sail is made of 5-micron-thick aluminized film, called PETF-OA. The film material was produced by the Joffe Physics and Technical Institute in St. Petersburg. Overall diam-

*Space Regatta Consortium
offered the possibility for
companies to place
advertising on the sail*

ter of the sail is 20 meters. Mass of the sail material is about 4.2 kg., and total mass of the unit—including sail, drum and associated hardware—is about 40 kg.

The sail has no frames or other support members. Its deployment from the drum will be performed by centrifugal force created by the rotation of the drum. The drum rotation also ensures the deployed sail retains its form once it is unfurled.

"Our goal is to keep down the sail's overall weight, and we think our approach of using centrifugal force is unique," Sevastianov said.

The drum will rotate at a roll rate of about 570 deg./sec. to provide sufficient

torque for the sail's deployment. Once the sail takes its form, the drum's roll rate will be about 84 deg./sec. to keep the unit deployed and to maintain its shape.

The sail will be evaluated in its deployed form on Progress for a period of about three days. It then will be separated from the spacecraft before the Progress makes a destructive reentry. The sail also will reenter the atmosphere and burn up.

The Space Regatta Consortium has offered the possibility for companies to place advertising on the sail. The advertising spots, offered at prices ranging from \$20,000 to \$100,000, will be visible on film Mir 1 cosmonauts will shoot for television rebroadcast to Earth.

Program managers envision a number of applications for solar sails in the future. One is as a means of propulsion for spacecraft.

Another possibility is to use huge sails as reflectors that will illuminate selected points on the Earth. "This could provide a sufficient level of light to allow work during nighttime hours on oil/gas drilling sites in northern Russia or at the scenes of major disasters, for example," Sevastianov said.

The sails could be deployed as large antenna reflectors for telecommunications relay missions. Some evaluations also have been made on whether such sails could be used to "sweep up" small debris in Earth orbit. □

244

O'CONNOR & HANNAN

ATTORNEYS AT LAW

SUITE 800
1919 PENNSYLVANIA AVENUE N.W.
WASHINGTON, D.C. 20006-3483

(202) 887-1400

TELEX 89-7420

FAX (202) 466-2198

JAMES W. SYMINGTON

MINNEAPOLIS OFFICE
3800 IDS CENTER
80 SOUTH EIGHTH STREET
MINNEAPOLIS, MN 55402-2254
(612) 341-3800
FAX (612) 343-1256

MADRID OFFICE
LA RINCONADA, 6, 3º
28023 MADRID, SPAIN
(011) 341 575-0944 & 357-2251
FAX (011) 341 577-0759

August 18, 1992

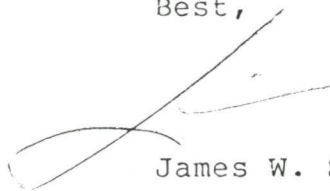
Dr. D. Allan Bromley
Assistant to the President
for Science and Technology
OEOB Room 358
17th & Pennsylvania Avenue, N.W.
Washington, D.C. 20500

Dear Allan:

This is the culmination of our efforts to get a sail into space in 1992. Note the Donatelli letter to Project Director Sevastianov.

Stay tuned.

Best,



James W. Symington

"Document Control"

TYPE: INFORMATION

DOCUMENT NUMBER: 9202498

ORIGINATOR: 02

STATUS C

DIRECTORATE STATUS

FROM: SYMINGTON, JAMES: O'CONNOR & HANNAN

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 08/18/92

SUBJECT: LETTER REGARDING A CULMINATION OF EFFORTS TO GET A
SAIL INTO SPACE IN 1992.

DIRECTORATE STAFF
ASSIGNED: ASSIGNED:

ACTION STAFF
REQUIRED: ACTION:

SENDER'S DUE DATE:
OSTP DUE DATE: STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT:

COPIES TO: PHYSICAL SCIENCES
D. Allan Bromley

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

OSTP RECEIVED: 08/27/92
FILE: P-PHYSCIAL SCIENCES

DEPT RECEIVED:

CENTRAL FILES:

THE WHITE HOUSE
WASHINGTON

October 6, 1992

Dear Steve:

I was delighted to get your letter of September 24 with its news about you, Anna and Maeve and to learn that you are more permanently settled at Los Alamos. I much regret that you and Anna have so great a distance between you and I hope that this can be a very temporary separation. Please do give her my best regards.

I have been travelling extensively and will certainly be continuing to do so until the election. What you tell me in your letter, however, is extremely tantalizing and I shall try to contact you by secure telephone so that we can discuss, at least in preliminary fashion, some of the issues involved.

I will be in touch with you shortly.

Sincerely yours,



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

Dr. Stephen M. Sterbenz
LAMPF MS H841
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Withdrawal/Redaction Sheet

(George Bush Library)

Document No. and Type	Subject/Title of Document	Date	Restriction	Class.
07. Letter	To: Allan Bromley From: Stephen Sterbenz Re: Work at LANL (2 pp.)	9/24/92	(b)(1)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: Correspondence Files
WHORM Cat.:
File Location: D. Allan Bromley Correspondence - J-S [3 of 4] [1992]

Date Closed:	2/5/2010	OA/ID Number:	62002-007
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)]

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

PRM. Removed as a personal record misfile.

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(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

THE WHITE HOUSE
WASHINGTON

September 25, 1992

Dear Pat:

Enclosed is an advance copy of a report soon to be released by OSTP in which the SBA is prominently mentioned. I appreciate all of the assistance you and your staff provided to Dr. Broz and his associates. There are a few minor corrections to be made but I will send over copies of the final report as soon as it arrives from the printer.

Best wishes,

Sincerely yours,



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

Enclosure

*You have done a
superb job in Hawaii!
AA*

The Honorable Patricia Saiki
Administrator
Small Business Administration
409 Third Street, SW
Washington, D.C. 20416



Executive Office of the President
Office of Science and Technology Policy

A Profile of Small High Technology Business in the United States

ADVANCE COPY

Joseph S. Broz
David C. Cranmer
Mark F. DeSantis

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Highlighted Results

- There are estimated to be approximately 75,000 to 100,000 small, high-technology firms in the U.S.
- There are estimated to be 1.75 million direct employees in small, high-tech firms; 10.8 million in high-tech enterprises overall.
- Small high-technology firms:
 - are much more innovative than larger firms with 1/2 of all major technological innovations deriving from small firms;
 - historically have created 2 to 3 times their proportional share of new jobs;
 - facilitate increased productivity in all businesses through innovative products that improve efficiency;
 - provide products that in themselves create or stimulate new industries; and
 - grow very rapidly (both employment and assets).
- Angel (informal, non-professional) investors and venture capitalists play complementary roles in financing small, high-technology businesses. Angel capital appears to be (by a large multiple) the largest source of risk seed and start-up capital for small businesses.
- Angels are not always wealthy - one study states that up to 1/3 of investors in small businesses earn under \$60,000/year.
- Angels are dominant investors in the seed-level phase of new companies; venture capitalists become important in later follow-on investments (the start-up or later phases). Equity-oriented SBIC's and SBIR funding pick-up in the start-up phases.

Executive Summary

Small high technology business is one of the most important, yet least understood, elements of our nation's economic foundation. While the major contributions of small business to the economy and to improving our way of life are often self-evident, the contributions of small businesses engaged in the development of high technology products and services are sometimes less clear. This report attempts to expand our understanding and appreciation of the small high technology business sector of the economy. It is hoped this report will provide greater insight into this issue and serve as the basis for future action by the Administration on matters affecting the formation and development of small, technology-based enterprises.

This study estimates that roughly one and three-quarters of a million employees work in approximately 75,000 to 100,000 small, high technology firms throughout the United States.¹ A significantly larger number of individuals and businesses are either suppliers or customers to these businesses. While the small high technology business sector represents only a few percent of the total number of small businesses in the United States, and only 3% to 4% of the total small business sector work force, the economic, technological, and social impact of these technically based firms is profound. Many of the technology products in use in our daily lives — including the personal computer used to create this manuscript — were initially derived from a small high technology business.

The availability and reliability of information on small high technology firms is poor when compared to information on other sectors of the U.S. economy, and better information is critical if this economic sector is to be fully understood. Nevertheless, the data gathered for this study do provide an approximate profile of small high technology businesses in the United States. It is clear from this profile that these firms have a number of unique characteristics and needs, and information about these needs should be made readily available to public policy makers.

The first, and perhaps most striking, finding of this study is that small high technology businesses are a significant and continuous source of product and process innovation. A large and growing body of research indicates that new, small firms are a major force for technological change in our economy by innovating, in general, more efficiently than their large-

er counterparts. Equally important, several studies, in general,²³ indicate that small firms have more new products per dollar of sales, and a higher percentage of total sales generated by new products. Small firms consistently obtain more patents per research and development (R&D) dollar than larger firms, and account for half of all major technical innovations in the United States.

Secondly, small high-tech firms are dynamic in the creation of new jobs. In the decade between 1976 and 1986, employment growth in the high-tech sector was the highest of any sector of the economy. Small high-growth, high technology firms contributed over one-third of all new jobs in the high-tech sector, and firms with fewer than 20 employees accounted for fully half of this growth. In total, high technology companies contributed nearly *four* times their expected share of new jobs, and the trend continues today.^{4,5} Once dominant basic U.S. industries, such as steel, autos, and consumer electronics, have all lost significant market share in the last five years. For example, from January 1989 to September 1991, durable goods manufacturers lost 8.3% in total employment. In contrast, during the same period, small and mid-sized technology manufacturers *increased* employment by 10.6%.⁶

Lastly, a few small high technology businesses will one day become some of our nation's largest corporations; Apple, Hewlett-Packard, and others were established, in many cases, based on innovative products inspired by the company's founders. Small high technology businesses are the seeds for our future, as evidenced by the fact that almost half of the largest industrial firms in the U.S. are now replaced by new "upstarts" every five years.⁷ Of the 1400 largest high-technology firms in the United States, 41% have been created since 1980, 31% since 1983, and 14% since 1987.

The importance of small high-tech firms to the U.S. economy cannot be overstated; competition in the global economy will inevitably mean that many of the most successful technology firms will eventually succumb to competitive pressure, and as a consequence, a viable pool of smaller firms must be available to replace these firms with newer, updated technology products. The small business sector, and the high technology sector in particular, is a major component of the nation's engine for technological change,⁸ and small high-tech firms are engaged in many of the critical technology areas that are key to U.S. competitiveness. One study reported that small high-tech businesses account for half of all major U.S. innovations, and further, that the innovative technology derived from these firms is more than twice as likely to be licensed, purchased, or converted to economically viable products than innovations from large high-tech firms.⁹

The Importance of Small High-Technology Firms

- *Innovation* – Small high-technology firms are much more innovative and produce more patents per employee and R&D dollar than do larger firms (2 to 8 times). One-half of all innovations derive from small firms.
- *Rapid Growth* – Small high-technology firms contributed at least 2-3 times their proportionate share of new jobs as compared to other sectors of the economy in the period 1986-1991 and grow rapidly.
- *Important Products* – High technology products are used throughout the entire economy and generate a "leverage effect", facilitating increased productivity and stimulating the formation of entirely new businesses. Two-thirds of venture-financed, small high technology firms are involved with Federally identified "critical technologies" that are key to U. S. competitiveness.

Financing Small High-Tech Ventures

Despite these apparent advantages, a good deal of economic risk is associated with new, small technology-based firms, and perhaps more risk than is generally associated with other types of entrepreneurial activity. As a result, traditional financial institutions tend to shy away from investing in these businesses. In response, a separate, high technology finance market has taken shape over the last two decades that includes private individual investors (or "angels"), professional venture capitalists, initial public offerings of stock ("IPO's"), and proprietorship capital. The available information on this market shows that:

- Informal ("angel") investors and venture capital funds play complementary roles in the financing of new technology-based firms.¹⁰ Angels are important in the seed-level phases of new companies, and venture capitalists generally become important in later follow-on investments, although some venture capitalists still engage and specialize in seed-level investments.
- A significant number of small high-tech start-ups in the U.S. currently have great difficulty obtaining, or lack altogether, sufficient seed and start-up capital.¹¹

In comparing the two major seed-level financing sources, we note that, for small businesses in general, the total available informal "angel" investment is *three to ten times* the total amount of professional venture capital.¹² A similar ratio is likely to hold true for the high technology small business investment market as well.¹³

The data indicate that informal angel investors in small high-tech businesses are *not* exclusively from the upper-class; in fact one-third of such investors earn under \$60,000 annually and have a net worth of less than \$500,000. The preponderance of informal capital over venture capital demonstrates the close link between high technology financing and macro-economic factors such as tax policies (low capital gains tax and personal savings incentives) and the international performance of the U.S. economy.

While some categories of high-tech companies (i.e., biotechnology concerns) are still successful in attracting professional venture investment even at the seed and start-up levels, the total disbursement of venture money has declined by nearly 80% from 1987 to the present. Only new firms that are relatively well-established and offer expected rates of return well above average have adequate access to funding — a trend likely to continue into the immediate future.¹⁴ At the very least, this trend has the effect of drawing funding away from more mundane, but technologically important, business opportunities,¹⁵ and at its worst, is stifling technological innovation in the United States.

In addition to the availability of financing, this study has endeavored to broadly characterize those factors that can either foster or impede the growth of a small high-tech firm. Internal factors such as poor business plans and incompetent management are cited as the most common reasons for business failures and are coincidentally, the most common reasons for venture capitalists rejecting a specific investment.¹⁶ External factors such as the regulatory environment for product approval and public underwriting, as well as the macro-economic climate, including interest rates and unemployment, all dramatically affect the success rate of small firms.

Related to financing impediments are trends regarding foreign investment and foreign acquisition of small, high-tech firms. General estimates can be made from data on foreign direct investment and outlays made by U.S. affiliates of foreign-owned firms. The Japanese have been the most active investors in the last four years, having acquired 399 U.S. high-tech companies during this period — the majority of firms are presumably small from the data available for this analysis. Computer firms, followed by semiconductor firms, were the most common targets for acquisition. Recently, the rate of foreign acquisition activity has slowed in the United States reflecting, perhaps, a downturn in the Japanese economy. The number of venture-backed firms acquired has fallen dramatically — a 75% decrease last year.

Finally, the effectiveness of incubators and research science parks in fostering the entrepreneurial growth of small high-tech firms is examined. Currently, incubators do not play a major role in the development of U.S.-based small high-tech firms, as only some 3,600 businesses are involved in them, however the future looks promising, particularly when viewed

Conclusions

against a purported better-than-average success rate for incubator graduates and the projected growth rate of incubator facilities. Research parks play an only slightly larger role in the small, high-tech business picture at present, but are also likely to continue to grow in participation. This study encourages the establishment of efficient enterprise centers that can improve the chances of success for small high-tech firms by providing valuable services, advice and infrastructure support.

Small high technology businesses occupy a unique and critical position in our economy. It is estimated that there are 75,000 to 100,000 small high-tech firms in the U.S. They are a predominant and continuous source of technology, product and process innovation and are dynamic in the creation of jobs. Many of our nation's largest technology corporations were founded on a single innovative product as small businesses, and not established as subsidiaries of larger companies. Many small high-tech firms are concerned with technologies that are critical to maintaining U.S. competitiveness.

Financing new technology-based firms appears to be problematic at present; both informal sources of funding and venture capital currently appear to be in short supply as a consequence of market correction factors and the extreme sensitivity of the informal investment market to unfavorable tax and macro-economic factors. While some companies, (especially in biotechnology) are still very successful in attracting professional venture investment, the total pool of venture money has sharply declined. Only those firms with the highest potential return, and generally at a more mature phase, can consistently attract financing according to the data reviewed.

A number of broadly-defined factors determine the ultimate success of an entrepreneurial high-tech venture. Internal factors, such as management issues, as well as exogenous factors, such as the macroeconomic environment, appear to be the most important determinants. The rate of success can apparently be enhanced by improving the overall nurturing and management assistance a firm receives through the initial critical phases of development. Incubators and science research parks may to enhance the rate of company success by shared critical services and infrastructure improvement. The development of incubators and research parks should be encouraged.

Foreign acquisition of U.S. firms is currently dominated by the Japanese, particularly in the area of computer-related businesses and semiconductor firms. A recent slowdown in acquisition rates probably reflects the economic downturn in Japan but the rate is still significantly above the 1988 levels when the upward trend began.

Overall Benefits to the Economy From Small High Technology Companies

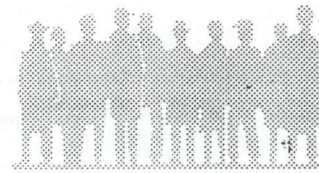
The economic benefits from small, venture-backed, high-technology companies were summarized by a 1991 NVCA* survey.

The companies surveyed exhibited the following average characteristics (between 1986 and 1991):

**Compound Annual
Growth Rate**
Years 1-6

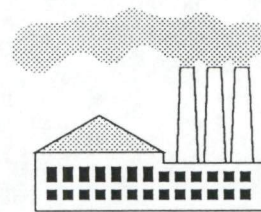
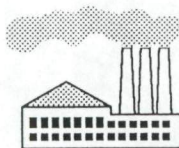
27%

Jobs



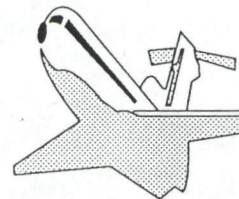
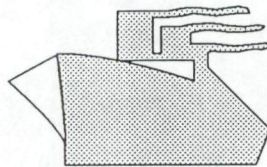
23%

Assets



136%

Exports



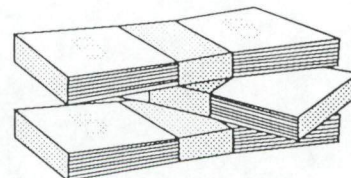
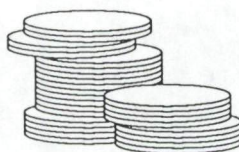
18%

R&D



233%

Taxes



*National Venture Capital Association Second Annual Economic Impact of Venture Capital Study, Coopers & Lybrand and Venture Economics, 1991.

Introduction

"The advancement of agriculture, commerce, and manufactures by all proper means will not, I trust, need recommendation; but I can not forbear intimating to you the expediency of giving effectual encouragement as well to the introduction of new and useful inventions from abroad as to the exertions of skill and genius in producing them at home."

President
George Washington,
First Annual Message to
Congress

January 8, 1790

The role of small business in science and technology continues to draw attention as concerns about U.S. competitiveness grow. Small high technology businesses — firms with fewer than 500 employees whose principal focus is the development of technology-based products — typically have a number of economically attractive attributes. Small high technology businesses innovate faster and more frequently than virtually any other type of business, regardless of size or economic sector. Also, these firms enjoy exceptional rates of growth, both in sales and in employment. Their size allows small high technology firms to respond quickly to rapidly changing market demands. In turn, this flexibility allows for the formation of formal and, more often, informal entrepreneurial networks, and as a consequence, small high technology businesses have an impact on the national and international economy that their diminutive size belies.

This report characterizes small high technology businesses and attempts to describe their impact on the U.S. economy. The goal of this report is to place small high technology business in the context of the U.S. small business sector, and to present recent national economic trends in the high technology sector.

This report also aims to show the full economic and technological contribution of the small high technology sector to our nation's competitiveness. Issues critical to the continued success of the small business sector, and the small high technology sector in particular, are discussed. Major impediments to the formation, growth, and development of small technically-based businesses are also outlined and described. Indications of appropriate measures to relieve these impeding factors are provided.

Objectives of the High Technology Business Profile

1. To characterize small, high technology firms within various industries in the U. S. (with regard to the number of firms, type, and employment).
2. To establish the importance of the small, high technology sector to the U. S. economy and its role in international competitiveness.
3. To identify major financing and operating impediments to the formation and growth of small high technology businesses.

Characterizing Small High Technology Businesses

Availability of Information and Working Definitions

What is a Small High Technology Business?

- "Small" means fewer than 500 employees.
- "High Technology" means specific technical products and/or services whose industries are generally defined by a series of Standard Industrial Classification (SIC) codes. Formal definitions exist for each of the databases used in this analysis.
- A "business" is defined as the top most firm in a group of establishments thereby eliminating small subsidiaries of larger companies from consideration in the study.

Defining with some degree of accuracy the economic, organizational and technical characteristics of small high technology firms is critical to understanding this unique sector of our economy. While there is a fair amount of anecdotal information surrounding high technology business, most of the available empirical information lacks sufficient detail or clarity for useful analysis. Inconsistencies in terminology across data sources, as well as differences in data collection methodology, further complicate the sifting and ordering of information.

To increase accuracy, three primary sources were used: the U.S. Small Business Administration, and two private database services: Cognetics, Inc. and CorpTech, Inc.¹⁷ An effort was made to corroborate these sources with a separate state-by-state survey (conducted in-house by the Office of Science and Technology Policy (OSTP)). The largest discrepancies found in this comparison were generally rectified quite easily by the originators of the information through definition changes. For example, while the number of small high technology firms varied from 50,000 to 90,000, a comparison of the sources demonstrated that this reflected differences in the definitions of "small" and "high technology" used in each.

This report defines small high technology businesses as follows:

- A small business is a firm with less than 500 employees.
- A high technology business is defined by the various database sources as follows:
 - (a) The Small Business Administration employs a series of four-digit SIC codes as shown in Table 1 to establish the high technology industry sectors.
 - (b) The CorpTech, Inc. database derives from a detailed partition of over 3000 product codes that specify one or more product or service type for each technology.
- For this study, the Cognetics, Inc. database was filtered through an alternate set of SIC codes that is only slightly different from that presented in Table 1.
- The necessary distinctions regarding a firm and an establishment have been made. A firm is the parent of a group of establishments, and an establishment may belong to only *one* firm. An establishment is an operating entity that may be, but is not necessarily, a subsidiary of a larger company. However, this document will use the terms "business" and "firm" equivalently and interchangeably.

The above definitions for a small high technology business were used uniformly throughout the analysis presented herein, and in the cited studies unless otherwise noted.

Table 1

Standard Industrial Classification Codes and Industries Used in Office of Technology Assessment Definition of High Technology^{18,19}

1311	Crude petroleum and natural gas	3574	Calculating and accounting equipment
1321	Natural gas liquids	3576	Scales and balances
2812	Alkalies and chlorine	3579	Office machines, nec
2813	Industrial gases	3622	Industrial controls
2816	Inorganic pigments	3623	Welding apparatus, electric
2821	Plastics materials and synthetic resins	3624	Carbon and graphite products
2822	Synthetic rubber	3629	Electrical industrial apparatus, nec
2823	Cellulosic man-made fibers	3651	Radio and TV receiving sets
2824	Organic fibers, non-cellulosic	3652	Phonograph records
2831	Biological products	3661	Telephone and telegraph apparatus
2833	Medicinal chemicals and botanical products	3662	Radio and TV communication equipment
2834	Pharmaceutical preparations	3671	Electron tubes, receiving except cathode rays
2861	Gum and wood chemicals	3672	Cathode ray television picture tubes
2865	Cyclic crudes and intermediates	3673	Electron tubes, transmitting
2891	Adhesives and sealants	3674	Semiconductors and related devices
2892	Explosives	3675	Electronic capacitors
2893	Printing ink	3676	Electronic resistors
2895	Carbon black	3677	Electronic coils and transformers
2899	Chemical preparations, nec	3678	Electronic connectors
2911	Petroleum refining	3679	Electronic components, nec
3482	Small arms ammunition	3721	Aircraft
3483	Ammunition except for small arms	3724	Aircraft engines and engine parts
3484	Small arms	3728	Aircraft equipment, nec
3489	Ordnance and accessories, nec	3761	Guided missiles and space vehicles
3511	Turbines and turbine generator set units	3764	Space propulsion units and parts
3519	Internal combustion engines	3769	Space vehicle equipment, nec
3531	Construction machinery	3811	Engineering, scientific, research instruments
3532	Mining machinery	3822	Environmental controls
3533	Oil field machinery	3823	Process control instruments
3534	Elevators and moving stairways	3824	Fluid meters and counting devices
3535	Conveyors and conveying equipment	3829	Miscellaneous measuring/controlling devices
3536	Hoists, cranes, and monorail systems	3832	Optical instruments and lenses
3537	Industrial trucks, tractors, and trailers	3841	Surgical and medical instruments
3561	Pumps and pumping equipment	3842	Surgical appliances and supplies
3562	Ball and roller bearings	3843	Dental equipment and supplies
3563	Air and gas compressors	3851	Ophthalmic goods
3564	Blowers and fans	3861	Photographic equipment and supplies
3565	Industrial patterns	3873	Watches, clocks, and parts
3566	Speed changers, drives, and gears	7372	Computer programming and software
3567	Industrial furnaces and ovens	7374	Data processing services
3568	Power transmission equipment	7379	Computer services, nec
3569	General industrial machinery	7391	Research and development laboratories
3572	Typewriters	7397	Commercial testing laboratories
3573	Electronic computing equipment	8922	Noncommercial educational and research organizations

nec = not elsewhere classified

Sources: (a) William K. Scheier, "The Population and Birth Rates of High Technology Firms, 1976-1986", U.S. Small Business Administration, March 1989.

(b) C. Armington, C. Harris, and M. Odle, "Formation and Growth in High-Technology Firms: A Regional Assessment", U.S. Office of Technology Assessment, contained in *Technology, Innovation and Regional Economic Development*, Congress of the United States, July 1984.

Other Considerations of This Analysis

The difficulty in assessing the impact of small high technology businesses extends beyond the availability of information. To reiterate, this report focuses on firms that perform research and development (R&D) and on firms that manufacture products with a high concentration of sophisticated technology. However, exclusive focus on the developers of high technology, by necessity, excludes the equally important — and frequently not so obvious — users and implementors of advanced technology.

For example, a firm producing a product such as chocolate chip cookies would generally not be considered a high technology company, despite the fact that this company may use one of the most sophisticated and advanced decision support systems in existence that employs satellite-linked inventory control. Similar examples of firms employing high-technology, but not developing technology, are readily available.

The difficulty in distinguishing high technology companies from other types of businesses is further complicated by the problem of defining just what should be considered high technology. Frequently, physical objects such as microprocessors or cellular phones come to mind. However, high technology can also mean sophisticated processes and knowledge, as well as material outputs. Very little research currently exists examining this aspect of small high technology business development.

Comparing anecdotal insights with available statistical information reveals yet another level of complexity in the available information. This involves the issue of self-reporting by businesses on their high technology-related activities. Research and development budgets are frequently cited as indicative of the level of technological development being performed in a particular business; however, many large and small high technology organizations frequently understate the actual amount of high technology-related research and development performed.

Further, activity levels based on R&D budgets fail to take into account the full level of managerial and individual commitment of a firm's employees. For example, many small businesses fail to report a formal research and development expenditure even though the majority of the effort of the firm's employees is dedicated to technology development! This is because the *entire* budget for the firm is effectively devoted to R&D, not just a division of the firm. Since no *separate* R&D budget exists, "zero" is often the reported budget for the "R&D department" of such firms which is completely misleading as an indicator of the level of research activity. Another, more significant case involves the use of surveys to determine dollar levels of R&D. While such surveys collect the dollar value of formal R&D in a company, they fail to pick up the "informal" R&D which happens much more in small firms than in large ones.

Such difficulties in data acquisition and management were encountered in the development of this report and serve to underscore the need for increased information management in the Federal government for this important sector of the economy.

National Trends in Small High-Tech Businesses

Estimates of Sector Size

Approximately 75,000 to 100,000 of the 20 million small businesses in the United States could be considered, by our definition, as small high technology businesses. These firms have between 1.5 and 2.0 million employees by our estimates.²⁰ As Table 2 shows, small high technology businesses represent between 89% and 98% of all high technology businesses, depending on the source of information, and approximately 15% of the total high technology work force. The remaining 85% of high technology employees work for large high technology business organizations. This is indicative of the fact that most large high technology businesses are manufacturers that employ a large proportion of skilled labor.

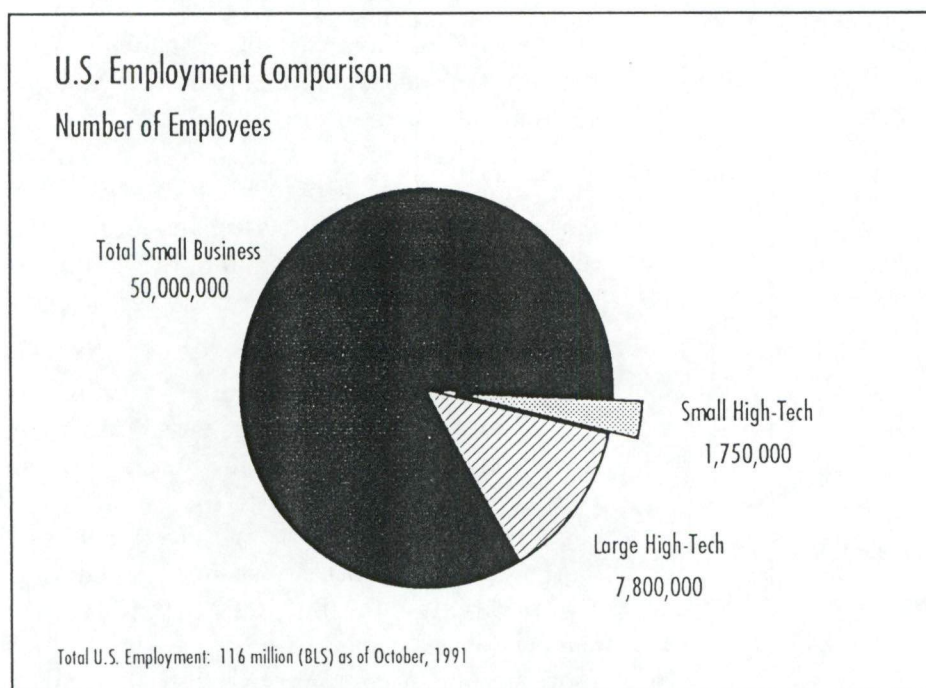


Table 2

Number of Businesses and Employment Figures for
Small Business, Small High Technology Business
and All High Technology Business

	Cognetics (1991)	CorpTech (1991)	U.S. Small Business Administration (1988)
Small Business			
Total Number of Businesses ²¹	7,000,000	Not Available ²²	6,200,000
Total Employment	69,000,000	Not Available	50,000,000
High Technology Business²³			
Total Number of Businesses	51,000	57,000	92,000
Total Employment	9,300,000	10,800,000	8,800,000
Small High Technology Business			
Total Number of Businesses	49,000	51,000	90,000
Total Employment	1,500,000	1,900,000	1,800,000

NOTE Total number of businesses reported by the SBA includes 4.3 million corporations and over 1.9 million partnerships. Additionally, there are 13.8 million sole proprietorships (not counted in these figures) making a total of 20 million small businesses in the U.S.

Geographically, new high-tech companies are highly concentrated with 65% of these businesses located in 10 states. When ranked by venture capital disbursed in 1991, the top states are indicated in Table 3.

It is clear that California leads in the number of new small high-tech businesses — a fact further shown by data in Figure 1 published for the technology fields examined.²⁴

Table 3

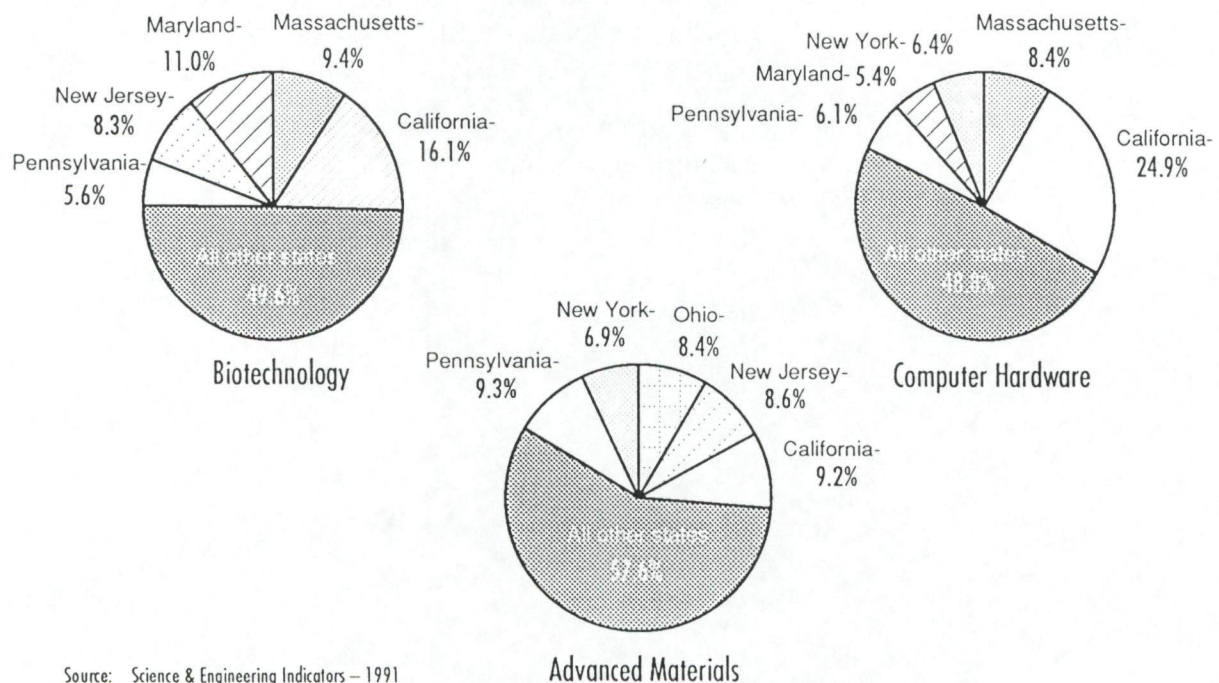
Top Ten States Receiving Venture Capital Disbursements in 1991

Rank	State	Dollars Invested (\$ millions)
1	California	661
2	Massachusetts	155
3	Texas	91
4	Arizona	47
5	New Jersey	36
6	Maryland	34
7	Minnesota	64
8	Colorado	32
9	Pennsylvania	28
10	Oregon	26

Source: Venture Economics Publishing Co., 1992.

Figure 1

U.S. Locations of Companies Active in Three Technology Fields



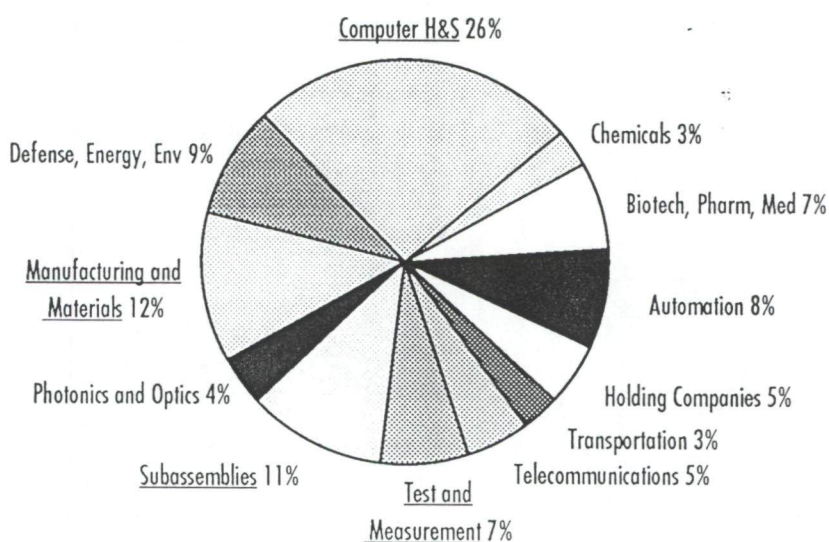
Source: Science & Engineering Indicators - 1991

Industry Groupings

Small high technology businesses include a broad range of industries, as indicated in Figure 2. The largest number of firms are found in two industry groupings: computer hardware and software, and electronic subassemblies, test equipment, and components; however, this is dynamic and changes rapidly. Interestingly, these businesses bridge the spectrum of physical and biological sciences, and include those technologies identified as critical or emerging in a number of recent reports.²⁵

Figure 2

What Technology Areas Constitute Small High Technology Businesses?



Source: CorpTech, Inc., 1991. (May be strongly database-dependent and subject to some systematic error, however, general investment trends are probably well indicated.)

Patterns of Growth in Small High-Tech Firms

This report employed several methods for assessing prior growth patterns and predicting future trends for small high technology businesses. A recent report examined the birth and death rates for all high technology businesses from 1976 to 1986 and concluded that the number of new high technology business formations will continue to exceed failures for the foreseeable future leading to a net growth rate of 0.5% per month, or 6% per annum.²⁷ This trend is exemplified in Table 5, which summarizes the findings of that report. The second column in the bottom half of that table is the number of closures for both small and large high-tech businesses during the period 1976-1980. Since the study compared the 1980 file to the 1976 file, only the closures of firms that existed in 1976 are represented. A firm that opened after 1976 but closed before 1980 would not

appear in either the closures or the start-ups data on Table 5, which the author attempted to correct by assuming a factor for such events. The ratio of firms that did not close, to the original number, is the four-year survival rate defined by Scheirer in this study. Under the assumptions stated and outlined by Scheirer, his analysis estimates the annual survival rate to be 95% with firms half-life of 12 years. This differs from the 40% survival rate over six years for all small businesses quoted by Kirchhoff and Phillips.²⁸ The data are too sketchy to determine which figure is closest to the actual survival rate, which is likely to vary as a function of time, and certainly differs between the small high-tech sector and the small business sector in general.

From Table 4, we also find that the largest growth occurred in firms having fewer than 100 employees. Smaller growth rates were more characteristic of firms of over 1000 employees. As a result, the vast majority of new firms formed within the examined decade are small businesses employing fewer than 100 employees. The highest rates of growth in new business formation are also found in small businesses.

Table 4

Number of High Technology Firms by
Employment Size in 1976 and 1986²⁹

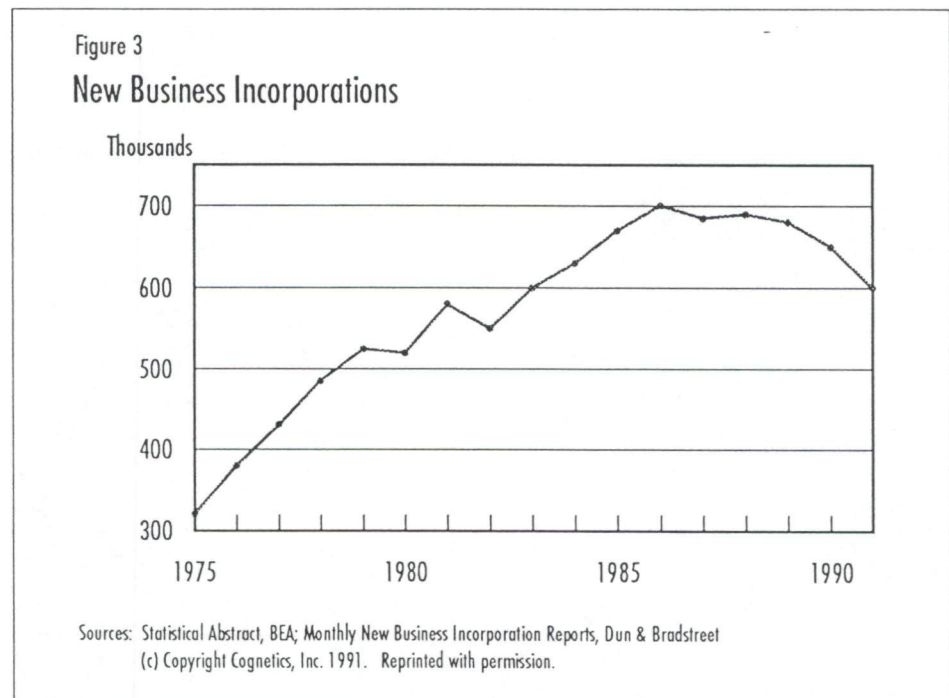
Employment Size	Number of Businesses		Annual Growth Rate (percent)
	1976	1986	
1-99	50,245	83,550	5.22%
100-499	2,554	3,789	4.02%
500-999	292	459	4.63%
1,000-9,999	432	520	1.87%
10,000 and up	<u>133</u>	<u>135</u>	<u>0.15%</u>
TOTALS	53,656	88,453	5.13%

Type of Business	Number in 1976	1976-80		Annual Rates	
		Closures	Start-ups	Survival	Birth
Small Businesses	52,799	10,668	20,719	95%	12%
Large Businesses	857	50	46	99%	1%

Source: Scheirer, U.S. Small Business Administration, Ibid.

More recent figures regarding replacement rates for all businesses show a continuation of prior trends.³⁰ The percentage of high technology businesses compared to all businesses has been growing, constituting 1.1% in the period from 1981 to 1983, 1.25% in the period from 1984 to 1987, and approximately 1.5% in the period from 1988 to the present. Growth is also seen for small high technology businesses compared to all small businesses, as well as for all high technology businesses compared to all U.S. businesses.

In Figure 3, we see that in the period from 1985 to 1989, the number of companies incorporated, on average, dropped sharply compared to the preceding five year period for all industry groupings. The causes of this precipitous decline are not clear — venture capital market corrections and changes in the capital gains tax may have had some effect on the level of new incorporations.



Growth in the emergence of new incorporations is a critical indicator of the health of the small business sector. Of all large high technology firms (those with over 500 employees), 41% have been created since 1980, 31% since 1983 and 14% since 1987.³¹ These data show that high technology firms are much more likely to develop quickly than high-growth firms in general.

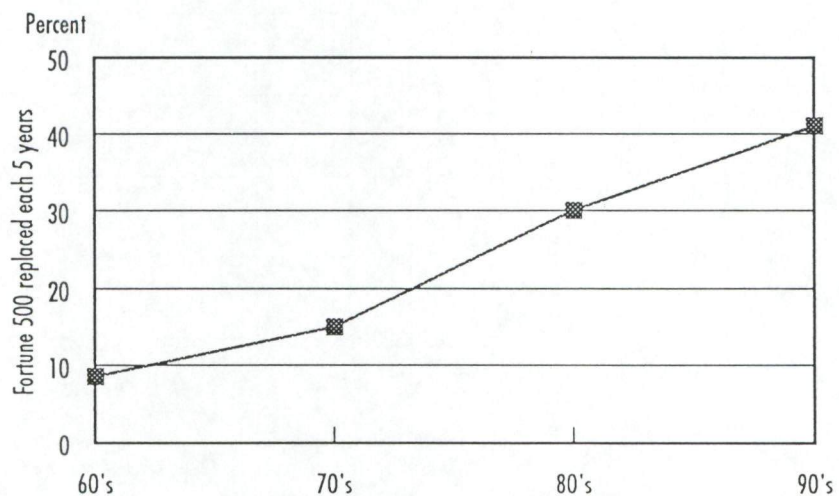
Figure 4 plots the percent of the *Fortune 500* that are replaced by new "upstarts" every five years starting in the 1960's.³² As the Figure shows, the replacement rate was approximately 8% in the 1960's, jumped to 30% in the 1980's and has approached 40% at the beginning of this decade. Almost

half of the largest industrial firms in the U.S. are now replaced by new firms every five years. For high technology businesses, approximately 25% of the established firms are replaced every five years.

High technology businesses are growing much faster than all U.S. businesses, when measured in terms of a "growth index" that combines absolute growth with the percentage change in employment. The percentage of high-tech companies exhibiting very high growth (defined as a growth index greater than 20% per year) is much greater than the percentage of all U.S. companies exhibiting very high growth (9% of high-tech companies versus 2% of all U.S. companies).³³ While the percentage of business closures is about the same for high technology businesses and all U.S. businesses over the period from 1986 to 1991 (23% and 21%, respectively), the percentage of high technology businesses that are start-ups (15%) is greater than the percentage of all businesses that are start-ups (9%).

Figure 4

Replacement Rate of Companies in the Fortune 500



(c) Copyright Cognetics, Inc. 1991. Reprinted with permission.

One method for developing some insight into future growth of the small, high-tech segment of the U.S. economy is to examine the ratio of size to age as a measure of a firm's relative growth. This "precociousness index" demonstrates high technology businesses are more precocious or grow at a relatively high rate compared to all U.S. businesses. The data reviewed show that small high technology firms historically have demonstrated the potential to grow faster than firms in all other U.S. business sectors, both large and small.

Small Business Sales Volume

The average high technology business has a somewhat larger sales volume than the average non-technically-based business.³⁴ Specifically, 18% of high technology businesses report annual sales of over \$5 million, while only 4% of all U.S. businesses report sales above \$5 million. In addition, 6% of high technology firms report annual sales of over \$20 million. The same ratios remain for the total sales of small high technology businesses as compared to all U.S. *small* business.

The importance of the small, high-tech sector to the U.S. economy is underscored by their performance measures as shown in Table 5. Noting the sales volume per employee figures, employment growth rates, and number of jobs created, we can see that computer hardware and software remain predominant segments of the small high-tech business sector, but interestingly, the computer software sector has the lowest percentage of exporting firms. All computer-related small companies, including software, added about 250,000 new jobs during 1990.

Table 5
Performance Measures for Newly Formed Companies Active
in Certain High-Tech Fields: 1990³⁵

Field	Employment growth rate during past year	Number of jobs created during past year	Annual sales per employee	Percentage of companies exporting over 10 percent of total sales
Automation	12.6	58,471	\$126,330	40.7
Biotechnology	10.6	16,468	86,063	43.9
Computer hardware	14.5	148,304	172,752	42.9
Computer software	13.9	103,479	107,992	32.1
Advanced materials	5.8	32,452	155,198	44.4
Photonics and optics	8.4	27,654	103,592	36.8
Telecommunications	12.7	61,280	117,679	43.9

Source: Derived from the CorpTech Database, published in *Science and Engineering Indicators*, 1991.

Foreign Acquisition of High Technology Firms

(Both Large and Small Businesses)

- Foreign direct investment for acquisitions rose steadily and sharply from 1985 to 1989.^{1/}
- The Japanese are by far the largest acquirer of U.S. high-technology firms. 65% of all high technology acquisitions in 1991 went to Japanese investors.^{2/}
- Computer firms are the largest acquisition targets, followed by those including semiconductors and telecommunications.
- Over 1/3 of acquisitions occur in the first four years, and 60% before the firms are 10 years old.^{3/}

1/ Fahim-Nader, Bureau of Economic Analysis, U. S. Department of Commerce, 1991.

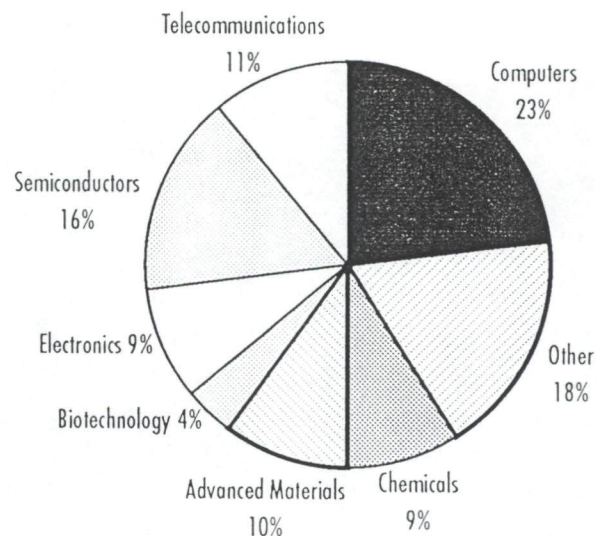
2/ Economic Strategy Institute, High Technology Acquisitions, Summary Charts, May 1992.

3/ Cognetics Inc., 1991.

Foreign Acquisition of High Technology Businesses in the U.S.

The total outlays of foreign direct investment to acquire U.S. businesses of all kinds and sizes rose steadily and sharply from 1984 to 1989.³⁶ In this period, total outlays increased more than four-fold from \$12 billion to over \$56 billion. On average, almost 75% of the total outlays were made by U.S. affiliates of foreign owned firms, the remaining 25% were made by foreign direct investors. In 1990, foreign outlays for acquisition decreased somewhat but remained substantially higher than they were before 1988, and nearly one-third of the acquisition outlays were for manufacturing firms. The Japanese and British currently are the largest acquirers of U.S. high technology firms. Table 6 presents data on the ownership of companies active in high-tech fields operating in the United States.³⁷

Foreign Acquisitions of U.S. High Technology Firms by Industry



Sources: Economic Strategy Institute, 1991.

Table 16

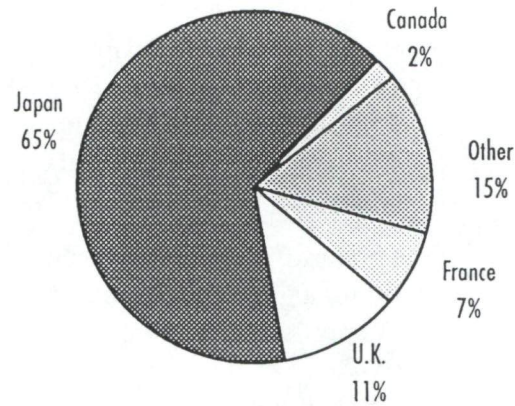
Ownership of Companies Active in High-Tech Fields Operating in the United States, by Country of Ownership: March 1991

Country	All fields	Automation	Bio-technology	Computer hardware	Advanced materials	Photonics & optics	Software	Tele-communications
Number of companies								
Total	30,919	3,413	974	4,541	2,302	1,673	7,095	2,424
United States	27,412	3,066	868	4,212	1,957	1,471	6,887	2,182
Other Foreign owned.....	3,507	347	106	329	345	202	208	242
United Kingdom.....	813	70	17	56	85	53	73	53
Japan	600	66	15	101	42	51	16	66
West Germany.....	560	79	20	34	82	36	15	17
France	269	26	6	23	40	12	23	24
Switzerland	242	28	8	17	23	13	16	6
Canada	246	20	4	16	18	9	22	27
The Netherlands.....	144	5	8	17	23	11	10	12
Sweden	170	21	8	12	10	5	8	6
Taiwan	35	0	0	10	0	2	1	6
South Korea.....	22	1	1	6	1	0	1	3
Percent								
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
United States	88.7	89.8	89.1	92.8	85.0	87.9	97.1	90.0
Foreign owned	11.3	10.2	10.9	7.2	15.0	12.1	2.9	10.0
United Kingdom.....	2.6	2.1	1.7	1.2	3.7	3.2	1.0	2.2
Japan	1.9	1.9	1.5	2.2	1.8	3.0	0.2	2.7
West Germany.....	1.8	2.3	2.1	0.7	3.6	2.2	0.2	0.7
France	0.9	0.8	0.6	0.5	1.7	0.7	0.3	1.0
Switzerland	0.8	0.8	0.8	0.4	1.0	0.8	0.2	0.2
Canada	0.8	0.6	0.4	0.4	0.8	0.5	0.3	1.1
The Netherlands.....	0.5	0.1	0.8	0.4	1.0	0.7	0.1	0.5
Sweden	0.5	0.6	0.8	0.3	0.4	0.3	0.1	0.2
Taiwan	0.1	*	*	0.2	*	0.1	*	0.2
South Korea.....	0.1	*	0.1	0.1	*	*	*	0.1

* = less than 0.05 percent

Source: Derived from the CorpTech Data Base, Corporate Technology Information Services, Inc., as reported in Science and Engineering Indicators - 1991.

Foreign Acquisitions of U.S. High Technology Firms by Country



Sources: Bureau of Economic Analysis, U.S. Department of Commerce, 1991; Economic Strategy Institute, 1992.

Table 7

Foreign Acquisition of U.S. High Technology Firms October 1988 — April 1992

	Advanced Materials	Aero- space	Chemicals	Computers	Electronics	Semi- conductor Equipment	Semi- conductor	Telecommuni- cations	Biotech- nology	Other	Cumulative Totals
TOTALS	63	32	54	142	56	39	60	64	27	71	608
Japan	40	19	25	93	33	30	51	31	17	60	399
UK	11	5	6	13	10	1	1	13	2	3	65
France	2	4	11	8	2	2	2	5	2	3	41
Canada	0	3	3	4	1	0	1	2	0	0	14
Taiwan	1	0	0	8	0	0	1	1	0	0	11
Germany	0	1	4	0	1	1	3	3	2	2	17
Switzerland	1	0	1	3	0	1	0	3	3	2	14
Australia	2	0	0	1	1	1	0	2	0	0	7
South Korea	0	0	0	3	1	0	0	0	0	0	4
Netherlands	1	0	1	1	0	0	0	0	0	0	3

Source: Economic Strategy Institute Database
1100 Connecticut Avenue, N. W., Suite 1300
Washington, DC

Table 7 shows total foreign acquisition of U.S. high technology companies (both large and small) by industry and by country for the period from October 1988 through April 1992. The Japanese were the most active investors, acquiring or investing in 399 U.S. high technology companies during this period.³⁸ Computer firms were the most popular choice among foreign investors who invested majority interest in (or acquired) 142 enterprises ranging from software producers to hardware manufacturers. Semiconductor firms, or firms manufacturing semiconductor equipment were the targets of 99 acquisitions followed by telecommunications firms, advanced material companies, electronic firms, and chemical groups.

Foreign investors, in general, preferred to make investments of 51% or more, thereby receiving controlling ownership of these enterprises. Japanese investment, however, tended to be more evenly split between majority control and minority interests in companies according to the Economic Strategy Institute Report.³⁹ Table 8 shows these results on minority versus majority ownership.

Table 8

Economic Strategy Institute Database – Acquisition of U.S. High Technology Firms Between October 1988 and April 1992
Mode of Investment (Minority VRS Majority Ownership)

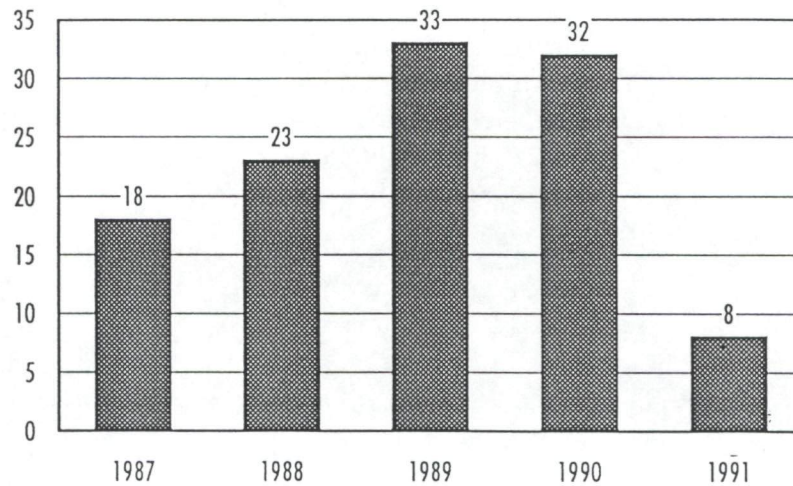
	All Firms	Japanese Firms
Number of investments resulting in majority ownership	319	189
Number of investments resulting in minority ownership	203	162

86 of the 608 firms did not specify whether it was majority or minority acquisition.

Interestingly, foreign acquisition of venture-backed companies (largely high-tech firms) dropped off by 75% in 1991 according to the Venture Capital Journal.⁴⁰ As seen in Figure 5, just eight U.S. venture-backed companies were purchased by overseas investors last year compared to 32 in 1990. This decline in mergers and acquisition activity is said to reflect internal banking, real estate and stock market difficulties in Japan that has caused an economic retrenchment in that country.

Figure 5

Acquisitions of U.S. Venture-Backed Companies by Foreign Acquirors



Source: Venture Economics Publishing, 1992

The above data do not relate explicitly to the acquisition of *small* high technology based enterprises, however a reasonable approach to this issue is to assume that the rate of acquisition is in direct proportion to the percentage of businesses of a given size within a specific industry grouping. Specifically, using the average revenue figures from Table 9, (or the average purchase price with an assumed price/sales ratio of 3:1), for the key technology sectors where data are available, average revenues are below \$50 million — a reasonably assumed cutoff for a small business. This presumes a \$100,000 per man-year average, or can be assumed from average

Table 9

Average Revenue, Purchase Price and Age of Acquired,
Private Venture-Backed Companies in 1991
(Domestic and Foreign Acquisition)

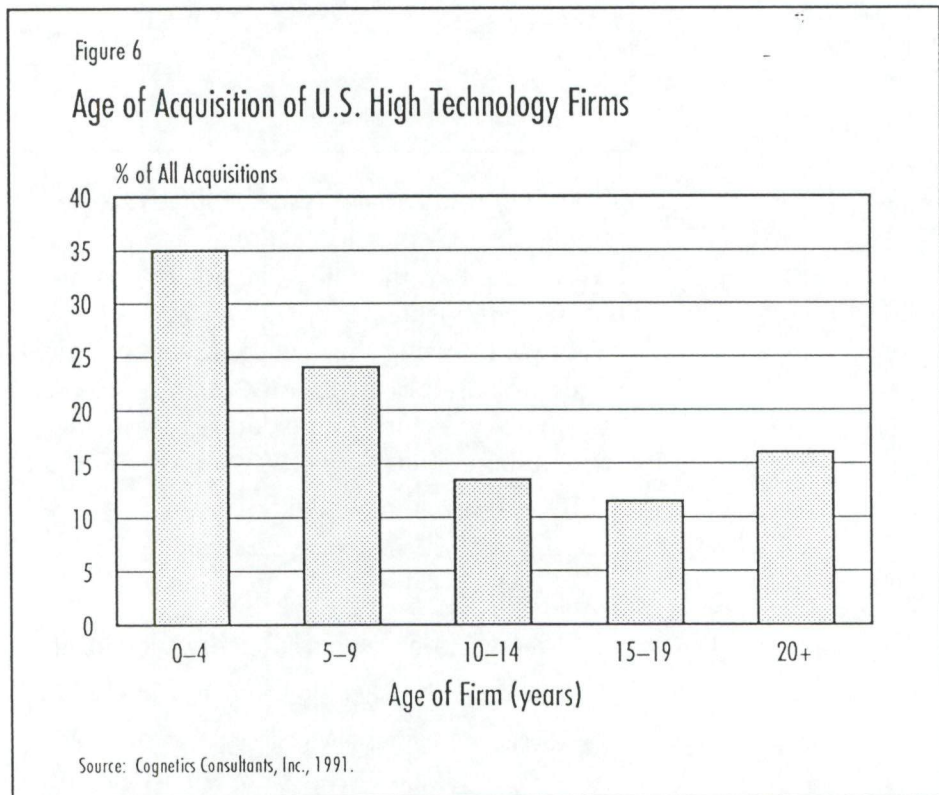
	Average Revenue (S Millions)	Average Purchase Price (S Millions)	Average Age (Yrs.)	Number of Acquisitions
Computers, H&S	40.9	43.7	7.8	18
Electronics	Undisclosed	30.5	6.9	8
Communications	23.8	60.1	7.4	5
Biotechnology	16.8	23.5	8.9	6

Source: Venture Capital Journal, February 1992

sales per employee data. Both methods indicate that the majority of acquisitions probably involved small high-tech businesses.

The stage of development at which firms are acquired is critical to understanding the nature of small firm growth. Figure 6 follows the age at which firms were acquired during the period from 1986 to 1991. The data support the contention that, as the degree of innovation and technology increase, the percent of firms seeking capital at a younger age goes up. Also, almost 60% of high technology acquisitions occur before the firm is 10 years old, and over one-third occur in the first four years.

Rapidly growing, small technology-based companies have a high need for capital that reaches them vulnerable to acquisition when other sources of funding are unavailable.



Innovation and Small High Technology Business

A wide array of anecdotal evidence and several studies of empirical data show that small firms innovate more often and more efficiently than do larger businesses. This capacity for innovation is probably even greater for the sub-group of small high technology firms.

A 1984 survey conducted for the Small Business Administration found that in 1982, there were 2.4 times as many small firm innovations as large firm innovations per employee.⁴¹ This study also found that innovations from small firms were twice as likely to be licensed or purchased by others as those from large firms, although the number of such cases was limited for both large and small firms. Further, small firms are more inclined to sell their innovations to the private sector rather than the military or civilian government.

An earlier study showed that small firms having fewer than 1,000 employees were responsible for almost one-half of the major U.S. innovations during the period from 1953 to 1973.⁴² This same study also showed that small firms (defined by these authors as having less than 1,000 employees) had a ratio of innovation to R&D employment that was four times that of larger firms, and a ratio of innovation to sales that was one-third greater than for larger firms. A final point was that the cost per R&D employee (scientist or engineer) was almost twice as great in the large firms compared to the smaller ones.

A more recent study supports these conclusions, showing that small manufacturing firms (again defined by these authors as firms with fewer than 1,000 employees) developed a new product for every \$10 million of sales which is 7.8 times the rate for all firms.⁴³ The small firms also had 2.1 new products for each million dollars of R&D, which was 3.5 times the rate for all firms.

The reasons for the high level of innovation in small high-tech firms are varied. This phenomena has been ascribed to the fact that managers of small R&D firms have greater economic incentive to innovate while the bureaucracy of larger firms demands that technical improvements to products be held to a certain minimum range of variation or within prescribed limits. Large firms may also tend to overspecialize their research efforts in comparison to a small firm, and contact between customer requirements

and the technical design groups may be closer in a smaller firm as compared to a large organization, where the sales force and technical groups may have little contact (i.e. even separate locations). Finally, smaller firms are often more product-innovation oriented as compared to large firms, which places emphasis on process innovation in the manufacturing cycle. This effect tends to artificially lower the perceived innovation level of larger firms.

Certainly, the data demonstrate the innovative forces behind the small, high-tech business and the retention of competitive high technology capability in the United States requires support of this important economic sector.

The Employment Impact of Small High Technology Businesses

Job Creation by Small High Technology Firms

- Small high technology firms have a disproportionately positive impact on job creation:
 - small businesses represent 99% of all U.S. businesses and created 70% of all new jobs between 1986 and 1991; but
 - while small high-technology firms represent only 1% of all U.S. businesses, they created 6% of all jobs between 1986 and 1991.*
- Cognetics Inc. (Dun and Bradstreet listings, 1991)

To set the stage for the total employment impact of small high-tech businesses, it is worthwhile establishing the employment impact of small businesses in general. The United States Small Business Administration⁴⁴ estimates that small businesses represent 99% of all U.S. businesses and accounted for an estimated 90% of net private sector job growth measured in 1990.

Small high technology firms are one of the most dynamic job creating sectors in the economy. Over 400,000 jobs were created in the small, high-tech sector in 1990.⁴⁵ Recent data indicate that domestic small high technology companies contribute almost four times their expected share of new jobs. For a recent one-year period, 40% of the jobs created were in the computer-related industries. Seventy-six percent of the total number of high technology jobs created were in companies of between 50 and 500 employees.

In aggregate levels of job creation, it is apparent that the small high technology sector makes a proportionally large contribution. Table 10 shows the new jobs created by high technology firms and high-growth firms that existed in 1986 and 1991.⁴⁶ When job creation in small high technology firms is compared to that in large high technology firms, we find that small high technology firms created all new high-tech jobs between 1986 and 1991. Larger firms lost over 88,000 positions.

In the period between 1976 and 1986, small high-tech firms contributed 839,000 (38%) of the 2.2 million new jobs in high technology industries and expanded 81.8% in terms of capital assets. These figures show growth that is twice as fast as that for the economy in general over this period.

Table 10

Job Creation in the High Technology/High-Growth Sector over
5-year Period for Firms Existing in 1986 and 1991¹⁷

	All High High Technology Firms (New Jobs Created)	High-Growth, High Technology Firms (New Jobs Created)	All High-Growth Companies in the United States (New Jobs Created)
Company Size (employees)			
0-500	170,293	270,729	5,568,547
500+	<u>-88,400</u>	<u>332,644</u>	<u>3,460,480</u>
TOTAL	81,893 ¹⁸	603,373	9,029,027

Source: Cognetics, Inc., 1991.

Financing Small High Technology Business at the Early Stages

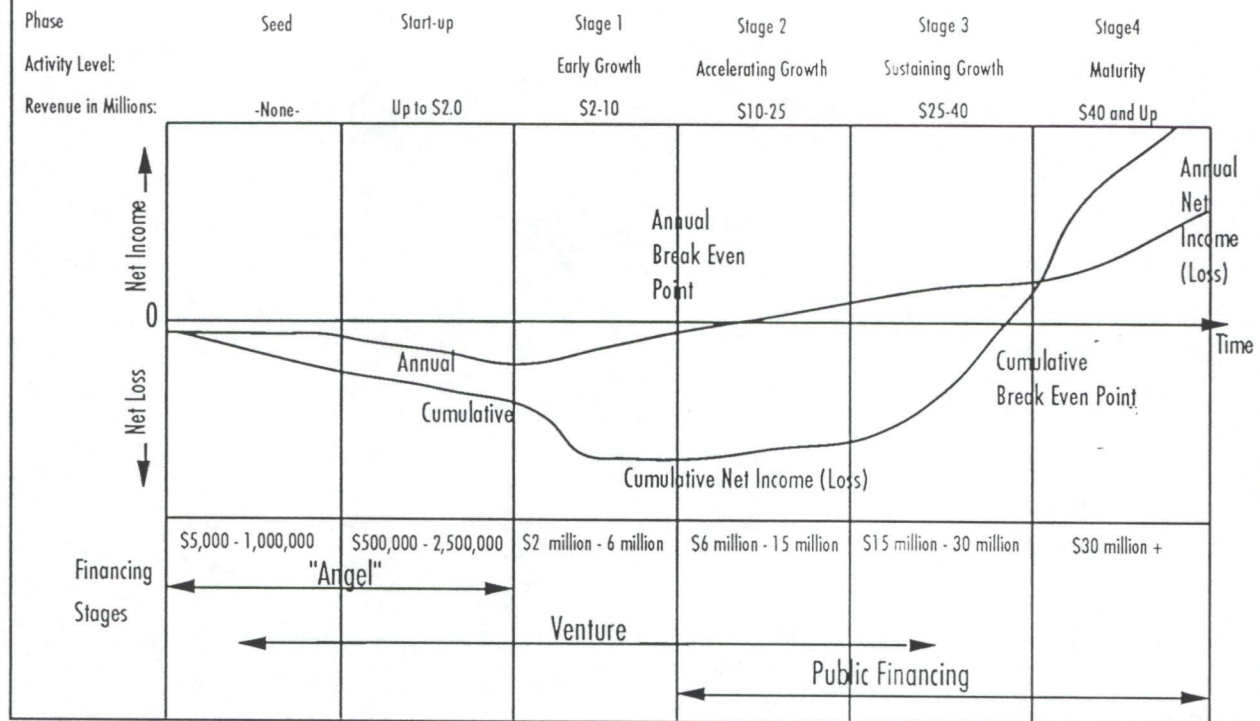
In the last two decades, a highly specialized and dynamic capital market has formed for financing technology ventures. Within this market there are two highly complementary sources of enterprise financing: informal ("angel") capital and venture capital.

The informal investor capital market is an invisible and relatively inefficient market comprising a highly dispersed and disaggregated population of middle-income to wealthy individuals.⁴⁹ These individuals typically have been entrepreneurs themselves and are generally knowledgeable, careful investors. Their investment behavior and preferred strategies for investing in seed and start-up ventures are extremely diverse. Two aspects of the angel capital market stand out, however, as distinguishing common features:

- The total size of the angel market may be anywhere from 3 to 10 times the size of professionally managed venture capital in terms of dollar volume; and
- The angel investor market is extremely fragile and sensitive to changes in tax structure, regulatory impediments and macro-economic factors. Anecdotal evidence gathered in several reports shows that even slight movements in the regulatory environment can choke the growth of this market.

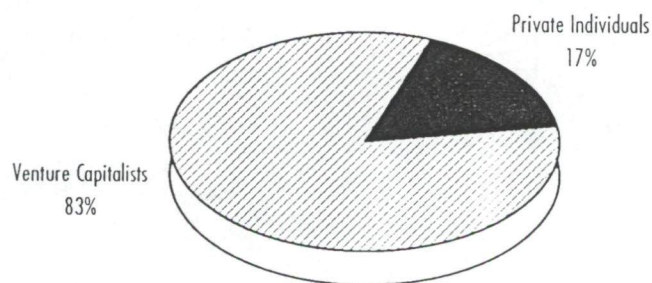
The venture capital market represents professionally managed funds that are invested in high technology enterprises that range from seed-level deals to mature companies needing bridge financing prior to an initial public offering ("IPO"). Recently, the venture capital market has suffered an enormous decline in the level of investment activity in the numbering investment and size of total disbursements. In 1989, there were roughly 600 venture capital funds in the United States with about \$30 billion under management. At the peak year of 1987, this market invested about \$4 billion into some 3,000 ventures. In 1992, the National Venture Capital Association Directory lists 201 active venture funds, and slightly over \$1.4 billion of investments were made in 1991.

Life Cycle of A New Enterprise Model of A Growing and Successful Company The 3 Key Financing Stages: Angel, Venture, IPO



Who Invests in Later-Stage Small High-Technology Businesses?

Percentage of Later-Stage Rounds
Involving \$500,000 or More



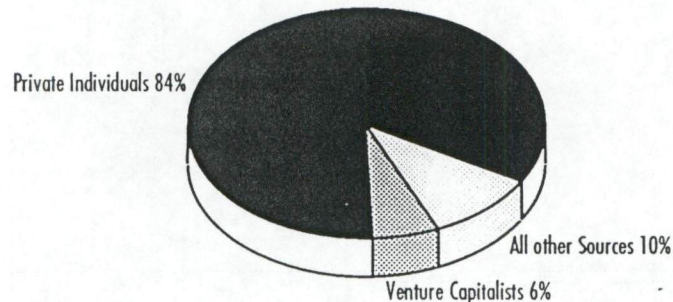
Institutional venture capitalists provide most
of the financing for later stages.

Source: American Council for Capital Formation, Center for Policy Research: The Critical Role of Taxable Capital Gains for Entrepreneurial Start-Up Companies, Freear and Wetzel, 1988.

Informal Investment

Who Invests Seed Capital in Small High Technology Businesses?

Percentage of Seed Stage Financing
Rounds involving less than \$250,000



Private "Angel" investors bear the
burden of the seed investment load.

Source: American Council for Capital Formation, Center for Policy Research: The Critical Role of Taxable Capital Gains for Entrepreneurial Start-Up Companies, Freear and Wetzel, 1988.

As is the case for the informal angel market, venture capital sources are also extremely sensitive to over-regulation, changes in the tax code, and to general macro-economic factors.

Details regarding each of these components of the technology financing market are given in the following sections.

Stage and deal size distinctions cause individual investors and venture capital funds to play complementary rather than competing roles. Table 11 shows the results of an analysis of historical financial data on 284 small high technology businesses in New England.⁵⁰ The data in this table are believed consistent with national averages and can be extrapolated to represent the nation as a whole for a first estimate of the size of informal investment in new, technology-based enterprises.

Table 11
Rounds Invested in Small High Technology

	Private Individuals		Venture Capital Funds	
By Size of Round (\$000)				
< \$250	102	(58%)	8	(5%)
\$250 - \$499	43	(24%)	14	(8%)
\$500 - \$999	15	(8%)	31	(18%)
> \$1,000	<u>17</u>	<u>(10%)</u>	<u>120</u>	<u>(69%)</u>
TOTAL	177	(100%)	173	(100%)
By Stage				
Seed	52	(29%)	11	(6%)
Start-up	55	(31%)	38	(22%)
First	29	(16%)	56	(32%)
Second	26	(15%)	46	(27%)
Third	10	(6%)	19	(11%)
Bridge	<u>5</u>	<u>(3%)</u>	<u>3</u>	<u>(2%)</u>
TOTAL	177	(100%)	173	(100%)

A 1983 survey of 3,665 families of all income groups resulted in an estimate of 2 million families in the U.S. (2.5% of all households) that make informal equity investments in privately held businesses totaling to \$300 billion, an average investment of about \$150,000 per household.⁵¹ Individual investors are estimated to invest over \$30 billion per year in over 400,000 ventures. By comparison, in 1987 venture capital funds were investing about \$4 billion annually, with an average investment of \$1 million.

Another study examined the rate of informal venture investing based on a sample of 435 investors. From the findings, the researchers estimated that 720,000 investors annually made 439,000 informal investments with a mean dollar value of \$66,700.⁵² These numbers imply an annual flow of informal equity capital of \$32.7 billion.

According to Cognetics, Inc., entrepreneurial ventures include about 50,000 high potential start-ups each year, and 500,000 private companies growing at rates above 20% including 80,000 with annual growth rates above 50%. The equity financing needs of these high-growth ventures exceed \$50 billion per year.

Several recent studies have attempted to profile the typical informal investor.⁵³ The investor profile is confirmed by three separate surveys of the informal investor market conducted by the Small Business Administration between 1985 and 1988.⁵⁴ All of these studies show that the total market is huge but highly fragmented and localized, and the investors are unusually diverse, displaying a wide range of personal characteristics and investment behavior. Investment capital from individuals appears to be the largest source of external equity capital for small businesses; annual investment is anywhere between 3 to 10 times the \$4 billion (1987 figure) invested annually by venture capital companies.⁵⁵

However, the available information cannot conclusively confirm whether this ratio of informal capital to venture capital is also true for the small high technology sector. Nevertheless, it appears that, at the very least, the total amount of informal investment in the small high technology sector is equal to or exceeds the total annual investment by venture capital. The following profile information is taken from the previously cited surveys: The average informal investor is 48 years old (with an age range of 30 to 80 years old) and has a bachelor's degree. In fact, almost half of all informal investors have a graduate degree, and have some general business experience in sales, marketing, finance, or research and development.

Profile of Informal "Angel" Investor

- Tax-sensitive investor (easily hurt by high gains tax)
- 70-80% are self-made entrepreneurs ^{1/, 2/}
- 20-25% regularly recycle their funds into new ventures^{3/}
- Informal investor dollar pool is 3-10 times the total professional venture capital pool for all small business.^{4/} This is likely to be true for small, high-technology firms at the seed financing stage as well, but has not been conclusively demonstrated by statistical analyses.

^{1/} Sullivan, M. K., Ph.D. Dissertation, University of Tennessee, August 1990.

^{2/} Gray, T. A., U. S. Small Business Administration, Presented at OECD Meeting, Paris, July 1990.

^{3/} Personal communication, W.E. Wetzel, Angel investor researcher, December, 1991.

^{4/} Freear and Wetzel, University of New Hampshire, April 1991.

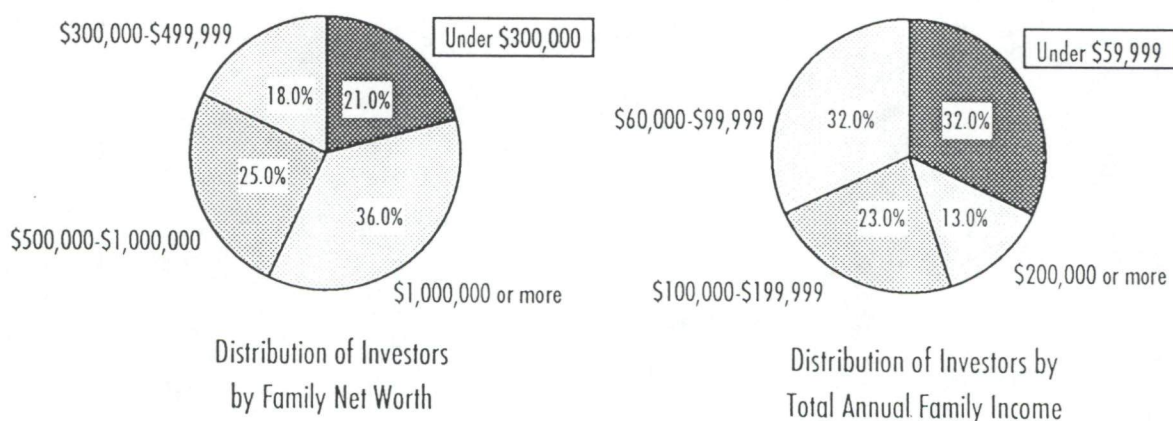
Half of informal investors have full-time managerial experience in entrepreneurial ventures with a median of two years. One study found that most informal investors have had previous experience in start-up enterprises.⁵⁶ A similar 1989 study examined the motivations of informal investors and found that earlier experience in starting a firm was strongly associated with a greater commitment to financing start-up ventures.⁵⁷

Three-quarters of the informal investors have annual household incomes in the range of \$50,000 to \$299,000 with 23% in the \$100,000 to \$199,000 range. These income ranges are supported by another recent study which found that over half of the investors had annual incomes in the \$100,000 to \$249,000 range.⁵⁸ Most investors have a substantial net worth. Almost one-third of informal investors have a net worth of between \$1 million and \$2.5 million and one-quarter have a net worth exceeding \$2.5 million. The median net worth for investors was \$1 million to \$1.5 million.

Surprisingly, the data also indicate that not all angel investors are wealthy individuals. 32% of angel investors earned under \$60,000 annually, according to a 1990 SBA study.⁵⁹

These informal investors are usually very active with a median number of two investments in 36 months. They typically provide loan guarantees as well as their own knowledge and experience to the firms. Although most proposed projects are rejected, a substantial number are accepted (3 out of 10).

Are All "Angel" Investors in Small Businesses Wealthy Individuals? No!



Surprisingly, while they have generally higher-than-average incomes, these individual investors are by no means always "wealthy".

Source: Gray, T. A., U. S. Small Business Administration, Presentation at OECD Meeting, Paris, July 1990.

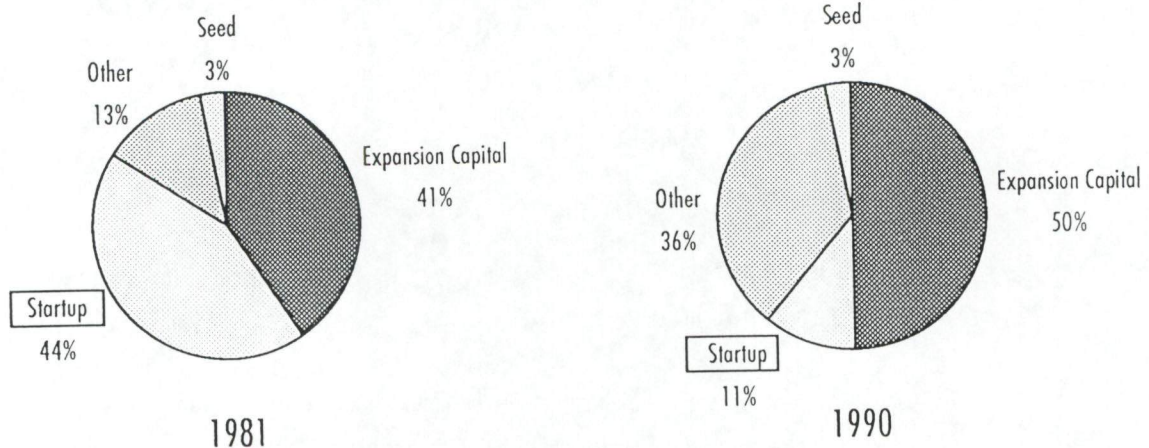
The informal capital market is large and evolving. Most investors are successful business people interested in investing in other businesses to expand and diversify their business and investment activities. They are knowledgeable, careful investors and have been satisfied with the performance of their past investments. In fact, the studies show that the majority would be interested in investing in more deals if presented with viable opportunities.

Venture Capital

Venture capital is the other primary source of early funding for high technology businesses. However, a small firm must show sufficient promise before venture capitalists invest in a firm. Venture capital is a relatively recent phenomenon with the first venture capital investments arising in the early 1960s. However, recent trends indicate that the venture capital market is currently undergoing significant changes. At present, the total U.S.-based venture capital portfolio is approximately \$30 billion. The stage of the company at which the investment is made is later than it was a decade ago. The most recent figures are indicative of current trends in venture capital investing: later-stage deals, fewer start-ups, and risk-aversion.⁵⁹ Venture capitalists generally provide funding increments anywhere between \$1 million and \$100 million, depending on the stage of development. Some seed-level specialists provide smaller infusions of money. Table 11 shows the typical stages of investment for venture capital for small high technology firms.

Figures from the industry further indicate that 91% of the venture capital investments for 1988 were related to later stage development or expansion.

Venture Capitalists Grow Risk-Averse
(Percentage distribution by financing stage)



Professional venture capital in start-up financing is declining

Source: Venture Capital Journal, July 1991.

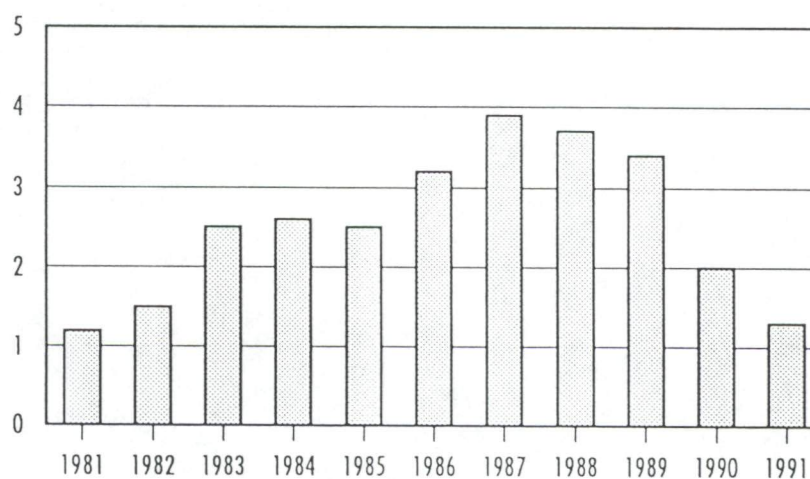
The \$3 billion included contributions from pension funds (47%); corporations (12%); endowments (11%); individuals (8%); insurance companies (9%); and foreign sources (13%). The share contributed by pension funds has been generally increasing, while the portion of venture funds coming from individual investors declined.

While there are some reported discrepancies in the total available venture capital, current information indicates that the total available venture capital has decreased sharply. For example, the available venture capital declined from an all-time high in 1987 of approximately \$4 billion to a total of \$1.4 billion in 1991.⁶⁰

This trend of decreasing availability of venture capital is being mirrored internationally as well.⁶¹ For example, the total amount of Japanese-based venture investment in U.S. companies declined from an all-time high in 1989 of \$320 million to a low of \$97 million for 1991.

The trend toward decreasing investment is attributed to factors ranging from a correction to excessive speculation on the part of venture capitalists (too much money in the same technology companies) to changes in the tax laws (hike in capital gains tax in 1986). An example of the former is when venture capitalists during the mid-1980's were invested in 35 companies, all of which were developing computer disk drives. In the end, only a few of these companies survived; the rest failed, taking with them the venture capital.

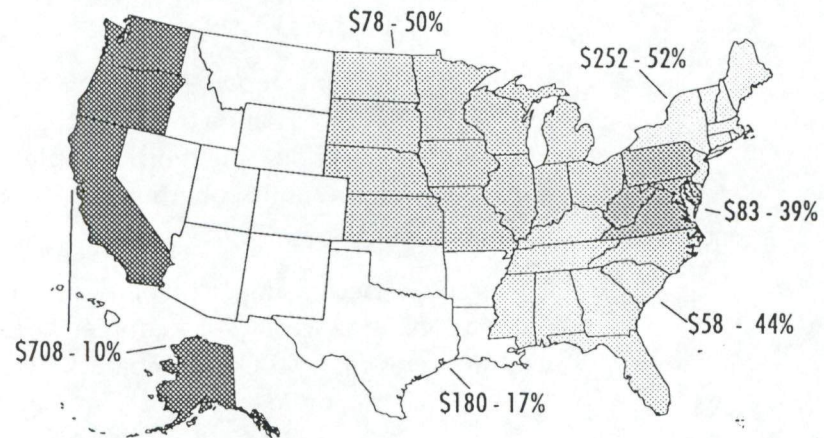
Venture Capital Disbursements Continue to Decline in 1991



Source: Venture Economics Publishing Co.

Venture Capital by Regions

(Dollars invested in millions, 1991, percent change from 1990)



Source: Venture Economics Publishing Co.

Apart from the difficulties inherent in data collection and the problems in definition, it is apparent that small high technology businesses occupy a unique and critical position in our economy. They are the fulcrum for economic and technological change. As a consequence, these businesses have become a critically important societal institution. Despite this important contribution, the financing of small, high-tech businesses remains in a rather primitive state of information transfer within the principal capital markets, and the venture and informal markets suffer dramatically, and often unpredictably, from changes in tax, regulatory, and economic conditions.

Some Possible Reasons for the Decline of Angel and Venture Capital in the United States

- Adverse gains and general tax policy.

A high gains tax:

- Discourages investment by tax-sensitive angel investors
 - Limits small firm liquidity
 - Impacts institutional and professional venture capitalists through investment liquidity and limits downstream public offering (IPO) participation by individuals
 - Reduces attractiveness of stock options as a draw to top caliber management
 - Angel investors cannot expense 100% of their capitalized losses against their ordinary income under the current tax code.
- Market correction: Over-valuation and imprudent investments during the 1980's have slowed the commitment of money to venture funds.
 - Poor economic conditions: A recessionary economy and "gloomy" outlook probably has caused angel investors to become more cautious.
 - Other angel investments (real estate, retail, etc.) are probably not doing well at present, thus contributing to the shortage of available funds.

A Brief Overview of Other Financing Sources: SBIR and SBIC Programs

The SBIR Program

The Small Business Innovation Research (SBIR) Program is designed to assist small businesses that are involved with Federal agencies in their external research efforts. Eleven Federal agencies with \$100 million or more of extramural R&D obligations are required to set-aside 1.25% of these funds for small businesses. The basic program is structured as follows:

- Phase I of the program provides up to \$50,000 for concept development. Additional money from angels, founders, or venture sources can be combined to augment total funding.
- Phase II allows up to \$500,000 for prototype development, again often supplemented by outside investment sources.

In the first eight years of the program, the Small Business Administration⁶³ reported \$2.3 billion was awarded to small firms for a total of 13,712 projects.

Table 12
Small Business Innovation Research (SBIR) awards,
by technology area and selected agency: FYs 1983-1989 (cumulative)

Technology Area ¹	Total	Dept. of Defense	Dept. of Energy	Dept. of Health and Human Services	NASA	NSF	Other ²
Total (1983-89) percent	100	100	100	100	100	100	100
Computer information, analysis	22	26	10	15	26	18	19
Electronics	21	27	18	7	20	16	12
Materials	16	18	25	6	15	24	14
Mechanics of vehicles & facilities	7	10	4	1	12	4	4
Energy conservation and use	12	10	28	3	15	10	6
Environmental & natural resources	7	5	10	4	7	13	20
Life sciences	16	4	4	64	4	15	25
millions of current dollars							
Total (1983-89)	2885	1389	337	513	371	136	139

1 Distributions are based on the cumulative 1983-89 value of awards, not on the number of awards granted. Within each of the broad technology areas listed, SBIR awards are assigned to more specific technology areas, including multiple technology areas. Therefore, the dollar distributions include overcounting of awards assigned to multiple technology areas.

2 Includes Departments of Agriculture, Commerce, Education, and Transportation, the Environmental Protection Agency, and the Nuclear Regulatory Commission.

Source: Office of Innovation, Research, and Technology, Small Business Administration. *Small Business Innovation Development Act: Seventh Year Results*, (Washington, DC: SBA, 1990), Science and Engineering Indicators, 1991.

A recent review of the SBIR program⁶⁴ reported that a “healthy” level of commercialization had been achieved, and that one in four SBIR program participants was successful in commercialization six years after receiving Phase II funding. Further, the companies surveyed reported a 50% growth level in the period between the Phase I award and the Phase II award.

Despite the positive assessments that the SBIR program has generally received, it is hardly a substitute for a robust venture capital industry, as it is often misperceived, nor does it play a significant role in the overall small, high technology financing picture when compared to the \$30 billion annual informal capital market. However, some notable success stories have evolved from the program – successes that could be strengthened and multiplied with a vigorous venture capital community and a sustained level of angel investment activity.

The SBIR program should be viewed as complementary to sources of funds from the private sector. It augments a unique segment of the universe of small Federal contractors performing critical R&D for government agencies.

The SBIC Program

The Small Business Investment Company (SBIC) program has provided government-backed venture capital for 33 years through qualified business licensees.

The historical success of the SBIC program has been the subject of recent debate. Proponents cite statistics revealing that the total return to the government has been positive over the life of the program, while opponents cite the demise of several SBIC's and the consequent loss of private and Federal funds. Both pictures fail to accurately assess the full scope of the SBIC program.

Stepping aside from the debate, some facts about SBIC's are available: (1) In 1990, \$391 million of disbursements to small business investment companies were made; (2) Since its inception in 1959, \$8.5 billion has been disbursed to 55,000 small businesses using \$2.6 billion in government borrowings and generating an internal rate of return of 7.6% while creating 1,000,000 jobs. Unfortunately, nearly \$1 billion in government leverage held by 519 SBIC's has been liquidated due to poor reporting, poor auditing and excess leverage.

Disbursements to Small Business by Small Business Investment Companies (SBICs)
1980-September 1990 (Millions of Dollars)

Year	SBICs Disbursement Amount	Year	SBICs Disbursement Amount
1990.....	545.9	1984.....	425.5
1989.....	542.4	1983.....	412.9
1988.....	614.4	1982.....	322.9
1987.....	537.9	1981.....	332.7
1986.....	75.9	1980.....	295.2
1985.....	434.6		

Source: U.S. Small Business Administration, Investment Division.

Despite the difficulties the program has experienced, there is presently a movement to restructure the program to encourage SBIC's participation in equity investments in young, high-tech companies.

Under the current program, the SBIC must invest interest-bearing debt into the long-term equity of small companies that do not generate periodic or fixed yields. Servicing the debt during the growth phase is difficult and there is therefore said to be an inherent mismatch between the debt instrument and the desired investment goals of the SBIC. That is, there exists a disincentive for SBIC's to make long-term equity investments in high-risk ventures.

The proposed new program would provide for a structure using a preferred security as the financing instrument. The determined or non-interest bearing security would encourage investment in long-term equities and is proposed as a viable alternative to the interest-bearing debenture. Redemption of the preferred security would occur in 10 years at 100% par value plus accrued dividends, leading to potentially high returns to the SBIC.

The SBIC program has generated notable business successes and is likely to continue to generate successful graduates such as Intel, Federal Express, Apple, Cray Research and others who benefitted at early stages from SBIC funds. However, the efficiency of the funding mechanism for small, high-tech firms can likely be improved.

Incubators, Science, Industrial, and Research Parks

Business incubators provide shared tenant rental space and support services to small seed or start-up firms. The services offered by incubators are designed to assist young entrepreneurial ventures with technical and business plan development, and management consulting, accounting, and marketing services. Less commonly, services such as seed capital funds, tenant loans, and access to sophisticated computer processing equipment are available.

The purpose of an incubator is to nurture a newly started business through the critical phases of early development, thereby enhancing the chance of commercial success. New entrepreneurs generally lack the key management and organizational skills necessary for the success of their venture. In an incubator environment, high-tech entrepreneurs can learn these skills, or have them provided at low cost, while their businesses are getting started. A supportive business environment is the characteristic element that defines a well-run incubator.

In addition to small business incubators, research parks and private industrial parks support both start-up and mature high-tech business development, as well as provide lease space to large established corporations. Research parks generally are attached to a university or have a strong university affiliation. This distinguishes them from industrial parks, which are usually private-sector developments, having only informal ties to a university community.

Incubators

In 1991 there were more than 450 operating incubators in the United States and Canada.⁶⁵ An average of four or five facilities have been opened each month since 1986 according to the National Business Incubation Association in Athens, Ohio. The average incubator has eight small, (often high-tech) tenants in a shared space of about 2,300 square meters. The small companies are able to sell products to other firms within the incubator and can enter new lines of business without purchasing new equipment because the other entrepreneurs are generally willing to share facilities and exchange expertise. The assistance provided by the incubators helps with the technical and managerial aspects of running a small business, but the entrepreneurs also learn from watching the mistakes and successes of the other facility tenants.

About 14% of incubators are run for profit⁶⁶ and the average graduation rate for incubator tenants was 22% in 1989, representing 267 businesses and 1,850 jobs. Nine percent of incubator graduates failed, and on average, those incubators three years or older produced three graduates per year and had 1.3 failures.⁶⁷ In a recent survey, the top 11 incubator objectives according to a survey of incubator owners and managers were, in order of priority:

Priority Objectives of Incubator Owners and Managers from Survey Data

1. Create positive environment for start-ups.
 2. Create local employment opportunities.
 3. Contribution to community.
 4. Diversify local economy.
 5. Create opportunities for Minorities/Women.
 6. Technology transfer.
 7. Commercialization of research.
 8. Generate income from tenants.
 9. Neighborhood revitalization.
 10. Investment in tenant firms.
 11. Generate income from intellectual property rights.
-

Source: NBIA, 1991.

The results of this poll show that the success of the individual businesses and the creation of jobs are the most important goals of managers and owners in the incubation community.

Research and Industrial Parks

Research parks — or science, or technology parks as they are sometimes called — emerged as a vehicle of small, high-tech business support in the early 1960s. A research park differs from an industrial park in that it usually has an academic affiliation, whereas an industrial park generally represents a completely private-sector development or real-estate venture that often (but not always) concentrates on more mature businesses. There are presently over 130 research parks in the U.S. and 306 worldwide according to the Association of University Related Research Parks (AURRP). The distribution of research parks in the U.S. is shown in Table 13. Industrial parks number over 500 in the U.S.

Table 13
United States Research Parks
1990

State	Number of Parks	State	Number of Parks
Alabama.....	3	Missouri.....	3
Arizona.....	1	Montana.....	1
Arkansas.....	1	Nevada.....	1
California.....	6	New Hampshire.....	1
Colorado.....	2	New Jersey.....	2
Connecticut.....	4	New Mexico.....	3
Delaware.....	1	New York.....	11
Florida.....	9	North Carolina.....	3
Georgia.....	2	North Dakota.....	1
Hawaii.....	1	Ohio.....	6
Idaho.....	2	Oklahoma.....	1
Illinois.....	3	Oregon.....	3
Indiana.....	2	Pennsylvania.....	6
Iowa.....	3	South Carolina.....	3
Kansas.....	2	South Dakota.....	1
Kentucky.....	2	Tennessee.....	3
Louisiana.....	1	Texas.....	5
Maine.....	1	Utah.....	3
Maryland.....	4	Virginia.....	4
Massachusetts.....	3	Washington.....	2
Michigan.....	9	West Virginia.....	1
Minnesota.....	1	Wisconsin.....	3
Mississippi.....	1	TOTAL.....	130

Source: Research Park Statistics 1990 from the Association of University Related Research Parks.

Starting with a single project in 1951—the Stanford Research Park—the research park concept has mushroomed and resulted in the development of over 42,500 hectares of land, and the creation of 2,600 firms housed in 2,900 buildings employing over 400,000 people. By exploiting the unique relationship between the park and a university (or medical institution), private companies derive an added value by having access to the school's faculty, graduate students, computer experts, and the range of basic research that is being done by universities.

Research parks have become an effective conduit for technology transfer from the research lab to the private sector, and ultimately to the marketplace. Many universities have, in turn, invested in research parks because they provide opportunities for faculty and students to interact with colleagues in industry in a way that would ordinarily not be possible. Further, research parks can be highly profitable for the host institution, particularly important in a period of decreasing budgets.

The research park movement is now becoming international in scope with 34 countries having built or currently planning facilities. A summary of U.S. and international research parks by development type is shown in Table 14. Also, the trend today is to create hybrid parks that incorporate small R&D-based firms with light manufacturing and mature companies, all in the same environment. It is hoped that the cross-fertilization of technologies and experience level with entrepreneurial drive will benefit all tenants of the facility.

Table 14
Summary of U.S. & International Research Parks by Type

Type of Development	Total	Percent
Joint Venture	60	20
Not for profit	45	15
University funded	61	19
Private	44	14
Government	31	10
Other	18	6
No type listed	48	16
TOTAL	307	100

Source: Real Estate Forum, April 1991.

Success Factors

Factors determining the success of an incubator or a research park can be reduced to three basic components that are common to many geographical settings:

- There must be an adequate supply of informal or venture capital in the incubator region that is supportive of, and compatible with, the types of businesses being incubated.
- Even non-affiliated industrial parks benefit dramatically from the presence of a high-quality university community that can provide an adequate supply of skilled researchers in the areas of technical interest.

-
- The local infrastructure should be amenable to the types of businesses occupying the incubator or research park. Light manufacturing centers must have sufficient access to transportation, water, gas, and power utilities and basic material supplies.

These three criteria outline a necessary basis for incubator and research park success, but do not guarantee that sufficient conditions exist so that a facility will graduate successful companies. A recent article⁶⁹ discussing the "mixed success" of several specialized incubator facilities in the United States has pointed to the lack of local markets for the goods and services produced. Understandably, a specialized group of companies would have additional needs relating to their specialization that would go beyond the basic needs of capital supply, a skilled work force, and an adequate manufacturing infrastructure.

Some Key Impediments to the Formation, Growth, and Development of Small, High-Tech Businesses

While it is apparent that high technology-based businesses are important to our nation's economy and competitiveness, it is less clear what factors may impede or foster the growth of these firms. This is especially important when one recognizes that only 40% of high technology-based firms are reported to survive beyond six years.⁷⁰ An even smaller percentage of firms reach maturity and achieve the economic impact of a major company.

The impediments to maturity and technological growth are diverse and varied. For purposes of exposition, the factors affecting the success or failure of small and medium-sized technology-based businesses can be characterized along two dimensions as factors that are either *external* or *internal* to the firms. Table 15 summarizes these key factors.

Table 15
Summary of Major Factors Affecting the Success of Small High-Tech Businesses

	Internal Factors	External Factors
Fostering Growth	Sufficient capital at all stages of development Professional management expertise Adequate technical expertise Skilled labor force Well-defined business plan	Access to technology Strong economy Favorable interest rates Easy market access (domestic and foreign) Supportive infrastructure (i.e. transportation and education system) Strong investor exit strategy (i.e. stock offering)
Impediments to Growth	Lack of capital at any stage, especially seed or start-up capital Management failure: —poor resource allocation —unfocused goals —bad decisions —unexecutable goals Poor business plan Technology failure	Regulatory environment including: —FDA restrictions —SEC regulations Poor economic climate including: —high interest rates —reduced venture fund pool —poor product market conditions Inadequate job training/uneducated workforce Unprotectable intellectual property rights Lack of debt financing

Internal Factors and Financial Impediments

The most important factor influencing the success or failure of a venture is the availability of financing. Interestingly, the second most important factor contributing to failure after a lack of initial venture financing is management failure. The lack of a clear direction for a new venture, which typically should be articulated in a detailed business plan, is also a common cause of failure. Rarely is the collapse of a new high-tech enterprise attributable to the technology alone. Management failures also generally dominate the list of factors that can impede the growth of a small firm.

Small, high-tech firms in the United States currently exhibit signs that there is an insufficient supply of venture and informal investment capital. Debt financing for these young firms is almost non-existent at present. Venture capital has moved to predominantly later-stage deals (although notable exceptions at the seed and start-up level exist) and venture capitalists demand extraordinary rates of return on their investments, thereby leaving technologically important, but less stellar performing companies, unfunded.

The availability of capital plays a critical role in the success of small technology-based firms. Financial failures reflect the inability of a firm to find sufficient resources for the venture at the seed, start-up, venture, IPO or buy-out capital stages. Financing a new technology-based venture means that the investor accepts a level of risk in exchange for a minimum acceptable rate of return for the money (or other equity) invested in the venture. However simple this may sound, at present many new firms fail to find adequate financing because of the delicate matching required between: (1) the type and maturity-level of the firm on the one hand, and (2) the financing source, and the minimum required investment return on the other hand. Not all combinations of investor, company, maturity-level, return, and assessed risk work to the advantage of the entrepreneur seeking financing.

Major financing issues are involved when a small, high-tech company desires to move into a high-growth mode within a relatively short period of time. Having successfully navigated the seed and start-up phases of formation and expansion, such firms seek to access sources of venture capital and generally believe that they have the potential to eventually become public companies. The availability of venture capital is directly related to the quality of "deal" available: the small company must convince the venture investor of the soundness of the business plan, the marketing plan, the overall market assessment, the technological feasibility of the product, and the managerial competence of the firm.

Based on an assessment of these critical factors, the venture capitalist then generally looks for a minimum return on investment (that is usually quite high), with an exit strategy exercisable within one to seven years. Failure to meet any one of these requirements means that the new venture may not find sufficient capital to grow to the next stage.

External Factors and the Regulatory Environment

From discussions with venture fund managers, there appears to be a significant number of start-up companies offering an investment return of 10-35% which cannot find funding in the present climate to achieve the next stage of growth. Compounding these difficulties is the fact that the amount of venture capital available for infusion has decreased by nearly 80% since the mid-1980s. Less money available to a large number of ventures allows investors to be highly selective and to *raise* the already stringent financing requirements placed on companies. Further, two-thirds fewer new deals in the seed and start-up phases are being venture-financed today than were financed in 1980.⁷¹ (Certain exceptions to this trend exist, particularly in the biotechnology sector.)

The informal capital or "angel" market has also shown signs of weakness and decreasing volume — a feature that heralds a trend having significant impact on the technology sector because of the enormous size of this market (estimated earlier to be 3 to 10 times the total venture capital pool). Since angel investors generally derive their investment funds from other entrepreneurial ventures, the availability of this type of capital is strongly dependent on the general health of the economy overall as well as being extremely sensitive to changes in tax (i.e., capital gains) policy.

Debt financing is not a major source of funding for small high-tech companies. Recent data from the American Electronics Association⁷² (AEA) show that in a survey of 126 member companies with under \$50 million in revenues, 62 companies had some financing difficulties and 50 were actually denied loans. The AEA further reported that only 34 of 100 banks that previously lent to high technology concerns currently indicate no interest in lending to electronics firms.

The current shortage of debt capital reflects in part, the discomfort banking institutions feel lending to high-risk, high-tech ventures. Often, the time to pay-out for the venture is far too protracted for the small firms to adequately service the interest on the debt, and given the low survivability rate of these companies, banks are unwilling to assume the compounded risk. Interestingly, in recent months, even mature high-tech companies have found difficulty in procuring debt financing for growth and working capital. As banks move increasingly away from younger higher-risk companies toward old established firms, the pool of innovative, small technical firms suffers from a lack of capital for proper growth.

Access to technology, market, and infrastructure are key to a firm's ability to manufacture, sell and ship goods to the customer. During this cycle, however, regulatory constraints can become overwhelming, especially in the medical/biotechnology products area.

An additional layer of regulatory constraint occurs upon the issue of company stock for public funds. Data indicate⁷³ that a simple underwriting along the lines of a "Reg. D" offering can cost the firm up to one-third of

the total funds raised in legal fees and underwriting expenses. The Administration has recently taken measures through the Securities and Exchange Commission (SEC) to reduce the expense of public stock underwritings.⁷⁴ These changes promise to ease the cost and lower the critical threshold for obtaining public funds. Opening this capital source to a larger variety of companies may help ease the capital shortage that currently exists.

The proposed revisions to the rules and forms under the Securities and Exchange Act of 1934 will facilitate capital raising by small businesses and reduce the overall compliance burdens on these companies by Federal securities laws. The current small issues exemption for Securities Act registration, Regulation A, as well as the Rule 504 exemption, are targeted for revision. The proposals to modify Reg. A will increase from \$1.5 million to \$5 million the exemption dollar limit, and simplify procedural requirements. Pre-issue solicitations of interest before filing the mandated offering document will be allowed. Conditions to the use of Rule 504 of Regulation D are also targeted for streamlining.

Other factors inhibiting the growth of a high-tech firm are at least as important and, in some respects more important, but are inherent to the firm. "A good idea does not a commercial product make," was a common refrain of the entrepreneurs and financiers interviewed for this report. This study revealed a whole array of intangible factors determining the success or failure of technology-based businesses.

Chiefly cited among all non-financial factors are Food and Drug Administration and Environmental Protection Agency regulatory compliance issues. Results from the National Technology Initiative⁷⁵ ("NTI") workshop programs during the calendar year 1992 revealed that many investors and entrepreneurs feel that FDA and EPA regulations are either too stringent, or involve too much time to comply with them. Simplification of these regulations would allow small firms to concentrate on the development of their products and set a definitive upper time limit for passage of their products through the regulatory cycle. The time value of money prohibits these companies from tolerating long delays in the regulatory process.

The inter-relationships between and among the various factors further complicate the overall picture. For example, attracting investors can be dependent on the quality of the personnel in a new firm. Yet, an entrepreneur may not be able to attract talented personnel unless he or she can secure adequate financing. As another example, if the technical founder of the firm focuses too much time on the pursuit of financing, the business can suffer dramatically and lead to insurmountable management failures.

In the near term, public policy might focus on the external impediments identified in Table 15. Over the long-term, policy should focus on those factors fostering growth that are both internal and external to the firm. It is the latter category that may yield the most potentially powerful stimulus to small high-tech businesses in the United States.

Conclusions

Small high technology businesses occupy a unique and critical position in our economy. It is estimated that there are 75,000 to 100,000 small high-tech firms in the U.S. They are a predominant and continuous source of technology, product and process innovation and are dynamic in the creation of jobs. Many of our nation's largest technology corporations were founded on a single innovative product as small businesses, and not established as subsidiaries of larger companies. Many small high-tech firms are concerned with technologies that are critical to maintaining U.S. competitiveness.

Foreign acquisition of U.S. firms is currently dominated by the Japanese, particularly in the area of computer-related businesses and semiconductor firms. A recent slowdown in acquisition rates probably reflects the economic downturn in Japan but the rate is still significantly above the 1988 levels when the upward trend began.

A wide array of anecdotal evidence and several studies of empirical data show that small firms innovate more often and more efficiently than larger businesses. This capacity for innovation is even greater for the subgroup of small high technology firms. On average, small firms were about 2.5 times more innovative as large firms per employee. Innovations from small firms were twice as likely to be licensed or purchased as those from large firms, although the number of such cases was limited for both large and small firms. Further, small firms are more inclined to sell their innovations to the private sector rather than the military or civilian government.

Small high technology firms are one of the most dynamic job creating sectors in the economy. Over 400,000 jobs were created in the small, high-tech sector in 1990.⁷⁶ Recent data indicate that domestic small high technology companies contribute almost four times their expected share of new jobs. For a recent one-year period, 40% of the jobs created were in the computer-related industries. Seventy-six percent of the total number of high technology jobs created were in companies of between 50 and 500 employees. In aggregate levels of job creation, it is apparent that the small high technology sector makes a proportionally large contribution.

Financing new technology-based firms appears to be problematic at present; both informal sources of funding and venture capital currently appear to be in short supply due to market correction factors and the extreme sensitivity of the informal investment market to unfavorable tax and macro-economic factors. While some companies, (especially in biotechnology) are still very successful in attracting professional venture investment, the total pool of venture money has sharply declined. Only those firms with the highest potential return, and generally at a more mature phase, can consistently attract financing according to the data reviewed.

A number of broadly-defined factors determine the ultimate success of an entrepreneurial high-tech venture. Internal factors, such as management issues, as well as exogenous factors, such as the macroeconomic environment, appear to be the most important determinants. The rate of success can be enhanced by improving the overall nurturing and management assistance a firm receives through the initial critical phases of development. Incubators and science research parks appear to enhance the rate of company success by shared critical services and infrastructure improvement. The development of incubators and research parks should be encouraged.

Impediments to the formation, growth, and development of small high-tech businesses have been identified and classified into two categories: those which are external to the firm and those which are internal to the firm. External factors include the regulatory environment in the form of SEC, FDA, or EPA rules and regulations; economic climate factors such as interest rates, the total pool of available capital, and market conditions; and the ability to adequately protect intellectual property rights. Internal factors encompass availability of capital at any stage of development; management failures; business plans; and technology successes or failures. Lack of financing at a given stage of development is typically the most common reason for failures to grow. Rarely is the failure of a new high-tech enterprise attributable to a failure of the technology alone. Management failures dominate the list of other factors impeding the growth of a small firm.

Public policy in the near term might focus on the external impediments identified in Table 15. Over the long-term, policy should focus on some of those factors fostering growth that are both internal and external to the firm. It is the latter category that may yield the most potentially powerful solutions.

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3. Keith L. Edwards, and Theodore J. Gordon, *Characterization of Innovations Introduced on the U.S. Market in 1982* (Glastonbury, Connecticut: The Futures Group, March 1984), Prepared for the U.S. Small Business Administration, Office of Advocacy, Contract No. SBA-6050-OA-82.
4. Paul Hadlock, Daniel Hecker, and Joseph Gannon, "High Technology Employment: Another View," *Monthly Labor Review* July 1991.
5. Bruce D. Phillips, "The Increasing Role of Small Firms in The High-Technology Sector: Evidence from the 1980's," *Business Economics* January 1991.
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8. William A. Sahlman and Howard H. Stevenson, "The Importance of Entrepreneurship" Working paper, (Boston, MA: Harvard Business School, December, 1985).
9. Edwards and Gordon, *Characterization*. (*Ibid.*)
10. J. Freear and W.E. Wetzel, *Equity Financing for New Technology-Based Firms* (Durham, NH: Center for Venture Research, University of New Hampshire, March 1988). Prepared for the Babson Entrepreneurship Research Conference, Calgary, Alberta, May 1988.

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11. David Schutt, "Disbursements' Decline Deepens: First Quarter Results Point to Weakest Year in a Decade," *Venture Capital Journal* July 1991, p. 14; and *Venture Capital Journal* July 1992, p. xx.
 12. Freear and Wetzel, *Equity Financing*.
 13. This fact has **not** been statistically proven; however conversations with Wetzel and other researchers and venture capitalists indicate that the assumption is plausible.
 14. Consultations by the investigators with small business owners, venture capitalists and available empirical data. See also: *Financing Technology: A Report of the Financing Technology Roundtables*, U.S. Department of Commerce and U.S. Department of the Treasury, April 1992.
 15. Richard L. Florida, *The Breakthrough Illusion* (New York, New York: Basic Books, Inc., 1991).
 16. Coopers and Lybrand, "What do Venture Capitalists Think About Biotechnology" 1990.
 17. The CorpTech, Inc. database is a statistical sampling of small high technology businesses. The SBA and Cognetics, Inc. databases rely on Dun and Bradstreet listings, which include almost the entire universe of private firms in the U.S. CorpTech, Inc., and Cognetics, Inc. were engaged to provide specific analyses on their databases. The addresses of these companies are: CorpTech, Inc., 12 Alfred Street, Suite 200, Woburn, MA 01801-9998, telephone (617) 932-3939; Cognetics, Inc., 100 Cambridge Park Drive, Cambridge, MA 02140, telephone (617) 661-0300.
 18. William K. Scheirer, "The Population and Birth Rates of High Technology Firms, 1976-1986" (Washington, D.C.: U.S. Small Business Administration, March 1989). Prepared for the Conference on Creativity, Entrepreneurship, and Innovation, Orlando, Florida, March 1989.
 19. C. Armington, C. Harris, and M. Odle, "Formation and Growth in High-Technology Firms: A Regional Assessment" (Washington, D.C.: Office of Technology Assessment, U.S. Congress, July 1984). Prepared by the Brookings Institute.
 20. The aggregate figures presented throughout this report were obtained from both public and private sources including: Cognetics, Inc.; CorpTech, Inc.; and the U.S. Small Business Administration (SBA). Significant differences exist in the data from source to source. We have attempted to reconcile these differences by examining a number of characteristics of each database,

and by performing a survey of the twenty-five states having the highest concentration of high-tech business. This effort was undertaken to develop an independent characterization of small technically-based businesses and to corroborate the information obtained from the three data sources.

21. Total number of businesses reported by the SBA includes 4.3 million corporations and over 1.9 million partnerships. Additionally, there are 13.8 million sole proprietorships (net counted in these figures) making a total of 20 million small businesses in the U.S.
22. CorpTech focuses exclusively on the high technology sector.
23. Total employment figures include world-wide employment.
24. National Science Board, *Science and Engineering Indicators - 1991* (Washington D.C.: United States Printing Office, 1991 (NSB 91-1)).
25. *Report of the National Critical Technologies Panel* (Washington, D.C.: United States Printing Office, March 1991).

See also:

"Emerging Technologies: A Survey of Technical and Economic Opportunities", U.S. Department of Commerce, Spring 1990.

"Critical Technologies Plan", U.S. Department of Defense, 15 March 1990.

"Gaining New Ground: Technology Priorities for America's Future", Council on Competitiveness, 1991.

26. CorpTech, Inc. 1991. Totals greater than 100% because many firms are in multiple industry groups.
27. Scheirer, *Population*.
28. Bruce A. Kirchhoff, and Bruce D. Phillips, "Innovation and Growth Among New Firms in the U.S. Economy." Unpublished paper prepared for the Annual Babson Entrepreneurial Research Conference, St. Louis, Missouri, April 1989.
29. Scheirer, *Population*.
30. Cognetics, Inc., 1991.
31. Cognetics, Inc., 1991.
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33. Cognetics, Inc., 1991.
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35. Derived from the CorpTech Database, published in *Science and Engineering Indicators*, 1991.
 36. Mahnaz Fahim-Nader, *U.S Business Enterprises Acquired or Established by Foreign Direct Investors in 1989* (Washington, D.C.: U.S. Department of Commerce, Bureau of Economic Analysis, July 1990).
 37. National Science Board, *Science & Engineering Indicators* - 1991.
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 39. Linda M. Spencer, *High Technology Acquisitions Summary Charts, October 1988 through April 1992* (Washington, D.C.: Economic Strategy Institute, May 1992).
 40. *Venture Capital Journal*, Special Report February 1992.
 41. Edwards and Gordon, *Characterization*.
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 43. Hansen, *Utilization*.
 44. *The State of Small Business: A Report of the President* Transmitted to the Congress, 1991, (Washington, D.C.: United States Government Printing Office, 1991).
 45. CorpTech, Inc., as published in *Science and Engineering Indicators* - 1991.
 46. Cognetics, Inc., 1991.
 47. Cognetics, Inc., 1991.
 48. Approximately half of all net new jobs in any sector are created by the net expansions over layoffs and half by the net of start-ups over closing. Therefore, an estimate of the overall job creation of high-technology firms for this period would be 164,000 (2 x 82,000).
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50. J. Freear, J.A. Sohl, and W.E. Wetzel, "Raising Venture Capital: Entrepreneurs Views of the Process." Paper prepared for the 1990 Babson College Entrepreneurship Research Conference.
 51. C. Ou, *Holdings of Privately-Held Business Assets by American Families: Findings from Consumer Finance Survey*. Unpublished manuscript, U.S. Small Business Administration, Office of Economic Research, 1987.
 52. Robert J. Gaston and Sharon E. Bell, "The Informal Supply of Capital" (Washington, D.C.: U.S. Small Business Administration, Office of Economic Research, September 1988). Submitted to the U.S. Small Business Administration, Office of Advocacy as partial fulfillment of Contract No. SBA-2024-AER-87.
 53. The biographical profiles in this section are drawn from Freear and Wetzel (1989) unless otherwise stated.
 54. Thomas A. Gray, "Informal Investment: The Anatomy of an Unknown Market." Presented at the High-level Seminar on Small and Medium-sized Enterprises Organization for Economic Co-operation and Development, Paris, France July 2-3, 1990.
 55. Freear and Wetzel, *The Informal Venture Capital Market in the Year 2000*; Gray, *Informal Investment*.
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 73. An informal poll of recent new underwritings and data from the National Council for Industrial Innovation's 13th Annual Meeting, held on May 27, 1992 in Washington, DC.
 74. Securities and Exchange Commission, Release No. 33-6924, 34-30468, 39-2250; FR-39; File No. S7-4-92, Division of Corporation Finance.
 75. The National Technology Initiative is a multi-agency outreach program sponsored by the Departments of Energy, Commerce, and Transportation, and NASA during the calendar year 1992. J. Broz was a participant in the NTI meetings in Cambridge, MA and Golden, CO from which this information was gleaned.
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