MSI PATCH SHEET

Bush, Vannevar

Bx 114 Item - ~~2723~~ ✓ Vandenberg, H. S 1949

Bx 112 Item ~~2675~~ ✓ Truman, H. S. (4 items copied) 1947

" 98 " ~~2255~~ ✓ Robertson, H. P 6 letters 1950, 1955

" 1 " ~~31~~ ✓ USAF nothing but 2 letters 1947, 1953

" 13 " ~~308~~ ✓ Bowen, H. G nothing 1940

" 123 ✓ copied Expense Statements 1938-54

" 124 Gov. Salary & Military Org.

" 23 " ~~512~~ ✓ Charlesworth, H. P. nothing 1940

" 39 " 954 Forrestal, J. 1947-1949

" 52 " ~~1284~~ ✓ Hotel Reservations notes on reverse 1938 & 1955

" 72 " ~~1745~~ ✓ Menzel, D. H. copy made 1950

" 94 " ~~2158~~ ✓ Project ~~Wirlwind~~ Whirlwind 1949

" 95 " ~~2167~~ ✓ Quarles, D. A numerous references to "WSEG" 1953-55

missing W. Bradbury

" F. Wattendorf.

Vandenberg Collection occupies 40.5 feet of shelf & is comprised of some 34,000 items, about ½ still classified.

Bx: 01 Item: Diaries 1947-48 (10 pp copied)

07 Mail log 1947 - May '48 nothing.

67 Top Secret Memoranda - nothing.

File #52, item 1284 Hotel Reservations:

V.B.'s travel reservations as follows:

- 5/5/47 reserv. for single at Roosevelt Hotel, N.Y. for 5/18/47 made by Carnegie Institution, D.C.
- 9/24/57 reserv. for Bush + Mr. Paul A. Scherer to arr. 9/29 for convention.
  cancelled 9/26 because of cancellation of meeting.
  rescheduled for 10/06/51, but of "other arrangements" (not in file).
- 4/06/48 reserv. for 1 night (single) Hotel New Yorker, for arrival 4/20/48. Cancelled by phone 4/16/48
- 12/2/48 reserv. for single at Lord Baltimore Hotel, Balt. MD. for arr. 12/06/48.

(margin, vertical: No other items in file)

In automobile papers, file #123 (Family), shows Bush working at % Carnegie Institute, Wash. D.C. 1530 "P" NW. (May 9, 1947)

In Boat House file, a whole heap of corresp. dated between 10/13/47 and 09/9/48 dealing w/ purchase, moving + reconstructing of a Boat House. Bush's address during entire time is % Carnegie

- Vandenberg was at Natl Scouting Meet in Wichita Falls Tx 7/5 - 7/ /47 in company of Congressman Bassett.
  He gave a 4th of July speech there.

OMOND M. SOLANDT
THE WOLFE DEN, R.R. No. 1
BOLTON, ONTARIO L0P 1A0

TELEPHONE 594-4981
(AREA CODE 416)

August 26, 1983

Mr. William S. Steinman
15043 Rosalita Drive
LaMirada, California
90638
U.S.A.

Dear Mr. Steinman:

This is in reply to your letter of August 10. I reply to your numbered paragraphs in which you relate interesting information that you have recently 'dug-up':

1. I do not recall any formal team under Dr. Vannevar Bush dealing with flying saucers. I do recall the subject coming up informally in the course of discussions which we held fairly regularly.

2. The memo that you refer to was written by Wilbert B. Smith and was presumably classified by him. Mr. Smith did frequently discuss flying saucers both with me and with other more knowledgeable members of my staff.

3. As far as I am aware no non-U.S. citizen was allowed access to any material classified higher than top-secret.

As I mentioned in my previous letter DRB did work with Wilbert Smith in testing his theories of ~~on~~ electrostatic magnetic propulsion. The results were negative. I am sure that these were discussed informally with Dr. Bush but I do not recall any formal report.

Yours sincerely

O. M. Solandt

OMS/jmj

August 14, 1947.

Dr. O. M. Solandt,
Defence Research Board,
Administration Building,
Ottawa, Canada.

Dear Dr. Solandt:

In the absence of Dr. Bush, permit me to acknowledge receipt of your good letter to him of August 11th. We are expecting Dr. Bush in Washington during the first week in September, when your letter will be promptly brought to his attention. From earlier correspondence, I know that Dr. Bush has in mind the visit of Sir Henry Tizard, but everything depends upon how many obligations will be confronting Dr. Bush when he returns. It should be possible for Dr. Bush to send you a definite answer before Sir Henry arrives.

With best wishes,

Sincerely yours,

F. G. Fassett, Jr.
Director,
Office of Publications.

August 27, 1947.

Dr. O. M. Solandt,
Defence Research Board,
Administration Building,
Ottawa, CANADA.

Dear Dr. Solandt:

Dr. Bush is still absent from Washington, but there was opportunity today to talk with him by telephone and tell him of your letter of August 11 with its information concerning plans for the visit by Sir Henry Tizard. Dr. Bush does not expect to return to Washington for some time yet and in order to avoid further delay in getting definite word to you he has asked that I express to you his regret that it will not be possible for him to come to Canada during the period of Sir Henry's visit. I know that he had looked forward to this possibility with keen anticipation and I am confident that it is a disappointment to him that matters have worked out in such a way that he will be unable to be with you.

Very truly yours,

Secretary to Dr. Bush.

September 12, 1947.

Dr. Carroll L. Wilson,
U. S. Atomic Energy Commission,
1901 Constitution Avenue,
Washington 25, D.C.

Dear Dr. Wilson:

I think you know of my extended absence from Washington this summer and that you will therefore excuse my belated but very sincere congratulations upon your degree from Williams College, about which I learned only today. You know, I feel sure, that I consider the honor to be richly deserved; in fact, I anticipate frequent reports of your participation in such affairs in coming years.

Cordially yours,

V. Bush.

and to be a little less formal—I think it is bully, and I'm delighted that the recognition came at the hands of Phinney Baxter. Welcome, as a fellow alumnus.

CARNEGIE INSTITUTION OF WASHINGTON
1530 P STREET, NORTHWEST
WASHINGTON 5, D. C.

OFFICE OF THE PRESIDENT

October 9, 1947.

Honorable James Forrestal,
Secretary of Defense,
Room 3E 714, Pentagon Building,
Washington 25, D.C.

Dear Mr. Secretary:

Now that I have been sworn in as Chairman of the Research and Development Board, I would like to set forth in this letter my thoughts as to the arrangements to be made concerning my compensation from the Government.

As you know, this appointment was offered and accepted in the light of my desire to continue as President of the Carnegie Institution of Washington, a non-profit scientific organization, with the understanding that I would be free to devote to each task as much of my time as is required for its appropriate accomplishment. Experience over the past year, under almost parallel circumstances, assures me that this can be done without neglect of either.

I understand that, as the duly appointed Chairman of the Board, I am entitled to receive the entire salary of $14,000 per year fixed by the statute, regardless of how much time I devote to my duties as Chairman. However, I would prefer not to accept compensation from the Government, except for the actual time which I devote to those duties.

In order to accomplish this result, and subject to your views, I would like to suggest that I keep a record of the work days which I do not devote to my duties as Chairman, and that I file with your office applications for leave without pay covering those days. Upon the basis of these applications, it should be possible to adjust my compensation so as to cover only those days which I devote to the Research and Development Board.

If some such arrangement can be worked out, I will then plan to receive compensation from the Government for the time devoted to my duties as Chairman of the Research and Development Board. I propose to request that my salary from Carnegie be reduced by a sum approximately equal to the amount I will receive as compensation from the Government.

Can you please advise me whether the above arrangements will be satisfactory from the standpoint of the National Military Establishment?

Transcribed 5/3/54 from notes of

October 17, 1949.

Dear General Vanderberg:

On September 20 I reported to you the results of examination of scientific data in connection with the atomic explosion recently announced. This review was made by a panel appointed by you consisting of Dr. Oppenheimer, Dr. Bacher, Admiral Parsons, and myself. This panel before it adjourned authorized me to write you to commend the excellent work done by the agencies involved, particularly by the group under your command.

I do this with great enthusiasm. I was much impressed not only with the foresight exhibited by AFOT-1 in recognizing the need for confirmation of its conclusions and for initiating in the short time available the very valuable confirmatory studies by Los Alamos, Naval Research Laboratory, and by our colleagues in the United Kingdom, but I was impressed also with the thoroughness and skill exemplified in the entire study, and the effectiveness with which it was presented. It was also evident that AFOT-1 by its excellent performance has secured excellent collaboration from such agencies as Tracer Lab Inc, Air Weather Service, U. S. Weather Bureau, Office of Naval Research, and Naval Research Laboratory. I hence take great pleasure on behalf of the panel in commending those involved for a remarkable and effective performance.

It is fortunate that the Air Force instituted this work early, and that it was pushed with thoroughness and skill. This is one undertaking which has most certainly paid out. Its opportunities are by no means over, it now has tasks which are altered but in my opinion not lessened in importance, and I trust its performance in the future will conform to the high standards which it has already set.

Cordially yours,

V. Bush.

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Librarian, Proj. Whirlwind, 211 Mass. Ave.
(Name of addressee) Cambridge, Mass (P. O. and State of address)

September 13, 1949.

Librarian, Project Whirlwind,
211 Massachusetts Avenue,
Cambridge 39, Massachusetts.

Dear Sir:

I have appreciated receiving the reports on Project Whirlwind, but, my governmental relationships having been terminated, my time is completely occupied with other matters and I find no opportunity to follow the Project interesting though it is. Hence I feel that my name should be removed from your mailing list, and I am returning enclosed the copies of reports Nos.15-19 inclusive which I find on my return from a recent absence.

Very truly yours,

V. Bush.

MEASURES FOR PROGRESS

A HISTORY OF THE NATIONAL BUREAU OF STANDARDS

REXMOND C. COCHRANE

Editorial consultant—James R. Newman

1966

NATIONAL BUREAU OF STANDARDS

U. S. DEPARTMENT OF COMMERCE

Term

GANO DUNN ..... 1923-[illegible]
President, J. G. White Engineering Corp., New York.

PROF. WILLIAM F. DURAND ..... 1924-[illegible]
Professor of mechanical engineering, Leland Stanford University.

DR. WILLIS R. WHITNEY ..... 1925-[illegible]
Director, General Electric Research Laboratory, Schenectady, N.Y.

DR. CHARLES F. KETTERING ..... 1929–34, 1947-[illegible]
Director of research and vice president, General Motors Corp.

DR. CHARLES L. REESE ..... 1930-[illegible]
Consulting chemist to E. I. du Pont de Nemours & Co.

MORRIS E. LEEDS ..... 1931-[illegible]
President, Leeds & Northrup Co., Philadelphia, Pa.

DR. KARL T. COMPTON ..... 1931-[illegible]
President, Massachusetts Institute of Technology.

DR. WILLIAM D. COOLIDGE ..... 1935-[illegible]
Vice president and director of research, General Electric Co.

DR. FRANK B. JEWETT ..... 1935-[illegible]
Vice president in charge of research and development, American Telephone & Telegraph Co.; president, National Academy of Sciences.

DR. VANNEVAR BUSH ..... 1942-[illegible]
President, Carnegie Institution of Washington; director, Office of Scientific Research and Development.

DR. HAROLD C. UREY ..... 1945-[illegible]
Research professor of chemistry, University of Chicago.

DR. EUGENE P. WIGNER ..... 1946-[illegible]
Metallurgical Laboratory, University of Chicago; director of research, Clinton Laboratories, Oak Ridge, Tenn.

DR. ROBERT F. MEHL ..... 1948-[illegible]
Director, Metals Research Laboratory, Carnegie Institute of Technology.

DR. DONALD H. MENZEL ..... 1949-[illegible]
Chairman, Department of Astronomy, Harvard University; associate director, Harvard Observatory.

DR. DETLEV W. BRONK ..... 1950-[illegible]
President, Johns Hopkins University.

PROF. JOHN H. VAN VLECK ..... 1951-[illegible]
Dean, Division of Applied Science, Harvard University.

DR. MERVIN J. KELLY ..... 1952-[illegible]
President, Bell Telephone Laboratories.

DR. CLYDE E. WILLIAMS ..... 1953-[illegible]
Director, Battelle Memorial Institute, Columbus, Ohio.

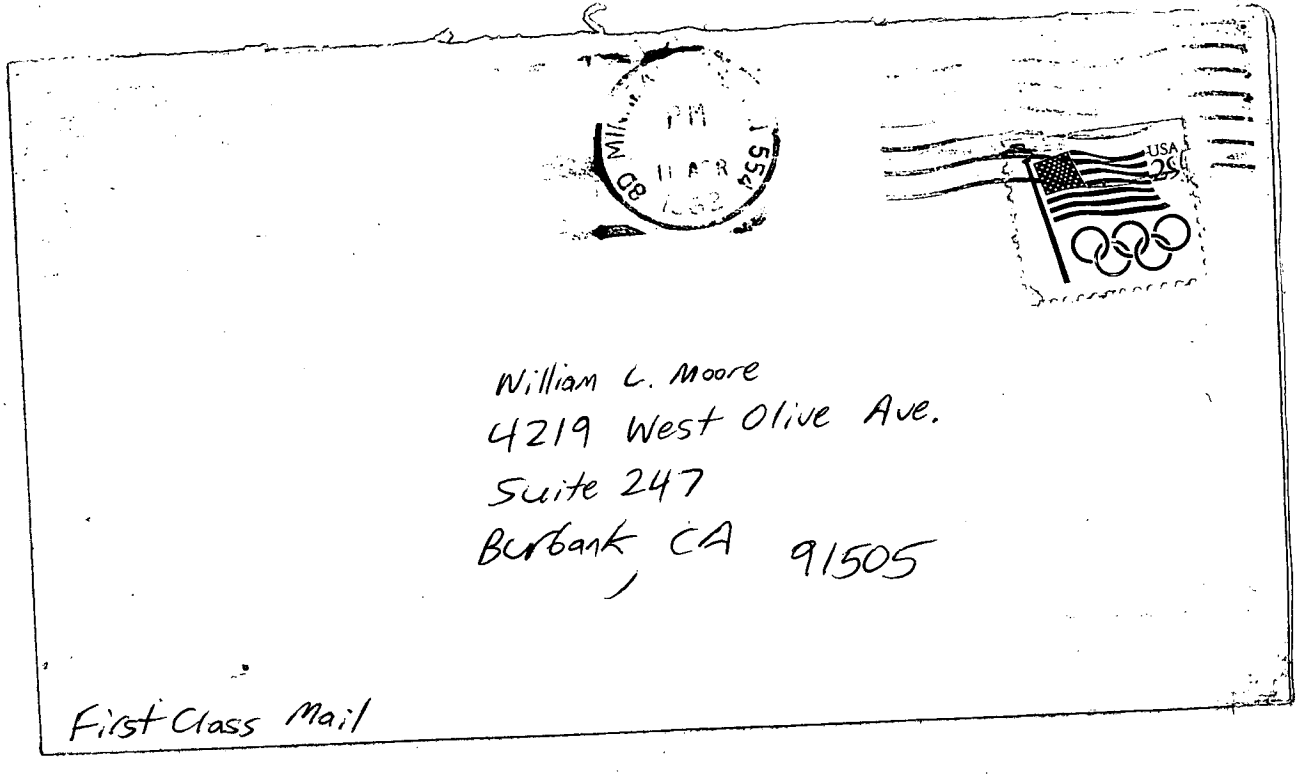
DR. CRAWFORD H. GREENEWALT ..... 1954-[illegible]
President, E. I. du Pont de Nemours & Co.

PROF. FREDERICK SEITZ ..... 1956-[illegible]
Chairman, Department of Physics, University of Illinois.

DR. LLOYD V. BERKNER ..... 1957-[illegible]
Scientific research administrator; chairman, Space Science Board, National Academy of Sciences.

PROF. CHARLES H. TOWNES ..... 1960-[illegible]
Department of Physics, Columbia University, consultant, Brookhaven National Laboratories.

MILLIONS OF DOLLARS



William L. Moore
4219 West Olive Ave.
Suite 247
Burbank CA 91505

First Class Mail

CARNEGIE INSTITUTION OF WASHINGTON
1530 P STREET, NORTHWEST
WASHINGTON 5, D. C.

OFFICE OF THE PRESIDENT

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c7—16—19433-8 GPO

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(Name of addressee) (P. O. and State of address)

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Cordially yours,

V. Bush.

July 17, 1947.

General Carl Spaatz,
Room 3E 1020, Pentagon Building,
Washington 25, D.C.

Dear General Spaatz:

Your letter of July 7 to Dr. Bush, in reply to his letter to you of June 25, did not reach this office until today. Dr. Bush is now away from Washington and does not expect to return until early September, but I am forwarding a copy of your letter to his present address on the chance that he may have opportunity to reply before he starts a journey to the Pacific Coast.

Very truly yours,

Secretary to Dr. Bush.

CONFIDENTIAL

HEADQUARTERS, ARMY AIR FORCES
WASHINGTON

PLY REFER TO:

7 July 1947

Dr. Vannevar Bush, Chairman
Joint Research and Development Board
1712 G Street N.W.
Washington 25, D. C.

Dear Dr. Bush:

I have received your letter of June 25, 1947, enclosing a copy of a letter from Dr. Berkner to you concerning the approach of the Armed Forces, and particularly the Air Forces, to our future research and development program.

I very much appreciate both yours and Dr. Berkner's comments in these respective letters. I agree that the problems before all of us are of extreme importance to the future of our research and development programs and, in turn, to the welfare of the nation, and that between us we must use all of our ingenuity to arrive at a satisfactory and workable solution to the problems raised by Dr. Berkner. However, he has raised the question as to the advisability of the Air Engineering Development Center and as to whether or not this is an effective method of assisting in carrying out the Air Forces' research and development program. It would appear to me in reading Dr. Berkner's letter that he may not fully understand the purpose and use of the facilities now in existence at Wright Field and those proposed for the A.E.D.C. I would like to say that our installations at Wright Field are not, and never have been, considered to be fundamental research laboratories. The funds received by the Air Forces for research and development purposes are expended totally with industry, commercial research laboratories and educational institutions, except for personnel, small amounts of materials for the repair of experimental airplanes and equipment and for maintenance of our facilities, to carry out research and development projects.

At Wright Field, we do not nor have we ever tried to carry on fundamental research. We cannot do this for many reasons, among which are that we cannot compete with industry as a whole due to lack of funds and qualified personnel, and because we also believe it is good policy to encourage industry and the educational institutions to do this work for us. In carrying out our research and development programs, we try to set up requirements and specifications to meet our needs and present these requirements to industry to produce the equipment we require. Upon receipt of the equipment, we use the facilities at Wright Field to test this equipment to determine whether or not it meets our requirements, and to assist in the development of the equipment mutually with the initial contractor. For instance, in our wind tunnel, we test full scale engine nacelles to

CONFIDENTIAL

ADDRESS REPLY TO: COMMANDING GENERAL, ARMY AIR FORCES, WASHINGTON 25, D. C.

Letter to Dr. Bush

determine proper air flow characteristics, cooling requirements, etc. In our Engine Laboratories, we test full scale engines to determine whether or not they meet our power and mechanical endurance requirements. This is true throughout our laboratories to a very great extent. Wright Field was started in the middle '20's and in building the facilities, we tried to look forward into the future as far as we could to determine the size and capacity of the various testing equipments which would be needed by the Air Forces. In many cases, these facilities are no longer of a sufficient capacity to meet the present requirements or those foreseen within the near future.

This really is the basis behind the requirement to develop the Air Engineering Development Center, not only to meet our needs but also those of industry. We cannot afford to build large test facilities at contractors' plants. The A.E.D.C. has never been considered as a fundamental research center. It is to be a development and evaluation test facility. It is not a duplication of Wright Field, although most of the facilities contemplated in A.E.D.C. will be similar in purpose but will be built to enlarge the out-grown capacity of many of the Wright Field installations. The usefulness of the Wright Field installations will in no way be decreased by the new A.E.D.C. facility and are being continually modified to keep pace with AAF test require-ments; however, space, power and water requirements have reached the limits of the area.

The A.E.D.C. program has been carefully considered over the last two years and has met the approval of the Aeronautical Board and the Committee of Aeronautics of the J.R.D.B. The wind tunnel portion of A.E.D.C. has also met the approval of N.A.C.A. and two sub-committees of N.A.C.A. which included members of industry. The wind tunnel projects fall within the National Pro-gram of Transonic and Super-sonic Wind Tunnels. I feel that the project has been completely coordinated by all interested agencies, and although perhaps not perfect in every detail, it appears to me to be reasonable and practical. The Joint Research and Development Board approval of the program would enable the project definitely to get started. It must be assumed that an intelli-gent review of the entire construction program will be continuously carried out by the AAF and that corrections, when required, will be made.

The problems raised by Dr. Berkner with respect to research and develop-ment organizations of the Services are very far-reaching and are subject to many opinions as to methods of implementation. To await a complete agree-ment on them before the initiation of the A.E.D.C. facilities or any other thoroughly coordinated research and development program, would probably delay all of our development programs for such a long time as to have very serious consequences to our national security.

Letter to Dr. Bush

It is my hope that the Joint Research and Development Board will see fit to pass favorably upon the Air Engineering Development Center program, as revised finally by the Board, within the very near future.

Sincerely,

Hoyt S. Vandenberg

for CARL SPAATZ
General, U. S. Army
Commanding General, Army Air Forces

BOEING AIRPLANE COMPANY

WICHITA DIVISION

WICHITA 1, KANSAS

Cable Address:
BOEINGAIR

July 10, 1947

In Reply Refer to
JES:cw

Lt. Gen. N. F. Twining
Commanding General
Air Material Command
Wright Field, Dayton, Ohio

Dear Nate:

I have just learned that you, General Craigie and Colonel Shephard were contemplating a trip to the west coast. I wondered if your itinerary would be such that you could stop off in Wichita for a brief visit, if not over night. On several occasions recently you have expressed an interest in stopping off here whenever the opportunity presented itself. Would this trip to the west coast present such an opportunity? We would be delighted to have you either on your outgoing or return trip. I just want you to know that the latch string is still out. We expect to fly the XL-15 next week. It is at the other end of the scale from the B-50 and might offer something of interest by way of contrast, if nothing else.

Best regards and good wishes always.

Sincerely yours,

Vice President

JESchaefer:cw
cc: Gen Craigie
MPCrews
Sebac

88

BOEING AIRPLANE COMPANY

WICHITA DIVISION

WICHITA 1, KANSAS

July 10, 1947 17 July 1947

JES:cw

Dear Earl:

I have received your letter in which you asked us to drop by at Wichita for a brief visit. With deepest regrets we had to cancel our trip to the Boeing factory due to a very important and sudden matter that developed here. All of us were considerably disappointed as Mr. Allen had planned a very fine trip for us; however, we hope to go out at a later time. Will remember your invitation and get out to see you just as soon as we can, as I am very anxious to see the XL-15.

I have been away quite a bit the last couple of weeks so have not had a chance to submit any information to you that you asked for in your round robin letter. I will get on this very shortly.

Best regards,

N. F. TWINING
Lieutenant General, U.S.A.

P.S. Unification looks like a sure thing now.

Mr. J. E. Schaefer
Boeing Airplane Co.
Wichita, Kansas

August 14, 1947.

Dr. O. M. Solandt,
Defence Research Board,
Administration Building,
Ottawa, Canada.

Dear Dr. Solandt:

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Director,
Office of Publications.

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Administration Building,
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Cordially yours,

V. Bush.

and to be a little less formal—I think it is bully, and I'm delighted that the recognition came at the hands of Phinney Baxter. Welcome, as a fellow alumnus.

COPY September 16, 1947.

General Carl Spaatz,
Room 3E 1020, Pentagon Building,
Washington 25, D.C.

Dear General Spaatz:

I seem to be in the position of an exceedingly interested intermediary in a discussion between you and Dr. Berkner. But the point that he brought up in his letter of June 25, 1947, and which is treated in your letter of July 7, seems to me of such central importance that further discussion is well worth while.

As I indicated in my first letter on this matter, having received a letter from Dr. Berkner in which there was criticism of the Air Forces, I took the subject up directly and personally with you, and did not place the correspondence before other members of the Board, and I believe that continuance on the subject can best proceed in this personal manner. It is true that the Board will need to consider this very point, and that it is a problem before every member in one way or another, but I believe that when it is there raised it should be on a general basis and not on a basis which involves the methods or procedure of one department particularly.

I showed your reply of July 7 to Dr. Berkner on his return from a rather extended vacation. He has now given me a memorandum in reply, a copy of which I attach to this letter. This memorandum places the subject on a somewhat more general basis and I find myself thoroughly in agreement with the central point, which is that there is a serious problem in addition to coordination and planning among interested agencies, namely the critical evaluation of programs within the Services where they are developed. I also believe that he is on sound ground when he states that much of the delay and difficulty which has occurred in connection with the facilities program of the Air Forces during the past year has come about by reason of a general feeling on the part of others that this critical evaluation had not been made to an adequate extent. Certainly such a feeling has been in my own mind as I have approached the problem at various times.

COPY

It is an entirely different question as to how the lack in this regard can be overcome, not only within the Air Forces, but also more generally in the military establishment. On this aspect of the subject I believe that you and I ought to have a thorough discussion at some time, however, for I am decidedly interested, and I will be very happy indeed if any suggestions of mine in this regard prove to be in any way helpful.

Cordially yours,

V. Bush,
Chairman.

COPY

September 15, 1947

Memorandum for Dr. Bush

I appreciated the opportunity to read General Spaatz's reply to my letter.

General Spaatz's letter illustrates as neatly as possible the point I endeavored to make in my original communication to you. He points out that, since the AERO Board, the NACA, and the AERO Committee of JRDB had "approved" AEDC, its plan must be good.

But approval by these agencies implies only the elimination of duplication and the coordination of planning among interested agencies. This approval is not a certification of excellence in conception or planning. No agency but the Air Force has the money, authority, or potential manpower to organize and execute a sound, productive, and creative program of air-force research. If the organization of their planning is faulty, AERO Board, JRDB, or no one else can correct it.

It seems imperative that the Services develop, through sound organization of their planning, the critical ability to evaluate their plans for research and development. It should be demonstrable that the adverse consequences of achieving a necessary end have been minimized by the recognition and critical analysis of those consequences.

In the case of AEDC I simply asserted that this critical evaluation had not been made. That this was so for such a tremendously important national proposal seemed a clear reason for questioning the organization behind the planning. Carelessness in this kind of planning might easily lead to the diversion of our available resources to the detriment of all that was new and promising. I concluded, therefore, that it was urgently necessary to reorganize military research administration and planning on a strong, authoritative, and able basis.

I have never thought that the necessary parts of AEDC should be delayed until the research and development administration of the Services is reorganized. I believe that the delay already experienced is simply the result of a need for a sound and reasonable plan on the part of the Air Forces for proceeding with the most urgent parts of the program.

(signed) L. V. BERKNER

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Folder entitled: Eyes Only-General Twining

CLASSIFIED

✓ **(TS) Eyes - Only. Memo for Gen T. fr Robert Cutler, Spec Asst to the President dtd 13 July 1953, subj: Re NSC Mtg. Orig cy only.**

✓ **(TS)**

✓ **(TS) Memo for Sec/Def fr Robert Cutler dtd 25 Jun 53. typed cy. subj: (re NSC Mtg).**

✓ **(TS) Eyes-Only. Memo for Record fr Gen White. cc. to Gen T. cy 2 of 5 cys Series A. dtd 2 Sep 54, subj: (U) Exchange of Information.**

✓ **(TS) Eyes-Only. Memo for C/S, USAF fr Adm Radford. cy 4 of 5 cys dtd 7 Jun 54 w/att brief statement, subject: (U) Re JCS Mtg.**

✓ **(TS) Memo for Clymn, JCS dtd 9 Jun 54 fr Gen Ridgway. cy 2 of 5 cys. subj: (U) FPTATRD.**

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Cont 1

DAILY LOG - GEN. TWINING

Tuesday - 18 Nov '52

09:00	Gen. Craigie
09:10	Gen. Maude
09:55	Gen. Partridge, ARDC
10:00	Armed Forces Policy Council (until 11:10)
11:40	Gen. S. Smith
12:00	Presentation of Harmon Tropy at White House
14:30	Conference w/ Secretary - Public Works
15:05	To Mr. Lovett's office -- Gen. Eisenhower
16:50	Col. Begg (effect of budget cut on AE Program)
20:00	Canadian Embassy - Farewell party for AVM and Mrs. Hugh Campbell.

notes:

(1) Regretted luncheon by Pan Am Airways in honor of Capt. Charles F. Blair, Jr., Mme. Jacqueline Auriol, Lt. Carl Seiberlich following the award to them of the International Harmon Trophies for 1952 by the President.

Cont. 3

Twining

CHIEF OF STAFF'S DAILY LOG

Thursday, 15 July 1954

08:45	Arrived
09:00	General Burns
09:30	Air Council (until 11:45)
11:45	General Ogle (Reporting in as Surgeon General)
12:00	General McConnell (SAC)
13:00	Lunch at White House
14:30	To Burning Tree (Mr. Sweetser and Mr. Joe Barr)

PM

6:30	Reception at Admiral and Mrs. Carney's (Naval Observatory - Garden)

CHIEF OF STAFF'S DAILY LOG

Friday, 16 July 1954

08:30 Arrived

09:00 General Burns

10:30 General K. B. Wolfe

11:00 JCS briefing (until 11:55)

11:55 General Burns

12:25 Lunch (until 13:00) (Returned w/Gen Burns)

13:30 Colonel Strom Thurmond (President of Reserve Officers Association) -Admiral LaBarge and Colonel Boyer

14:00 JCS (until 16:15)

18:00 Departed

PM

7:00 Buffet - Libyans (Shoreham - Black Tie)

Saturday, 17 July

13:30 Burning Tree (Mr. D. M. Patrick, Mr. Douglas, Mr. Howells)

PM

	FROM	OCCASION	DATE 54
	Comdr, TTrng Wing, Keesler	Ceremony for B/Gen Kirkendall	31 Jul
	George Washington University	Convocation for Pres of Korea	30 Jul
	Carter McGregor	Visit Wichita Falls	Jul
	Rhea Howard	Visit Wichita Falls	Jul
	H. W. Fillmore	Visit Wichita Falls	Jul
	Lloyd C. Thomas, Mayor	Visit Wichita Falls	Jul
	Lyndon B. Johnson	Visit Wichita Falls	Jul
	Frank Ikard	Visit Wichita Falls	Jul
A	Sec. Wilson	Luncheon for Mr. LeBaron	29 Jul
A	Sec. Wilson	Luncheon for Dr. Hannah	28 Jul
R	R. J. Hofmann	Visit Cheyenne's Frontier Days	Jul
A	Norman K. Haig	Aviation Exposition of Aero Club	24-25 Jul
R	Russell W. Nichols	World Championship Model Plane Comp.	24-26 Jul
R	Col Everett H. Ware	Posthumous award to Mrs. Dean L.Ray	22 Jul
R	Col Peter W. Agnell	Tops in Blue show at Bolling	19 Jul
R	Benjmn Ourisman	Military Service Day	19 Jul
R	Cong Judd of Minnesota	Aquatennial Celebration	17-21 Jul
A	Sec Wilson	Luncheon for Field Mar Alexander	16 Jul
R	Col J.A. Gunn	AFROTC graduation at Bryan AFB	16 Jul
R	Resv. Officers Association	Cocktail party for Col Thurmond	15 Jul
	E. H. Chamberlin	NACA meeting	15 Jul

NO	FROM	OCCASION	DATE 54
~~20~~ R	John P. Biehn	25th Anniv of Port Columbus	11 Jul
23 R	Paul R. Younts	Air Nat'l Guard Open House	10-11 Jul
24 R	Gordon W. Roseleip	36th annual conv. of Amer.Legion	16 Jul
25 R	M/Gen Mohammed Rafig Arif	Dinner	12 Jul
26 R	W. Earl Hopper	Ceremony for volunteer firemen	5 Jul
27 R	Hon. John P. Saylor	Speaker at Amer. Legion Week Celeb.	4-10 Jul
28 R	John E. Holden	Ground breaking ceremony at Portsmouth Municipal Airport	3 Jul
29 R	CWO Donald V. Seewoster	Premiere of film in St. Louis	2 Jul

Evening Box 36 9/11/84
Official Engagements

CHIEF OF STAFF"S DAILY LOG

Monday; 19 July 1954

08:40	Arrived
09:00	Secretary's Office (until 09:30)
09:30	Air Council
10:30	To White House (until 11:25)
12:30	To lunch with Secretary in Brown Room. Also Mr. Lewis, Mr. Gardner, Generals Everest, Briggs, Burns and Mills (until 13:30)
14:30	General Chang, Korean Air Attache (to say goodbye)
15:20	To Mr. Douglas' office
16:00	JCS (until 17:30 - Returned w/Gen Everest)
17:45	Departed

PM

8:15	Dinner - Ambassador and Lady Makins honoring Lord Alexander

COPY

DECLASSIFIED

TOP SECRET
Security Information

June 25, 1953

MEMORANDUM FOR THE SECRETARY OF DEFENSE:

1. The President has asked me to send to you the following directions relative to certain National Security Council matters.

2. It is now planned to hold (a) a special meeting of the Council at 12 o'clock on Tuesday, July 14, to consider budgetary matters relating to Fiscal Year 1955, and (b) an extraordinary all-day meeting of the Council on Thursday, July 16, relative to Project Solarium.

3. The President directs that there be in attendance at both of these meetings the newly-appointed Joint Chiefs of Staff, whether or not all have formally taken office, and the Secretaries of the Army, the Navy, and the Air Force.

4. It is the President's intention, prior to the July 14 meeting, to deliver to the newly-appointed Joint Chiefs of Staff a directive relative to matters to which he wishes them to give urgent and full-time consideration for such period, prior to their undertaking their new responsibilities, as may be necessary (presumably not less than a month).

5. The President further directs that you arrange the duties of these officers so that, beginning in early July and prior to undertaking their new responsibilities, they can for the above-mentioned period together give full-time, uninterrupted attention to the matters covered in the above mentioned directive. It is the President's express wish that during this period these officers be freed from all other duties.

/s/ ROBERT CUTLER
Special Assistant
to the President

Distribution: Wilson 2
Nash 2
Lay 1
Koons 1
President's file 1

DECLASSIFIED TOP SECRET
Security Information

THE WHITE HOUSE
WASHINGTON

July 13, 1953

file

heavy bond
blue ink
fold
marquette
EO
TSSI

MEMORANDUM FOR GENERAL TWINING

The President expects you to attend the Extraordinary Meeting of the National Security Council in the Broadcast Room of the White House, Thursday, July 16, at 9:00 A.M. The program will be explained in detail at the meeting. It is advisable not to plan any other engagements before 6:00 P.M. on that day.

Due to the nature of the Meeting, it is necessary to take special security precautions and to maintain absolute secrecy regarding participation in, as well as the substance of, the Meeting. It is requested that you enter the White House grounds via the Southeast Entrance not later than 8:45 A.M. and descend from your car at the South (Diplomatic) Entrance of the Mansion. Your car should be discharged and not wait anywhere in the vicinity of the White House.

The President expects you to lunch with him at the White House at 12:30 P.M.

In order to avoid communication on this subject, it is understood that in the absence of contrary word your concurrence in the above arrangements is assumed.

fold
can feel pencil on back

Robert Cutler
ROBERT CUTLER
Special Assistant
to the President

on Eagle watermark 4☆

EYES ONLY
DECLASSIFIED

TOP SECRET
DECLASSIFIED
Security Information

[redacted]

Bruce Maccabee 91/1 JTF ①

CUTLER-TWINING MEMO EXAMINATION SEPT. 16, 1987 (WITH R Swiatek)

CERTAINLY IS CARBON COPY: PRINT IS RATHER FAINT AND BROADENED (FAT) COMPARED TO THE SHARPNESS OF TYPED CHARACTERS ON ORIGINAL (TOP) SHEETS OF OTHER MEMORANDA. COLOR IS A "FADED" BLUE.

Folded into three parts. Note slight breaks along right edge at fold. Folds tended to "break" the paper along the crease, but there is no actual tear in the paper except the very slight tears at the right edge. Fold easily seen at back as "raised" above the level of the paper. Could this have been lying flat for years and still have such a well defined fold?

Comparison of the original doc. with my Xerox copy of Jan 12, 1987 shows that the Xerox copy has shows the right edge and THE BREAKS AT THE CREASES LINE UP AND EVEN APPEAR THE SAME SHAPE. ERGO, it was folded before I looked at it, but I didn't note that fact. A very faint horizontal line on my Xerox between MEMORANDUM... and SUBJECT.. also matches the upper fold line. Lower fold did not make an impression on the Jan 87 Xerox copy.

Note that the right edge of the Jan 87 Xerox copy has a darkness gradation. This matches the change in color, i.e. increased yellowing of the paper as you move from within the paper outward to the edge. Yellowing is obvious and uniform around all four edges from the edge to about 1/8" inward, and the gradation of yellow increases to a maximum at the edge. This suggests that it was in a stack that was vertical and thus uniformly exposed to air around the edges of the paper. The whole paper looks slightly yellow as compared to fesh white paper.

Dictation Onion Skin by Fox(?).

Line across the security mark is red.

Top Sec. Rest. Sec. Info is typed on.

The blue ink is not bright but rather faded and the impressions are not dense.

Looking at the back don't see print through except very slight print through of the period following the last word of the memo. However, I have seen more print through on other guaranteed carbon copies. Dots are not "punched out."

Swiatek points out that the word "scheduled" has a double print. There is a faint d (?) "underneath" the first e. It appears that the typist typed "schduled" and then retyped, but Swiatek points out that the e is slightly to the right of position and hits the m when "em" occur.

before Moore and Shanders got to see it.

(2)

Reese points out the folds in the C-T memo are precise and well defined. This impressed him. He doesn't remember noting it being folded. Said there were several Archives people who looked and none referred to the fold.

Note: the red line over the typed classification is typical of other declassification markings on other documents in the file. This suggests, but dies not prove, that the document was in the file before the declassifier went through with the red pencil.

(Released by Nat Archives)

(4)

MY COPY OF B. Moore's Copy

July 14, 1954

TOP SECRET RESTRICTED
SECURITY INFORMATION

MEMORANDUM FOR GENERAL TWINING

SUBJECT: NSC/MJ-12 Special Studies Project

The President has decided that the MJ-12 SSP briefing should take place during the already scheduled White House meeting of July 16, rather than following it as previously intended. More precise arrangements will be explained to you upon arrival. Please alter your plans accordingly.

Your concurrence in the above change of arrangements is assumed.

19mm ← 26mm

edge of the window in the Archives copy

ROBERT CUTLER
Special Assistant
to the President

NND 857013

Box 88

(3)

This is a copy of my Jan '87 copy

My copy has a faint line here that matches the location of the fold

July 14, 1954

~~TOP SECRET~~ RESTRICTED
SECURITY INFORMATION

location of fold in memo

MEMORANDUM FOR GENERAL TWINING

SUBJECT: NSC/MJ-12 Special Studies Project

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Your concurrence in the above change of arrangements is assumed.

← 19mm →

location of break in paper caused by crease

← 39.5mm →

edge of "window" of Archives copy machine

ROBERT CUTLER
Special Assistant
to the President

location of fold in memo

edge of "window" of Archives copy machine

location of break in paper caused by crease

Edge of Cutler-Twining Memo

CONFIDENTIAL
SECURITY INFORMATION

THE WHITE HOUSE

WASHINGTON

May 6, 1953

Dear Van:

Thank you for your recent letter and the proposed names. We are going to take this matter up at an informal staff meeting this week.

There seems to be a good deal of enthusiasm for making the maximum utilization of the National Science Foundation. Dodge was given a copy of the memorandum; other copies of it I sent to Flemming and Kyes. I was going to try to pull together a meeting of Cutler, Flemming, Hauge and the NSF.

At the weekly meeting in Flemming's office today, there was not much enthusiasm expressed for a scientific adviser in the White House. Everybody seemed to think it would be better to use the National Science Foundation.

Sincerely,

ROBERT CUTLER
Special Assistant
to the President

Dr. Vannevar Bush
Carnegie Institution of Washington
Sixteenth and P Streets, N. W.
Washington, D. C.

CONFIDENTIAL
SECURITY INFORMATION

December 2, 1952.

Rear Admiral Sidney W. Souers,
Wardman Park Hotel,
Washington, D.C.

Dear Admiral:

Once in a while an award of a medal excites my enthusiasm. This certainly happened this morning when I read the New York Times, for if anyone ever earned recognition for his work in the government you certainly have.

My hearty congratulations! Your many friends about town I know all rejoice with me that this graceful recognition has come to you.

Cordially yours,

V. Bush.

THE WHITE HOUSE
WASHINGTON

March 25, 1955

Dear Van:

Your letter of March 21, 1955, is one of those which I have cared for the most at this time of my departure, and which I shall treasure very much.

You have always been one of the people set apart in my mind as a great contributor to our country. I, too, have regretted that we have not had more opportunities to work together. It would have made my lot easier to have had more opportunities to counsel with you. It would not make any difference that we did not always agree, for often disagreement on matters of importance, rather than petty matters, are what bring people closer together.

I am sure that you do understand the regard and affection in which I hold you.

Sincerely yours,

ROBERT CUTLER
Special Assistant
to the President

Dr. Vannevar Bush
President
Carnegie Institute of Washington
1530 P Street, Northwest
Washington 5, D. C.

LANGLEY AERONAUTICAL LABORATORY
LANGLEY FIELD, VA.

AMES AERONAUTICAL LABORATORY
MOFFETT FIELD, CALIF.

LEWIS FLIGHT PROPULSION LABORATORY
CLEVELAND AIRPORT, CLEVELAND 11, OHIO

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

1724 F STREET, NORTHWEST
WASHINGTON 25, D. C.

TELEPHONES: EXECUTIVE 3515, 3516, 3517

November 10, 1948

To General Hoyt S. Vandenberg, USAF
Member, National Advisory Committee for Aeronautics.

Dr. Karl T. Compton, the new Chairman of the Research and Development Board, of the National Military Establishment, took the oath of office as a member of the National Advisory Committee for Aeronautics on November 9, 1948, succeeding Dr. Vannevar Bush, resigned.

Sincerely yours,

J. F. Victory
Executive Secretary.

11/10

File

THE WHITE HOUSE

WASHINGTON

December 5, 1952

Dear Van:

Many thanks for your very kind and thoughtful note. Praise from such an outstanding public servant who has contributed so much to the national security of our country is greatly appreciated.

With kindest regards and best wishes,

Sincerely,

SIDNEY W. SOUERS

Dr. Vannevar Bush, President
Carnegie Institution of Washington
1530 P Street, N. W.
Washington, D. C.

March 10, 1953.

Dr. Lloyd V. Berkner,
Associates Universities, Inc.,
350 Fifth Avenue,
New York 1, N.Y.

Dear Lloyd:

Before I went to Florida last month I had opportunity to pass to Bobby Cutler the copy of your talk to the War College and I believe it will serve a useful purpose. If I find need for a copy personally I will let you know.

I have held off from meeting with the Kelly committee while they are concerned with the technical aspects of their problem, but I have told Bob Wilson that when they come to the point of formulation I will be glad to be of such help as I can.

As matters are now developing it seems that the armament report is going to get some real attention; at any rate I am encouraged to believe that it will.

Cordially yours,

V. Bush.

October 23, 1953.

Mr. Lloyd V. Berkner,
Associated Universities, Inc.,
350 Fifth Avenue,
New York 1, N.Y.

Dear Lloyd:

Thanks for the copy of your speech, which I will read at once. I am enclosing a copy of the thing I gave in New York the other night. I am quite sure that this is not one of my best speeches, but nevertheless you may find points of interest in it.

In the speech I made one comment about the American tendency to talk too much about technical affairs and thus benefit the enemy. I put this in in order to make it clear that in urging more candor with the American people I did not mean the revelation of technical secrets. So I went on to say that any withholding from the American people of facts well known to the enemy was a very short-sighted policy likely to lead to serious trouble. Of course the press picked up the first and left out the second, and hence I judge a good many of my friends wonder just what I was driving at.

There is something moving of course, just how much and how I do not know. But there is also a mounting pressure in the country toward insisting that something really be done. I hope the President is going to tell the people something about it. If he does not, then when Congress comes in they are likely to run away with the ball. In fact Saltonstall's committee is already studying into it and I suppose I will be talking to Saltonstall about this before very long. If properly handled, as I am rather sure it would be in the hands of Saltonstall, this could be a very salutary thing. The executive branch needs to be prodded, and Congress is the proper agency to apply the prod. So my speech was primarily an argument for doing this in a constructive and decent fashion. Of course I think, as you know, that we will not really get going on this whole affair in a sensible and rounded fashion unless we get a North American Theatre Defense Command under a good strong officer and with lots of support from the President. Whether we are going to get this or not is highly questionable at the present time.

Cordially yours,

January 26, 1953.

Dr. Lloyd V. Berkner,
Associated Universities, Inc.,
350 Fifth Avenue,
New York 1, N.Y.

Dear Lloyd:

Thanks for the copy of the speech, which I will proceed to read with care. No doubt you have gotten this treatment or its equivalent before Merwin Kelley's committee and will back it up in discussions with them. I was going to meet with the committee yesterday, but they postponed this, which is just as well, for they are digging into technical matters at the present time where I certainly cannot help them much. Later on I may be able to be of some aid in ensuring that their conclusions get the right kind of attention. I hope they will do a thoroughly good job and it certainly is a very strong committee.

The panel that Acheson appointed on limitation of armaments has finished its work. We put in a final report to Acheson which also goes to Dulles, and it treats of some of this same subject matter at one point. I believe this will help, if Dulles has a clear idea of the matter when it comes to the Security Council. Taking everything together, it now looks as though something constructive might happen, and it is about time.

Cordially yours,

V. Bush.

Later.— I've read it. Swell talk! Will Bobbie Cutler, for example, see it? Can I help in getting attention to it?

BOHEMIANS IN EXILIO

Washington, D. C.
November 18, 1947

Your Excellency:

As most of those to whom this letter goes have already been forewarned, the members of Bohemia (and such former Encampment guests as can be corralled) who find themselves in unhappy exile in these benighted parts propose to foregather for an "Afterglow" at 5:30 P.M. on the evening of Thursday, December 11, 1947, at the Burning Tree Country Club, there to pour libations to the gods of the forest, to bury for the nonce the body of Dull Care, and to dedicate in song and fellowship

THE POTOMAC THICKET OF BOHEMIA'S WOODS.

We want you with us on that occasion. Don a "black tie" if you must, but if you do you will be alone, for the correct costume of the evening will be that of The Grove and The Encampment. (A prize to him whose togs are most appropriate!)

There will be plenteous libations and generous slabs of juicy steak, -- not to mention the feast of wit and wisdom over which our Sire of the evening, the ebullient "Ed" Goodrich, will preside. The cost will be $15.00 per person, and if there is anything left over (which seems highly dubious) we promise that it will be used as a "kitty" to foster future gatherings of a similar nature.

Whether or no you can be present, please fill out the enclosed card and mail it at once. We must know your intent as soon as possible.

And may Bohemia's joys be yours.

Carl I. Wheat
Spear Carrier pro tem.

WAR AND NAVY DEPARTMENTS
ARMED FORCES SPECIAL WEAPONS PROJECT
P. O. BOX 2610
WASHINGTON, D. C.

IN REPLY REFER TO:

3 October 1947.

Dr. V. Bush
Room 301
1530 P. Street, N.W.
Washington, D.C.

Dear Dr. Bush:

When I saw the announcement in the papers of your appointment, I had only one feeling which has become stronger as the days go by—the country is to be congratulated on your appointment and upon your willingness to serve.

Sincerely yours,

L. R. GROVES,
Major General, USA.

REMINGTON RAND INC.
Laboratory of Advanced Research
South Norwalk, Connecticut

April 2, 1948 April 5, 1948.

Lieut.
~~Major~~ General Leslie R. Groves,
Laboratory of Advanced Research,
Remington Rand Inc.,
South Norwalk, Connecticut.

Dear Leslie:

It is very pleasant indeed to hear from you and to know that you are so pleasantly located. I have no doubt at all that it is a great relief and I wish that I too could be free from governmental responsibilities. You and I had quite a drag, and while my way was a bit smoother, nevertheless I do feel the inclination to get onto other things.

Thanks for sending the pictorial history. I have no doubt I will find it decidedly interesting.

You are located in Connecticut fairly close to a friend of mine I think you know, Caryl Haskins, who has a place in Westport. I drop in on him sometimes when I am motoring through and you and he may possibly get together since you are close by.

I think you will be interested to know that the medal business is finally straightened out. I kept out of the thing because I felt that the OSRD group had not been properly recognized. This has now been corrected and there is quite an OSRD list that has gone through and the awards will be made shortly. That being the case, I am going to take one next month. So we now have that chapter closed out, and now reasonably,

My best wishes, and I will look forward to seeing you.

LAG:rtk

Cordially yours,

July 9, 1947.

I hope very much indeed that you may be successful in persuading Dr. Dryden to accept the post of Director of Research of NACA. As I remember it, this matter is to come up shortly and as I am just now going on vacation I wish that you would, if the matter comes before the members of NACA during my absence, speak for me my confidence in Dryden and my feeling that he is the man for that post. I have not believe he is just

Dr. J. C. Hunsaker,
Massachusetts Institute of Technology,
Cambridge 39, Massachusetts.

Dear Jerry:

At the meeting of the Joint Research and Development Board yesterday certain rearrangements were made in connection with committee personnel, and one of these, I am sure, is a matter of considerable interest to you. Dr. Berkner has been relieved as Executive Secretary in accordance with the arrangement that was made with him when he took on the post, and he has been succeeded by Dr. Hafstad, who I am sure is going to be very helpful. At the same time, Dr. Lovett, on becoming Under Secretary of State, resigned with some reluctance from our Aeronautics Committee. In order to fill the gap, Dr. Dryden, with the approval of all concerned, has been transferred from his membership on the Guided Missiles Committee to membership on the Committee on Aeronautics. Dr. Clark Millikan has replaced Dryden. Both Dr. Hafstad and Dr. Millikan were on the Panel of Consultants on the guided missiles program, but that body has completed its immediate assignment.

I thought that you would be particularly interested in the change in the Committee on Aeronautics, for I feel sure that Dr. Dryden will bring great strength to that Committee. You and I have discussed once or twice the possibility that he might succeed Dr. George Lewis as Director of Research of NACA, because of a transfer of Lewis to the status of Consultant. It seems to me that if this occurs the relationships are entirely reasonable with the Board, there will be two men from NACA, namely Dr. Wright and Dr. Dryden, having membership on the Committee on Aeronautics, but I am sure that there will be no objection on anyone's part to the fact that the NACA in addition to its regular representation on that body became more completely connected with its affairs in this manner. It would, in fact, I am sure, strengthen the Committee, for while Dr. Dryden and Dr. Wright are both very distinguished men in their profession, they represent two important approaches, one primarily from the engineering side, and the other primarily from the standpoint of research, and I believe that it would be salutary to have both of these points of view present in the Committee. Incidentally, Dr. Rowe, Chairman of the Committee on Aeronautics, cordially welcomes the new arrangements.

November 21, 1952.

General J. H. Doolittle,
Office of the Chief of Staff, USAF,
Washington, D.C.

Dear Jimmy:

In response to your note of November 18, I have had a talk with Larry Hafstad along the lines you indicated. I hope you get your problem worked out fully successfully.

Cordially yours,

V. Bush.

DEPARTMENT OF THE AIR FORCE
OFFICE OF THE CHIEF OF STAFF
UNITED STATES AIR FORCE
WASHINGTON, D. C.

31 October 1952

Dr. Vannevar Bush
Carnegie Institution of Washington
1530 P Street, N.W.
Washington 5, D.C.

Dear Van:

Thanks for your letters of the 27th and 28th. Thanks also for the valuable suggestions contained.

Agree that Gene Root is a very competent individual. We contacted him but found that he had been here over a year, felt that he had done his penance and was anxious to return to Rand not later than January or February. We also considered Bill Bollay and found him tied up with some very interesting combustion work which he is carrying on out West.

Acting on your suggestion of last Thursday, we contacted Dr. Lawrence Hafstad and he is coming in to see us today. Secretary Finletter is having a tea at 4:30 P.M. during which he will point out the great Air Force need for a Chief Scientist. Both General Vandenberg and General Twining are out of town but the Deputy Chief of Staff for Operations, Lt. Gen. White, will point up the military requirements. Don Putt, Jim McCormack and I are having supper with Larry this evening, during which time we will further discuss the duties, obligations, and opportunities of the Chief Scientist's job. We hope and believe he will see his way clear to accept. Will keep you advised.

With deep appreciation of your cooperation and kindest personal regards, I am

Very sincerely yours,

J. H. DOOLITTLE
Special Assistant to
Chief of Staff, USAF

September 24, 1947.

MEMORANDUM OF CONFERENCE WITH THE PRESIDENT ON SEPTEMBER 24:

Secretary Forrestal and I visited the President at 11:30 a.m. I opened the conversation after the usual greetings by stating that Mr. Forrestal wished me to take the post of Chairman of the Research and Development Board, and the President immediately said "so do I." I then told the President that while I would like to be relieved after some seven years of voluntary government effort, I would nevertheless be willing to go on and do the job, but that one thing seemed to stand in the way. I told him that I could not do the job appropriately and call in the needed aid from outside government unless the scientists in particular in the country felt that I had the confidence of the President. The President said he did not see how they could think otherwise, that I certainly had his confidence and that this was indicated by the fact that he wished me to take on the post, and he inquired how any other idea could have arisen. I told him that inasmuch as he had not called me in for anything for a year, and that since the last report that was made on the future of science in this country was made by someone else, scientists naturally gathered that I was not in his confidence. There ensued a discussion of the manner in which the Steelman report was handled, and I believe that the President had not realized previously that the board he set up really had nothing to do with the preparation of the Steelman report. However, he stated that certainly in the new post, if it had not been true recently in the past, I would be rather frequently in contact and that if there was an impression that I did not have his confidence he felt that that impression would soon be corrected by future relations. I then told the President that I felt that this time I ought to take the post with the definite understanding that I would relinquish it in about a year or perhaps less. We had some discussion of this and he finally agreed that it would be a good thing, after the Board was well on its way, to revolve the chairmanship at reasonable intervals. We talked about possible successors. Mr. Forrestal led this part of the discussion and stated that he felt that before the end of my term of office he and I ought to seek a successor agreeable to the President and see that he was indoctrinated.

We also discussed the science legislation. At first the President was very positive on this subject, and indicated that he felt that Congress had tried to take out of his control things that reasonably belong under his control. He blamed the fiasco on Senator Smith, but I explained to him that Smith had, in fact,

been the means of putting through the Senate an amendment that moved in the President's direction. I also told him that Mr. Webb and I had been attempting to bring Congress and the President together, and I stated that I felt sure that I could write a bill that would be agreeable to the President and that I felt would be a good sound bill and that would probably be agreeable to Congress. He asked me how it would be phrased and I outlined a board appointed by the President and confirmed by the Senate, a director appointed by the President and confirmed by the Senate after hearing the views of the board, a provision that the director would operate the business affairs of the Foundation under the usual checks and balances, but he would be subject on general policies to the board, with a provision that no grants could be made unless both the board and the director agreed. At this point the President stated that in order that control should be had by the President in appropriate fashion over matters in the Executive Branch it was essential that the board be advisory only. I thereupon said that I felt when we came to the giving away of public money we had an exception to the general rule that he indicated, and that in particular I felt that both he and the director needed the protection of a board having authority, for otherwise there would not be adequate defense against political pressure for inappropriate grants to various universities. We had some further discussion on this matter in which the Secretary joined, and I believe that I convinced the President on this point. We had also some discussion about the danger that was in the President's mind that the board would be simply a log-rolling affair to make grants to things that its members were interested in. I told him I had no fear of this, having been through the question during the war, and that I felt there was complete protection against any such affair if he appointed on the board not only scientists from universities but also a strong group of representative citizens interested only in furthering the public welfare, and that moreover my own experience had been that scientists of repute such as he would appropriately appoint leaned over backward when grants to their own organizations were concerned. I think he felt satisfied on this matter. We left this whole affair of the science legislation in this form: I am to consult with Mr. Webb to tell him of this conversation. We will attempt to outline a possible bill that might be accepted. Then Secretary Forrestal and Mr. Webb and I will confer on the matter and if it looks favorable we will place it before the President. Thereafter we will see whether it appears feasible to urge action on it in Congress. On this latter point we felt that we should go ahead with the matter if there was a reasonable chance of a bill being enacted that would be acceptable to the President, but, on the other hand, we felt that if it was likely to become a political football we should not open the matter.

On returning to the Defense Building in Mr. Forrestal's car we agreed that the best next step would be for the President to announce the appointment at a press conference. I stated that I would talk to Mr. Gifford and then let Mr. Forrestal know whether I am cleared to accept from that standpoint. Mr. Forrestal will draft a statement for the President for use at his press conference, bringing into it explicitly some statement to inform the public that I am in the confidence of the President, and will suggest it to the President. On coming out of the White House Mr. Forrestal when met by the press simply told them we had discussed the appointment with the President but the matter remained in the President's hands.

V. Bush.

NATIONAL MILITARY ESTABLISHMENT
RESEARCH AND DEVELOPMENT BOARD
Washington 25, D.C.

No. 151-48

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SPECIAL COMMITTEE ON TECHNICAL INFORMATION FORMED

Formation of a Special Committee on Technical Information to promote effective exchange of research and development information among the departments of the National Military Establishment was announced today by Dr. Vannevar Bush, chairman of the Research and Development Board, National Military Establishment.

The committee will study the problem of collecting, correlating, reproducing and disseminating technical information potentially useful in the research and development program of the National Military Establishment. Study and application of new methods and techniques to the problem of technical information organization, and promotion of active research in this effort, are expected to receive especial attention by the group.

At the first meeting of the committee, Dr. Detlev W. Bronk, chairman, pointed out the desirability of applying scientific methods to utilize more effectively the large body of information created by scientific activity.

"The handling of results of research in the matters of publication, dissemination and assimilation has not in the past shown an experimental or adventurous approach," Dr. Bronk stated.

Dr. Bronk, recently appointed president of Johns Hopkins University, is also chairman of the National Research Council and Foreign Secretary of the National Academy of Sciences. A specialist in physiology and biophysics, he is Johnson Professor of Biophysics and Director, Johnson Foundation and Institute of Neurology, University of Pennsylvania. During the war, he was Chief of the Division of Aviation Medicine of the Committee on Medical Research, Office of Scientific Research and Development; Coordinator of Research, Air Surgeon's Office; and a Special Consultant to the Secretary of War.

Membership of the Special Committee on Technical Information includes: Professor John E. Burchard, Dean of Humanities, Massachusetts Institute of Technology; Herman Henkle, Director of the John Crerar Library; Lt. Col. F. L. Walker, Jr., Army; Captain W. H. Leahy, Navy; Colonel Bernard A. Schriever, Air Force. Norman T. Ball is executive director of the committee.

****

he prepared a comprehensive series
s of educational attainments, includ-
curate standards of performance for
n of different ages; and he carried
his studies of statistical techniques
alysing test scores. His survey of *The
ution and Relations of Educational
's* was published in 1917, *Mental and
ttic Tests* in 1921, and a *Handbook
ts for Use in Schools* in 1923. Many
e tests are still the standby of educa-
psychologists in schools or child guid-
inics. He was a pioneer, also, in the
ction of intelligence and attainment
hich could be given to large groups
ils at one time, and which became
portant in the selection of 11-year
n for grammar school education.
tly after the war he rejoined Myers
me head of the vocational guidance
of the National Institute of Indus-
'sychology, and evolved the basic
s of all-round assessment and inter-
from which have sprung guidance
ents in most European and Com-
alth countries, including the British
Employment Service, and personnel
n in the armed forces. In 1924 he
Professor of Education (part-time)
London Day Training College, now
titute of Education, and played an
important role in the promotion of
ld-guidance and schools psycholog-
vices. From 1931 to 1950 he was
or of Psychology at University Col-
ndon, and was largely absorbed in
ining of British and Commonwealth
ogists, though continuing to contri-
olifically to psychological journals.
lso produced his most far-reaching
on *The Factors of the Mind* in

ceived the honour of knighthood in
n 1947 with Sir Godfrey Thomson,
me the first editor of the *British
of Statistical Psychology*, in whose
ay be found a continuous stream of
lies of mental measurement. But in
he was an excellent popular lec-
nd provided attractive series of talks
C. programmes. It was characteristic
to show boundless generosity in
younger psychologists who followed
though he was sometimes more
with colleagues who took an inde-
line. Those who submitted queries,
ical reports, were habitually greeted
by return of post with many closely-
oolscap pages of the most valuable,
dite, advice.
narried Joyce, daughter of P. F.
herself a doctor and gynaecologist.

12, 1971.

Burton, one of the dwindling band
sh Open golf champions, died on
30, 1974 in hospital, aged 66.
ictory came at St. Andrews in 1939;
seven years elapsed before the next
Open was played, Burton's career as a golfer was to a certain extent frustrated by lack of opportunity in the years when his game had reached its peak. Yet he played in the Ryder Cup matches of 1935, 1937 and 1949, winning both his foursomes, but losing three singles.

He was strong and stood well over 6ft., which explains a suggestion of looseness in his swing. He had a reputation for wildness in a wind, but it was blowing at St. Andrews when he came to the last two holes needing a five and a four to beat the American challenger, Johnny Bulla. He made his five at the Road Hole and then sent one of his huge drives up the eighteenth, stopping only just short of the Valley of Sin. To the alarm of spectators he took a deep-faced blaster for his short run-up to the green, but played it well and holed the putt for a three, winning by two strokes.

Apart from his long driving, putting was the strong point of his game. He demonstrated this after the war, when in one of the last events he won, in 1949 at Hollingbury Park, Brighton, he had rounds of 68, 66, 64, 68 for a total of 266, the lowest four-round tournament total ever recorded at that time in Britain. He finished 12 strokes ahead of the field.

Burton, who was born at Darwen, Lancashire, was attached to the Hooton club at Sale before moving to Coombe Hill.

February 2, 1974.

Dr. Vannevar Bush, the American scientist and engineer who was a central figure in the development of nuclear fission and the atomic bomb, died in Belmont, Massachusetts, on June 28, 1974 at the age of 84.

Graduating as an electrical engineer in 1913, he served in the United States Navy and then became an assistant professor at the Massachusetts Institute of Technology. He later was made Vice-President of the Institute and Dean of the Engineering Faculty. In 1938 he was elected President of the Carnegie Institution, where he began to coordinate research in various scientific fields. This was to lead to his appointment at the outbreak of the Second World War as Chairman of the United States National Defence Research Committee, and in 1941 Director of the Office of Scientific Research and Development.

President Roosevelt had been impressed by Bush's work and style. When a group of scientists were invited to the White House to discuss the plans needed if the nation were to become involved in global war, Bush—so the story goes—handed the President his recommendations set forth in four paragraphs on a single sheet of paper.

In Washington he directed the work of some 30,000 physicists, chemists, engineers and doctors, and became best known to the public as the man who commanded the "Manhattan Project"—the undertaking that produced the atomic bomb.

When the first experimental atomic explosion was to take place at the New Mexico testing grounds, and with zero hour approaching, someone remarked to Bush that they were all rather close. "Dr. Bush," he said, "if this thing goes off, the President will have to look for a new director for the O.S.R.D." "If it does not, he will, too", Bush replied.

After the war he was active in governmental and educational committees and became a director of Merck, Sharp and Dohme International, the pharmaceutical company. He was Chairman of the corporation at the Massachusetts Institute of Technology from 1957 to 1959, becoming honorary chairman after that.

An amiable, pipe-smoking New Englander (he once remarked that the reason why he could work with the British was because "they smoke pipes and can get together far better than those deluded chaps who smoke cigarettes"), Bush was always outspoken. He discomfited the United States space researchers in 1960 by declaring that placing a man in space was little more than a stunt. "The man can do no more than an instrument—in fact he can do less," he said. He believed that other fields of research should come first, particularly medical research.

His publications included *Modern Arms and Free Men*, a discussion of the role of science in preserving democratic institutions, and *Pieces of the Action*, a rambling and fascinating account of his varied life. Besides numerous American awards, he was made an honorary K.B.E. in 1948.

In 1916 he married Phoebe Davis and they had two sons.

July 1, 1974.

Colonel Frank Bustard, one of the great shipping pioneers of recent years, died at his home in Haslemere on January 22, 1974 at the age of 87 after a short illness.

He was the father of the "ro-ro" revolution. Using converted tank landing craft, he started services between Britain, Ireland, and the Continent after the war, which led to the huge drive-on ferry fleet of today, rivalling the container-ship in its fundamental impact on sea transport.

Bustard was a man of zest, enthusiasm, and ideas. The youngest of four sons of John and Alice Bustard, an old Liverpool Unitarian family, he joined the White Star Line as an apprentice under J. Bruce Ismay and quickly rose to be passenger traffic manager.

Transatlantic liners were still in their heyday, with fierce rivalries, particularly between Cunard and White Star, and it was typical of Bustard that he refused to join the forced merger between the two lines in 1934, preferring to start a rival concern with which he hoped to introduce new standards of tourist travel, with £10 fares to New

London Times

Vannevar Bush

VANNEVAR BUSH

March 11, 1890–June 28, 1974

BY JEROME B. WIESNER

NO AMERICAN has had greater influence in the growth of science and technology than Vannevar Bush, and the twentieth century may yet not produce his equal. He was an ingenious engineer and an imaginative educator, but above all he was a statesman of integrity and creative ability. He organized and led history's greatest research program during World War II and, with a profound understanding of implications for the future, charted the course of national policy during the years that followed.

The grandson of two sea captains, "Van" Bush manifested his Cape Cod heritage in a salty, independent, forthright personality. He was a man of strong opinions, which he expressed and applied with vigor, yet he stood in awe of the mysteries of nature, had a warm tolerance for human frailty, and was open-minded to change and to new solutions to problems. He was pragmatic, yet had the imagination and sensitivity of a poet, and was steadily optimistic. These essential qualities speak clearly in the foreword which he wrote in January 1970 for his book of reminiscences, *Pieces of the Action*:

> In my time, it has been my good fortune to have a piece of the action here and there in varied circumstances. It has been a pleasant experience for me to review some of the more rugged of these, and some of the more serene.
>
> Do birds sing for the joy of singing? I believe they do. The complexity of their songs is far greater than is needed for recognition or for marking

of reserved areas. I have become acquainted with a catbird who obviously derives pleasure as he tries out little phrases on his own. Moreover, I believe that evolution produced birdsongs, and the joy that goes with them, because of the survival value they bestow.

He who struggles with joy in his heart struggles the more keenly because of that joy. Gloom dulls, and blunts the attack. We are not the first to face problems, and as we face them we can hold our heads high. In such spirit was this book written.*

Van Bush gave the most comprehensive view of himself in *Pieces of the Action*. Characteristically, he despised pomposity and rather than write a formal autobiography he organized his recollections in a way that would illuminate certain historical episodes and amplify some of his views of life. Written in a direct, down-to-earth manner, the book tells a great deal about the rugged, indomitable spirit of its author.

Bush's father, the Reverend Richard Perry Bush, was also a nonconformist in style and conviction. He started his career as cook on a mackerel smack at Provincetown, Massachusetts at the age of fourteen and worked his way through Tufts College by delivering coal to students' rooms. Although of a Methodist family, he became a minister in the Universalist Church and was a pastor in Everett, Massachusetts when his son was born on March 11, 1890. Story has it that the boy was named for the Reverend John Van Nevar, a colleague of the Reverend Mr. Bush. Between Vannevar Bush and his father there was a strong bond of affection, cemented by a good-humored appreciation in each one for the personality and idiosyncracies of the other. Both were members of the Masonic order, both were good outdoorsmen, and both were wide-ranging in their interests.

As a boy, Vannevar Bush loved to tinker. When his father became a pastor in Chelsea, where Vannevar attended high school, he had a versatile shop at home. After high school he moved on to Tufts College, where he received B.S. and M.S.

* Vannevar Bush, *Pieces of the Action* (New York: William Morrow, 1970), p. ix.

degrees in 1913. Also, while still in college, he secured a patent—the first of many—for a surveying machine, which he built with two bicycle wheels and a device using a pendulum, for integrating and recording horizontal and vertical measurements.

After graduating from Tufts, Bush worked for a time in the test department of the General Electric Company at Schenectady, New York, and then as an inspector for the U.S. Navy. He returned to Tufts in 1914 as an instructor in mathematics. He had higher goals, however, and one of them was to marry Phoebe Davis, a Chelsea girl. Having saved enough money for one more year of study, he proposed to earn a doctorate at the Massachusetts Institute of Technology in that one year so that he could qualify for a better job and afford to get married. There was academic skepticism that he could accomplish this, and he was warned that he would wreck his health; but in 1916, at the end of a year, he had earned a Doctor of Engineering, a degree at that time given jointly by MIT and Harvard University. His health was never better, a troublesome case of rheumatism having disappeared for good. That fall he and Miss Davis were married, and he became an assistant professor of electrical engineering at Tufts. His first technical paper, "Oscillating-Current Circuits by the Method of Generalized Angular Velocities," based on his doctoral thesis, was presented before the American Institute of Electrical Engineers in 1917.

At about that time, Bush became a consultant to American Research and Development Corporation (AMRAD), a small company with quarters on the Tufts campus which, with the backing of J. P. Morgan, was pioneering in the development of radio devices. When the United States entered World War I, Bush went to New London, Connecticut to engage in antisubmarine research for AMRAD. He developed a magnetic device for the detection of submarines, but because of faulty administrative coordination it was never used effectively—a circumstance that he would remember when he took charge of U.S. research dur-

ing World War II. "That experience," he wrote later, "forced into my mind pretty solidly the complete lack of proper liaison between the military and the civilian in the development of weapons in time of war, and what that lack meant."* He did not serve in the Navy during World War I, but he was a lieutenant commander in the Naval Researve from 1924 to 1932.

In 1919, Bush joined the MIT faculty as associate professor of power transmission. He was placed in charge of the introductory course in electrical engineering and in 1922, with his colleague William H. Timbie, published a textbook, *Principles of Electrical Engineering*. Meanwhile, he had been made director of graduate study and of the Research Division of the Department of Electrical Engineering.

Bush not only continued to serve as a consultant to AMRAD, but was also largely responsible for its progress, despite numerous vicissitudes, toward success. He enlisted Laurence K. Marshall, who had been his roommate at Tufts, to provide business leadership. A new company, eventually named Metals and Controls Corporation, was formed to manufacture a thermostat invented by John A. Spencer, a staff member. Thermionic tubes for the booming radio industry were developed by another company, which took the name of Raytheon Manufacturing Company in 1925 and became a corporate giant. One of the tubes, the S tube, a gaseous rectifier, enabled the owner of a radio set to plug it into the household circuit rather than use what was known as a B battery. The tube was the subject of papers presented before the Institute of Radio Engineers and the American Institute of Electrical Engineers by the inventor, C. G. Smith, and Bush.

At MIT, Bush's interests turned toward computers. A former student, David O. Woodbury, recalls that in 1922 he was working on a master's thesis, assigned by Bush, dealing with three-

* *Pieces of the Action*, p. 74.

phase transients in alternating current motors. The research required onerous slide-rule computation, and Woodbury devised a small machine to do the work. One day Bush saw Woodbury using the machine and asked what it was. When Woodbury explained, the professor said, "Dave, give up all that slip-stick work and write us a thesis on your invention." Woodbury did, and sold the machine to General Electric Company.

The increasing complexity of power transmission networks stimulated further development in methods of analysis. Another of Bush's graduate students, Herbert R. Stewart, based a thesis on the Product Integraph, stating: "It was Dr. Bush's suggestion early in 1925 that a mechanical device should be developed to perform the continuous integration, which was the beginning of a continually expanding program of general solution of transients in networks by electromechanical means" (*A New Recording Product Integraph and Multiplier*, S.M. thesis, 1926).

The Product Integraph was the first in a series of analog computers which, though not direct ancestors of today's digital computers, led in the opening of the modern field of computation. In addition to Stewart, those closely associated with Bush in this development included Frank D. Gage, Harold L. Hazen, King E. Gould, and Samuel H. Caldwell. An advanced machine, called the Differential Analyzer, was completed in 1931 and was so successful that it was the model for the construction of similar machines elsewhere. It could solve sixth-order differential equations or three simultaneous second-order differential equations. Another complex device developed at that time by Harold Hazen and Hugh H. Spencer with Bush's leadership was the Network Analyzer, used in the simulation of power systems.

Preparation of the Differential Analyzer for solving a problem was a cumbersome process. Planning for a more versatile machine, which could be controlled by punched tape, was begun in 1935. Known as the Rockefeller Differential Analyzer

because it was funded in part by the Rockefeller Foundation, it had 2,000 electronic tubes, 200 miles of wire, 150 motors, and weighed 100 tons. It was demonstrated for the first time in 1941 and throughout World War II was operated on a three-shift basis in the computation of Navy range tables and studies of fire-control systems, radar antennas, and other critical subjects.

Bush was by no means satisfied with the Differential Analyzer. As early as 1937 he wrote memoranda on the possibility of achieving greater speed with an electronic calculator—the Rapid Arithmetical Machine, as he called it. Preliminary studies of its feasibility and, in fact, of tubes and circuits that might be used were conducted, but investigators were diverted by war research demands, and it was not until the early 1950s that MIT began operating Whirlwind I, a high-speed, high-capacity, highly reliable digital computer.

Although Bush maintained a lively interest in such machines, his career had taken a new direction. He had strong views on education. For example, in "Critical Analysis of the Examination System of American Engineering Schools," he wrote:

> The student is hounded. In four years the student has to take some forty or fifty independently taught subjects in which he is examined formally a total of perhaps a hundred times, and informally several hundred times. . . . All but exceptional students become automatons. . . . Our examinations are poor. . . . Student memories are being taxed with data which any reasonable practicing engineer would keep in notes or a handbook.*

Dr. Karl T. Compton had become president of MIT in 1930, and as part of his program to strengthen the Institute, he reorganized it as three schools and appointed Bush vice president of the Institute and dean of the School of Engineering. In the latter position, Bush became virtually the operating executive. His national reputation was growing, and in 1934 he was

* Vannevar Bush, *Journal of Engineering Education*, 23, no. 5 (January 1933): 322–36.

elected to the National Academy of Sciences. The following year he served on the Committee on the Relation of the Patent System to the Stimulation of New Industries, organized by the Science Advisory Board of the National Research Council.

In 1938 Bush was invited to become president of the Carnegie Institution of Washington. President Compton was so loath to lose him that he suggested an arrangement by which he, Compton, would become chairman of the corporation and Bush would become president of MIT. Bush accepted the Carnegie invitation, however, and shortly afterward was also appointed chairman of the National Advisory Committee for Aeronautics (NACA). As he later put it, he soon "learned quite a bit of the mysterious ways in which one operates in the Washington maze." *

After World War II broke out in Europe in 1939, Bush and others became increasingly concerned by the lack of technological preparedness in the United States. He; James B. Conant, president of Harvard University, and Frank B. Jewett, president of the National Academy of Sciences and president of Bell Telephone Laboratories, were members of the Committee on Scientific Aids to Learning, formed by the National Research Council in 1937, and thus had occasion to meet together and discuss the subject. President Compton of MIT and Richard C. Tolman, dean of the Graduate School at the California Institute of Technology, also joined in these discussions. Irvin Stewart, who was secretary of the Committee on Scientific Aids to Learning, was likewise involved.

Out of the discussions came a plan for the establishment of the National Defense Research Committee (NDRC), which Bush described in four short paragraphs and submitted to President Roosevelt. At the end of ten minutes he had an "OK–FDR," and an order creating NDRC was issued on June 27, 1940, providing

* *Pieces of the Action*, p. 34.

nearly a year and a half of lead time before the United States entered the war. Bush commented thirty years later:

> There were those who protested that the action of setting up NDRC was an end run, a grab by which a small company of scientists and engineers, acting outside established channels, got hold of the authority and money for the program of developing new weapons. That, in fact, is exactly what it was. Moreover, it was the only way in which a broad program could be launched rapidly and on an adequate scale. To operate through established channels would have involved delays—and the hazard that independence might have been lost, that independence which was the central feature of the organization's success.*

Bush was appointed chairman, and other members of the committee, in addition to Compton, Conant, Jewett, and Tolman, were Conway P. Coe, Commissioner of Patents; Rear Adm. Harold G. Bowen, representing the Navy; and Brig. Gen. George V. Strong, representing the Army. Stewart became the executive secretary.

The organization was elaborated in 1942, when the Office of Scientific Research and Development (OSRD) was established, with Bush as its director. OSRD had three principal subdivisions at that time: the NDRC, with Conant as chairman; the Committee on Medical Research (CMR), with A. Newton Richards as chairman; and the Advisory Council, with Bush as chairman. The latter, which included the chairmen of NACA, NDRC, and CMR, as well as Army and Navy representatives, served as a coordinating group. In addition, Bush was chairman of the Joint New Weapons Committee of the Joint Chiefs of Staff and, when the Manhattan District was created, chairman of its Military Policy Committee, which functioned as its board of directors.

Although a certain organizational complexity was inevitable in so large a program, OSRD and NDRC operations were simplified

* *Pieces of the Action*, pp. 31–32.

by the fact that Van Bush was unquestionably the boss. He had the full confidence of the President and Congress. He was decisive and could be tough. "I remember one time when a section walked into my office and resigned as a body," he wrote. "I still do not know quite what the row was about. So I just told them, 'One does not resign in time of war. You chaps get the hell out of here and get back to work, and I'll look into it.' " * His wisdom and integrity were respected.

The organization was a remarkable invention, but the most significant innovation was the plan by which, instead of building large government laboratories, contracts were made with universities and industrial laboratories for research appropriate to their capabilities. OSRD responded to requests from military agencies for work on specific problems, but it maintained its independence and in many cases pursued research objectives about which military leaders were skeptical. Military tradition was that a war had to be fought with weapons that existed at its beginning. Bush believed that World War II could be won only through advances in technology, and he proved to be correct. In some instances, the armed forces were enthusiastically cooperative. In others, resistance to innovation had to be overcome. Bush, himself, went to Europe to make sure that the proximity fuse was introduced to the battlefield and used effectively.

The major exception to the policy of avoiding the building of government laboratories was in the development of the atomic bomb. After preliminary studies by NDRC and OSRD, it became clear that a colossal program would be needed, and Bush recommended to Secretary Stimson that the Army take over the responsibility. The result was the formation of Manhattan Engineering District by the Corps of Engineers. Bush,

* *Pieces of the Action*, p. 41.

with Conant as his deputy, maintained an active scrutiny of the enterprise.

Bush successfully confronted Sir Winston Churchill (and earned his wrath) in London in an argument over the terms of exchanging atomic information. He had the duty, after the death of President Roosevelt, of giving President Truman his first detailed account of the bomb. He was among those whose recommendations prevailed when the President decided—in spite of some objections—that the Smyth Report on atomic energy should be released. He urged the appointment of the Interim Committee to advise the President on use of the bomb and on postwar atomic energy, and he was then appointed a member of the committee. He was a participant in the "Atlee Conference" and prepared the final draft of an agreement with the British proposing control of atomic energy by the United Nations. He was a defender of Dr. J. Robert Oppenheimer. After the Atomic Energy Commission's (AEC) decision that Oppenheimer's clearance be cancelled, he stated: "It does not affect my complete confidence in Dr. Oppenheimer's loyalty and deep devotion to the security of the United States. . . . Our internal security system has run wild." *

Bush did not have a central role in the formation of the AEC, but his voice was heard on this and other issues, such as military unification. He was influential in developing a policy of maintaining a high level of research for the military services and was instrumental in organizing the Office of Naval Research. But his greatest contribution was to launch an unprecedented national program in science and technology.

Long before the war was over, Bush began to devote thought to how the momentum of research could be sustained, with new peacetime goals. In a letter, President Roosevelt asked him to make recommendations on government policies for combating

* *Newsweek*, July 12, 1954, pp. 24–25.

disease, supporting research, developing scientific talent, and diffusing scientific information. Bush, on the basis of studies made by four committees which he organized, responded with a report titled "Science—The Endless Frontier," which provided a blueprint for far-reaching federal policies. "One of our hopes is that after the war there will be full employment," Bush said in the report. "To create more jobs we must make new and better and cheaper products. We want plenty of new, vigorous enterprises. But new products and processes are not born full-grown. They are founded on new principles and new conceptions which in turn result from basic scientific research. Basic scientific research is scientific capital." *

Use of the term "basic research" was not a casual choice. Bush explained later: "There were some on Capitol Hill who felt that the real need of the postwar effort would be the support of inventors and gadgeteers, and to whom science meant just that. When talking matters over with some of these, it was well to avoid the word fundamental and use basic instead."† To provide an organization for the support of basic research, Bush proposed the creation of a National Research Foundation, which would administer fellowships and scholarships and would "place its research contracts or grants not only with those institutions which have a demonstrated research capacity but also with other institutions whose latent talent or creative atmosphere affords promise of research success." ‡

Since 1942 Senator Harley Kilgore had been seeking passage of a bill providing for the support of science and technology, and in the spring of 1945 the bill was modified to provide for the establishment of a national science foundation. Its provisions, tending to favor applied research, were unacceptable to

* J. Merton England, "Dr. Bush Writes A Report: 'Science—The Endless Frontier,'" *Science*, 191 (January 9, 1976):2.

† *Pieces of the Action*, p. 65.

‡ "Science the Endless Frontier," p. 32.

Dr. Bush, whose own recommendations were embodied in a bill introduced by Senator Warren Magnuson. For two years there was debate on the bills. Finally a compromise bill was passed in 1947, with National Science Foundation (NSF) as the name for the new organization. It was vetoed by President Truman on grounds that the director would be appointed by the foundation's board rather than by the President and that he "would be deprived of effective means of discharging his constitutional responsibility." *

The bill was passed a second time, and Bush later related, "I managed to convince Truman he should not veto it again. But I did so on the basis that he was being given protection, a buffer against those coming to seek favors." †

An expectation had been that Bush would be chairman of NSF, but he asked President Truman not to name him to the board, saying, "I have been running about everything scientific during the war, and somewhat since, and I think people are getting tired of seeing this guy Bush run things around here. I think this outfit would be better if it had some new leadership. If you put me on the board, they will elect me chairman, and I do not think the body of scientists are going to like this continuation of one man in the top post."

President Truman remarked, "Van, you should be a politician. You have some of the instincts."

"Mr. President, what the hell do you think I've been doing around this town for five or six years?" was the response.‡

Bush continued to be "around town," and he saw NSF assume the kind of character he had envisioned for it. He served on its Advisory Committee on Government–University Relationships for two years. He was chairman of the Joint Research

* Detlev W. Bronk, "The National Science Foundation: Origins, Hopes and Aspirations," *Science*, 188 (May 2, 1975): 409–14.
† *Pieces of the Action*, p. 65.
‡ Ibid., p. 202.

and Development Board of the War and Navy departments in 1946–1947 and then chairman of the Research and Development Board of the National Military Establishment in 1947–1948. But he withdrew from active leadership in government affairs, and in 1955 retired as President of the Carnegie Institution. Of his service there, Caryl P. Haskins, his successor, observed that "His great gifts of intellect, of personality, and of administrative ability brought to the Institution one of the most formative and dynamic periods inspired by any president in its history, not even excepting the first, Daniel Coit Gilman." * One important accomplishment was an agreement between Carnegie and the California Institute of Technology for the joint operation of the Mt. Wilson and Palomar observatories.

During his retirement, Bush made his home on a hill in Belmont, Massachusetts, with a panoramic view of Cambridge and Boston. He was elected chairman of the MIT Corporation (of which he had been a member since 1932) in 1957 and was honorary chairman from 1959 to 1971. James R. Killian, Jr., former president, who succeeded him in these positions, commented that "Four M.I.T. presidents benefitted from his advice. They were, in fact, the students of his latter days. In this and other ways he showed unwavering devotion to the Institute and never lost his enthusiasm for its mission and potential."† MIT named its Center for Materials and Engineering the Vannevar Bush Building in his honor.

Bush had become a member of the board of Merck & Co., Inc. in 1949, and when George Merck, chairman of the board, died, he was elected to that position in 1957 and actively participated in the company's affairs. He had a deep interest in the advancement of medicine. In the formation of the Com-

* Biographical Memoirs, *Year Book of the American Philosophical Society* (Philadelphia: American Philosophical Society, 1974), pp. 120–27.
† Memorial service for Dr. Vannevar Bush, MIT, October 4, 1974.

mittee on Medical Research under OSRD, he repelled reactionary influences. During World War II, the death rate from disease in the Army was reduced to 0.6 per thousand, compared to 14.1 during World War I, and this was due in part to the effectiveness of the committee's program, notably in making penicillin available early and in large quantities and in consolidating pharmaceutical industry talents. Bush's interest in medicine continued through the years, and he later invented an automatic microtome, a silicone rubber valve for the heart, and a gold valve for use in hydrocephalus.

Although Bush has been called a scientist, and justifiably so because of his broad and profound understanding of science, he preferred to regard himself as an engineer. He was always fascinated by practical applications of science and was never happier than when he could work with his own hands in their achievement. He had shops at his home in Belmont and his summer cottage at South Dennis on Cape Cod, where he not merely tinkered but also attacked difficult problems with high skill. He had fun devising a bird feeder that was inhospitable to greedy pigeons and blue jays, and he worked doggedly for years to solve the problems of gas and free piston engines. He obtained three patents for the latter, in addition to a score of other patents for devices ranging from thermostats to a machine for rifling guns.

At one time Bush had a turkey farm in New Hampshire, but throughout his life he was devoted to salt water and boats. He loved cruising and was too independent-minded for conventional racing. For his ketch he designed unorthodox but efficient sails, ignoring the disapproval of nautical conformists. He was enthusiastic about the potential of hydrofoil boats and participated in designing, building, and testing them.

The most persistent line of Bush's inventive endeavors involved technology for processing information. The Differential Analyzer was the most important product of such activity, but

his interests led in other directions. At MIT in the thirties he designed a decoding machine for the Navy. In 1936 he initiated the development of a machine which he called the Rapid Selector, employing 35-mm film, on which microphotographed texts could be made quickly available by the use of photoelectric cells in scanning a coded index. His application for a patent was rejected, but development of the machine was carried forward until World War II interrupted, when the two men working on it were suddenly shipped off to Washington for decoding work in the Navy.

Bush did not lose interest in speeding up the cumbersome process of searching through masses of data. In 1945 he wrote an article for the *Atlantic Monthly* describing "memex," a system by which a researcher sitting at a desk could have almost instant access to microphotographed books, periodicals, and other materials and could use a mechanized "trail" to assist in searching for relevant information.

Twenty years later Bush took part in the inauguration of a program to develop such technology for library use, Project INTREX, which was undertaken by an MIT group. In an essay titled "Memex Revisited,"* he pointed out that the development of the digital computer, the transistor, video tape, and other such devices had heightened the feasibility of such mechanization but that costs would delay its achievement. And although Project INTREX demonstrated that technical problems could be solved, economic ones, as Bush feared, remained a barrier.

The stroboscopic light developed by Bush's former colleague in electrical engineering, Harold E. Edgerton, was used in the Rapid Selector. It was applied with greater success in Photon, a machine for setting type photographically, which was developed by Graphic Arts Research Foundation, Inc., a Cambridge-

* Vannevar Bush, *Science Is Not Enough* (New York: William Morrow, 1967), p. 75.

based enterprise of which Bush was one of the founders. The computer-controlled "cold type" method is now widely used in the printing industry. Bush also held patents for a justifying typewriter and, with Professor Caldwell, for an apparatus for generating continuously variable mechanical operations.

Having had personal experience with patents as well as in administration, Bush maintained a continuing interest in the patent system and was active in seeking its improvement. As director of OSRD, he believed inventions developed with government funds should not be exploited for private profit, and he developed strong patent policies. He had resigned from the Raytheon board when he went to Washington, and although the company became one of the leading industrial contractors in the field of radar, he scrupulously avoided favoring it. At the end of the war, his friend, Laurence K. Marshall, president of Raytheon, claimed the right to patent certain inventions. Bush threatened to fight the issue in the courts. In the end, they agreed to the appointment of an impartial committee which would determine what patents Raytheon could claim, but their long friendship ended.*

Bush was a strong believer in free enterprise and the work ethic. "I had grown up with a deep-seated distrust of most social reformators, whom I regarded as a bunch of long-haired idealists or do-gooders," he wrote. He had been "appalled at some of F.D.R.'s political theory and practice," though his views mellowed as he came to revere President Roosevelt, and his loyalty to him was absolute.†

"I am all for a welfare state in which a powerful government seeks to protect its citizens against the cruelties of nature and chance, and incidentally against the rapaciousness of their fellow citizens," he said in an essay, "Poverty and Opportunity." * "But just trying to abolish poverty leaves me cold. . . . From here on we should not equalize real incomes if we wish to preserve our prosperity and our safety. In the great social pyramid, there should be tangible rewards for those who rise. A state in which all material rewards are cancelled out will not long exist in a turbulent world." He wanted to see "dignity and satisfaction for those who contribute to our well-being" and equality of opportunity for all. He thought that:

> To accomplish this, or part of it, may involve a return to the village, not isolated in the hills, but surrounded closely in the city, the local community looking after its own affairs, the informal groups that hang together because of common interests. Our trends have been in the opposite direction, centralization of power, dictation from above. Even so, there has never been a time, or a country, in all history in which barriers that block the indvidual's path to success, material or intellectual, were so broken down as here and now. This is the hallmark of our way of life.†

Although Van Bush had consorted with the powerful and himself had exercised enormous power, although he was a brilliant technologist, although he shared the awesome view of nature disclosed by science, his devotion to individualism and the ideal of a simple life was central to his character.

Bush had been in failing health for more than a year when he suffered a cerebral vascular accident, developed pneumonia, and died at the age of eighty-four on June 28, 1974. Mrs. Bush had died in 1969. Bush was survived by two sons, Dr. Richard Davis Bush, a surgeon, and John Hathaway Bush, president of Millipore Corporation, by six grandchildren, and by a sister, Edith L. Bush of Provincetown, Massachusetts.

* Otto J. Scott, *The Creative Ordeal* (New York: Atheneum, 1974), p. 173.
† *Pieces of the Action*, p. 35.

* Vannevar Bush, *Science Is Not Enough* (New York: William Morrow, 1967), pp. 123–39.
† *Science Is Not Enough*, p. 138.

HONORS AND DISTINCTIONS

PROFESSIONAL AND HONORARY SOCIETIES

American Physical Society, Fellow, 1923
American Society for Engineering Education, Fellow, 1923; Honorary Fellow, 1961
American Institute of Electrical Engineers, Fellow, 1924; Honorary Fellow, 1950
American Academy of Arts and Sciences, Fellow, 1925
National Academy of Sciences, elected 1934
American Mathematical Society, Fellow, 1936
American Philosophical Society, Fellow, 1937
Franklin Institute, Honorary Member, 1947
Society of Naval Architects and Marine Engineers, Honorary Member, 1951
American Society of Mechanical Engineers, Honorary Member, 1955
American College of Surgeons, Honorary Fellow, 1956
Phi Beta Kappa
Sigma Xi
Tau Beta Pi
Eta Kappa Nu (Eminent Membership, 1950)

SOCIAL ORGANIZATIONS

Alpha Tau Omega
St. Botolph Club, Boston
Century Association, New York

AWARDS

Louis Edward Levy Medal, Franklin Institute, 1928
Lamme Medal, American Institute of Electrical Engineers, 1935
Research Corporation Award, Columbia University, 1939
Ballou Medal, Tufts University, 1941
Edison Medal, AIEE, 1943
Holley Medal, American Society of Mechanical Engineers, 1943
John Scott Award, Philadelphia City Trust, 1943
Gold Medal, National Institute of Social Sciences, 1945
Distinguished Service Medal, Roosevelt Memorial Association, 1945

Marcellus Hartley Public Welfare Award, National Academy of Sciences, 1945
Washington Award, Western Society of Engineers, 1946
Hoover Medal for 1946, AIEE, ASCE, AIMME, ASME, 1947
Distinguished Service Award, Tufts Alumni Council, 1947
Medal for Merit with Bronze Oak Leaf Cluster, President Truman, 1948
Knight Commander, Most Excellent Order of the British Empire, 1948
Medal, Industrial Research Institute, Inc. 1949
John Fritz Medal, AIEE, ASCE, AIMME, ASME, 1951
Award of Merit, American Institute of Consulting Engineers, 1953
John J. Carty Medal and Award for the Advancement of Science, National Academy of Sciences, 1954
William Proctor Prize, Scientific Research Society of America, 1954
Officer, Legion of Honor, France, 1955
New England Award, Engineering Societies of New England, 1957
Charles F. Kettering Award, George Washington University, 1952
1963 National Medal of Science, President Johnson, 1964
Great Living American Award, Chamber of Commerce of the United States, 1964
Citation, Brotherhood of Temple Ohabei Shalom, Brookline, Massachusetts, 1964
Wisdom Award of Honor, The Wisdom Society, 1965
First Annual Founders Medal, National Academy of Engineers, 1966
Distinguished Service to Science Education Citation, National Science Teachers Association, 1968
Atomic Pioneer Award, President Nixon, 1970

BOARDS

Life Member, Massachusetts Institute of Technology Corporation; Chairman, 1957–1959; Honorary Chairman, 1959–1971
Regent, Smithsonian Institution, 1943–1955
Trustee, Tufts College, 1943–1962 (Emeritus)
Trustee, Johns Hopkins University, 1943–1955
Trustee, Carnegie Corporation of New York, 1939–1950
Trustee, Carnegie Institution of Washington, 1958–1974
Trustee, George Putnam Fund of Boston, 1956–1972

Director American Telephone and Telegraph Co., 1947–1962
Director, Merck & Co., Inc., 1949–1962; Chairman of Board, 1957–1962
Director, Metals and Controls Corporation, 1952–1959
Director and Life Member, Graphic Arts Research Foundation, Inc., 1949–1974

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1926

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1970

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1971

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DEPARTMENT OF THE AIR FORCE
OFFICE OF THE CHIEF OF STAFF
UNITED STATES AIR FORCE
WASHINGTON, D. C.

27 OCT 1949

Dr. Vannevar Bush
President, Carnegie Institute of Washington
1530 P Street, N. W.
Washington 5, D. C.

Dear Dr. Bush:

I greatly appreciate your letter of 17 October 1949 concerning the excellent report submitted by AFOAT-1 on the recent atomic explosion. It was thoughtful of you to write me, as it is always a pleasure to receive such complimentary remarks concerning our personnel.

I wish to express my appreciation of the excellent cooperation of yourself and the other distinguished members of the panel which reviewed the results of this important project.

Your letter will be brought to the attention of the personnel who participated in this undertaking.

Sincerely,

Hoyt S. Vandenberg

HOYT S. VANDENBERG
Chief of Staff, United States Air Force

THE UNIVERSITY OF NORTH CAROLINA · *Consolidated Office*

University of North Carolina in CHAPEL HILL · *North Carolina State College of Agriculture and Engineering in* RALEIGH · *The Woman's College in* GREENSBORO

GORDON GRAY, *President*

CHAPEL HILL

January 19, 1955

Dr. Vannevar Bush
Carnegie Institution of Washington
1530 P Street, N. W.
Washington 5, D. C.

Dear Van:

I wish to thank you for your prompt review of my draft communication to Bobby Cutler. I appreciate your help very much.

As you will see, I have followed your suggestion as to re-arrangement of the letter and have put the recommendations near the beginning. I also have added a final paragraph, which is somewhat in accordance with your suggestion. I have also suggested your view of the charter for the committee.

Your letter just arrived today, and I have not had the chance to think through the implications of your grand jury parallel. However, I think you may have something significant. I should like to think about it further before making any detailed comment. Incidentally, I am leaving tonight to go to New York and will be in Washington Thursday, and hope to have a chance to talk with Bobby Cutler about the committee at that time.

Sincerely,

Gordon Gray
President

CARNEGIE INSTITUTION OF WASHINGTON
1530 P STREET, NORTHWEST
WASHINGTON 5, D. C.

OFFICE OF THE PRESIDENT

September 26, 1947.

Hon. James Forrestal,
Room 3E 714, Pentagon Building,
Washington 25, D.C.

Dear Jim:

I think I ought to reply to the President's letter, to have the understanding clearly on the record.

If you think the attached is suitable, won't you send it along; and if it ought to be altered, let me know.

Cordially yours,

V. Bush.

Copy to Josephs—sc

October 9, 1947.

General Dwight L. Eisenhower,
Room 3E 924, Pentagon Building,
Washington 25, D.C.

Dear General:

Yesterday in New York I had an interesting discussion with Devereux Josephs, who is President of the Carnegie Corporation of New York, on a matter which we recently discussed. This is the general problem of impressing upon American youth in particular, and upon the American public more generally, a more accurate and informed conception of the democratic process and the means by which this country might preserve it in an unsecure world. Since you are bound to have many relationships with the Carnegie Corporation, and since you are both very much interested in this subject, I would like to bring you and Mr. Josephs together, and I am sure that I could do this either when you are to be in New York or sometime when he is to be down here if you will let me know how it will prove most convenient. Incidentally, I think you may know that General Marshall joined the Board of Trustees of Carnegie Corporation just before he became Secretary of State, and has not dropped off of that Board since he plans to pay attention to the affairs of the Corporation after his present duties cease. In fact, I understand that he will be at a meeting of the Board next week.

Cordially yours,

V. Bush.

Trojan Ouconbin

March 20, 1951.

Lt. General Jeoffrey Keyes,
Chairman, Weapons Systems Evaluation Group,
Pentagon Building,
Washington 25, D.C.

Dear General Keyes:

I enclose a copy of a letter I am sending today to General Bradley. A similar letter has also gone to Mr. Webster, Chairman of the Research and Development Board.

Very truly yours,

V. Bush.

OFFICE OF THE SECRETARY OF DEFENSE
WEAPONS SYSTEMS EVALUATION GROUP
WASHINGTON 25, D. C.

27 March 1951

Dr. Vannevar Bush, President
Carnegie Institution of Washington
1530 P Street, N. W.
Washington 5, D. C.

Dear Dr. Bush:

Thank you for sending me a copy of your letter of 20 March 1951 to General Bradley.

The importance of the problems you mention has been recognized by the Weapons Systems Evaluation Group, as well as other groups, and some work has been done.

I am sure your letter will serve to focus attention upon the matter, and I consider this very worthwhile.

Sincerely,

Geoffrey Keyes

GEOFFREY KEYES
Lieutenant General, USA
Director

December 1, 1954.

President Gordon Gray,
The University of North Carolina,
Chapel Hill, North Carolina.

Dear Gordon:

A very pleasant thing has happened. The Harvard Law School Forum invited each of us to participate in a program. I now have the copy of your letter of November 30 to them in which you decline, but in the course of which you say some very nice things about me. The pleasant thing is this. Immediately upon receiving their invitation I replied with a declination and I included in that letter some nice things about you. In fact I used almost your exact words. I now enclose a copy of that letter, which I should have sent to you before.

By all means let us have a discussion some day. We agree, without doubt, on the basic principles, and I think we might make a lot of progress in digging into some of the more subtle aspects of the whole problem together.

But in the meanwhile it is highly gratifying to think that you and I could go through all of the experiences of the past year and emerge with this happy feeling toward one another.

Cordially yours,

V. Bush.

Gordon Gray

cc: Dean Griswold
Dr. Bush

Modern Scientists + Engineers 1980

[illegible] of novel molecular [illegible] be predicted on [illegible] model. Macro-[illegible] from three to eight donor [illegible] produced, and an ex-[illegible] which two metal ions [illegible] single ring. Busch [illegible] structures could be [illegible] the metal ion [illegible] ligand structure, a [illegible] confirmed several [illegible] laboratories. Other in-[illegible] demonstrated the template [illegible] synthesis and in [illegible] vitamin B_{12}. The [illegible] polyethers and their [illegible] bicyclic cryptands [illegible] against this historical [illegible]

[illegible] is special about [illegible]" was not simple to [illegible] on the natural prod-[illegible] highly specialized [illegible] simpler synthetic ma-[illegible] more appropriate [illegible] exploration of this sub-[illegible] the complexes of [illegible] synthetic macrocyclic li-[illegible] striking effects. The [illegible] were found to be [illegible] reported by Busch, [illegible] International Coordi-[illegible] Conference, 1966). [illegible] stereochemical studies [illegible] cyclic complexes are [illegible] dissociation of the [illegible]

[illegible] effects, Busch de-[illegible] macrocyclic complexes [illegible] macrocycles having [illegible] donors and no sub-[illegible] sizes varying from 13 [illegible] The choice of ligands and [illegible] that the properties of [illegible] should correspond to [illegible] typical coordination [illegible] only in ways that [illegible] structures of the li-[illegible] field strengths in these [illegible] a strong dependence [illegible] suggesting that the macrocy-[illegible] elastic band having a [illegible] The ring either readily ac-[illegible] metal ion or must suffer [illegible] accommodate it.

[illegible] strain-energy model [illegible] represent the cyclic li-[illegible] mismatch between the site [illegible] the normal metal-do-[illegible] correlated with the occurrence of unusual ligand field strengths. Therefore, strained metal ion sites can be instrumental in determining the extent to which electron density is transmitted from donor atoms to metal ions, a factor that may influence the roles played by metal ions in natural systems.

Other investigators confirmed quantitatively the exceptional inertness toward dissociation of macrocyclic complexes. From the dependence of inertness on ring size, Busch concluded that although macrocyclic complexes are often inert, those complexes in which the fit between metal ion and ring is very good are remarkably inert. The significance to natural products is clear. The tetrafunctional porphyrin ligand accomplishes this immobilization while leaving two additional sites available for other interactions.

The studies on ring size revealed other important relationships. As the ligand field of the planar macrocycle increases, that assignable to the extraplanar ligands decreases. In this way, the extraplanar interaction of metal ions with donors can be controlled by the in-plane macrocycle. The rates at which axial ligands are replaced are controlled by the strain energy of the ring. Therefore, the reactivities at axial sites may be controlled by macrocyclic ligands. Thus, studies on metal complexes with synthetic macrocyclic ligands produced an explanation for their role in nature and revealed important general relationships in coordination chemistry that derive from geometrically constrained systems.

Busch graduated in chemistry from Southern Illinois University in 1951 and attended graduate school at the University of Illinois, where he received the M.S. in 1952 and the Ph.D. in 1954. He served in the U.S. Army from 1946 to 1948. In 1954 he joined the faculty of Ohio State University and advanced to professor in 1963. He served as visiting professor at the University of Florida (1960), the University of California, at Riverside (1968), the University of California at Los Angeles (1975), and Kyushu University (1978). Busch received the American Chemical Society (ACS) Award in Inorganic Chemistry in 1963 and the ACS Award for Distinguished Service to Inorganic Chemistry in 1976.

For background information *see* COORDINATION CHEMISTRY; SCHIFF BASE in the McGraw-Hill Encyclopedia of Science and Technology. ■

BUSH, VANNEVAR

☆ American electrical engineer

Born Mar. 11, 1890, Everett, MA, U.S.A.
Died June 28, 1974, Belmont, MA, U.S.A.

As director of the Office of Scientific Research and Development (OSRD) during World War II, Bush was responsible for mobilizing and coordinating the United States scientific war effort, a task that included the development of radar and the atomic bomb. After the war he helped provide the impetus for the Federal government's encouragement of science, especially basic research, and for the institution of agencies to facilitate such encouragement.

In 1940 Bush, then president of the Carnegie Institution in Washington, DC, was appointed chairperson of the National Defense Research Committee (NDRC) by President Franklin Roosevelt. This agency was set up to supplement Army and Navy research work on war devices. Bush brought to the committee his skills as teacher, original researcher, engineer, and administrator. In the same year the Uranium Committee, which had been studying the feasibility of nuclear explosives, was made a subcommittee of the NDRC.

When in 1941 the Office of Scientific Research and Development was established, Bush was appointed its director. This agency was to mobilize the total scientific war effort, to conduct broad research programs, and to advise the Presi-

dent on the status of scientific research and development in connection with defense. During the course of the war, under Bush's direction virtually the entire scientific work force of the United States was at the disposal of the OSRD. The more than 2000 projects to which its scientists were assigned cost more than $300,000,000 directly, and the agency supervised the spending of many hundreds of millions more. The two most massive programs undertaken by the OSRD involved the development of tactical radar and the atomic bomb. The decision to make an all-out effort to produce the bomb was reached in 1941; thereafter, as a member of the Top Policy Group (headed by the U.S. President) and as chair of its Military Policy Committee, Bush shared responsibility for the setting of policy throughout the program, and continued in this work after the task of administration and development had been taken over by the Army in 1943.

In 1944 the President asked Bush to make recommendations as to how the experience gained under the OSRD in mobilizing and directing national scientific efforts might be applied under peacetime conditions. Bush's response was his report *Science, the Endless Frontier* (1945). Drawing on the studies of eminent scientists, engineers, and educators, he made proposals for the consolidation and utilization of scientific skills on a national level. He also urged government support for an unprecedented national effort in basic research. This recommendation was stimulated partly by the realization that, because of the needs of war, basic research had come almost to a standstill in the United States and partly by the fact that new methods of team research, which had been proved effective during the war, and the growing complexity of experimental equipment had made basic research much more costly than before. The proposals embodied in Bush's report led, among other consequences, to the establishment by an act of Congress of the National Science Foundation in 1951.

As an individual, Bush made numerous contributions, mostly in the fields of applied science and engineering. Beginning in 1930 at the Massachusetts Institute of Technology, he and a team from the institute's electrical engineering staff developed the differential analyzer, a device for the machine solution of differential equations, ubiquitous in modern science. Applicable to such widely diverse fields as atomic physics and acoustics, the machine could handle as many as 18 independent variables simultaneously, and was a forerunner of later analog and digital computing devices. Bush was also responsible for the "Rapid Selector," which he developed in collaboration with Ralph Shaw. This machine was designed to cope with the problem of rapid information retrieval by utilizing microfilm. Using a photoelectric scanner, the machine could recognize a specific item on the film on the basis of a binary visual code, devised by Bush and Shaw, which was printed on the edge of the film. Although the Rapid Selector did not receive wide use, it did much to stimulate interest in the basic problems of information retrieval. Among Bush's other productions were the justifying typewriter, which automatically spaced copy so that both margins were even; the network analyzer, developed in the late 1920s, which could reproduce large electrical networks in miniature and simulate their performance under stress; gaseous conduction devices; and cathode arrangements and coatings for grid-controlled arcs.

Son of a clergyman, Bush received his B.S. and M.S. from Tufts College in 1913. He was granted his D.Eng. simultaneously by Harvard University and the Massachusetts Institute of Technology in 1916. After employment with the General Electric Company in 1913 and the U.S. Navy in 1914, Bush taught at Tufts College from 1914 to 1917. During World War I he did research in submarine detection for the Navy. In 1919 he returned to MIT as associate professor of electric power transmission and became professor in 1923; he was appointed vice-president of the institute and dean of the school of engineering in 1932. Bush was elected president of the Carnegie Institution of Washington in 1938, a position he held until his retirement in 1955. He was chairperson of the National Advisory Committee for Aeronautics in 1938–39. In 1940 he became chair of the National Defense Research Committee, and from 1941 to 1947 directed the OSRD. He was chair of the Joint Research and Development Board of the War and Navy departments in 1946, chair of the Research and Development Board of the National Military Establishment in 1947–48, and later became honorary chair of the Corporation, MIT. Granted many awards and some two dozen honorary degrees, he received the National Medal of Science in 1964 and the Founders Award of the National Academy of Engineering in 1966.

Bush wrote *Operational Circuit Analysis* (1929), *Endless Horizon* (1946), a collection of papers and addresses, *Modern Arms and Free Men* (1949), *Science is Not Enough* (1967), and *Pieces of the Action* (1970).

For background information *see* ATOMIC BOMB; DIFFERENTIAL ANALYZER; RADAR in the McGraw-Hill Encyclopedia of Science and Technology. ■

BUSIGNIES, HENRI GASTON

★ American engineer

***Born** Dec. 29, 1905, Sceaux, France*

When Busignies was 21 he invented the Hertzian compass, later known as the airborne radio compass. When tuned to a radio station, the radio compass needle indicates directly on a 360° scale the bearing of the station. This function was achieved first by measuring a ratio of signal amplitude between two fixed-cross receiving loops combined with antennas, and later by comparing the phase of the envelope output signal of a loop rotating at 5 or 10 turns per second with a fixed phase signal generated locally. This was the first continuously rotating directive antenna, later followed by rotating radar antennas.

Shortly thereafter, in 1928, Busignies joined the International Telephone and

April 2, 1954.

Dr. Detlev W. Bronk, President,
National Academy of Sciences,
2101 Constitution Avenue, N.W.,
Washington 25, D.C.

Dear Det:

I see by the program of the Academy that there is an evening meeting and reception on April 26 at which the Carty Medal is to be presented. I have gathered that I was likely to be involved in this matter, and from the announcement it appears that the medalists will "respond with short addresses pertaining to their fields of scientific inquiry." Now if anyone can tell me today what my field of scientific inquiry is they will solve quite a problem for me, for if I am supposed to respond in this way I certainly am stuck as to what I might say. It seems to me that under these circumstances I need some guidance from the President of the Academy. Won't you tell me how long to talk and what to talk about?

Cordially yours,

V. Bush.

June 11, 1947

W. A. Rothe, Editor
Current Biography
The H. W. Wilson Company
950-972 University Avenue
New York 52, New York

Dear Mr. Rothe:

In Dr. Bush's absence from the city may I acknowledge the May issue of Current Biography with its able and interesting article about him. The data as presented are in the main entirely accurate. There do occur, however, a couple of slips in column 2 of page 10. OSRD did not go out of existence in January, 1947; on the contrary, though now skeleton size, it is still functioning and in all probability will continue to do so for a few months to come. Since this is so, the later statement that only the AEC and the JRDB remained at the beginning of 1947 as evidences of the Government's wartime scientific program is not quite sound. As you know, the Senate has passed the Smith Bill for the creation of a National Science Foundation, and it is hoped that the bill will receive House passage during the present session. This fact may call for revision of the fourth sentence of this particular paragraph. The final sentence of this paragraph is too sweeping to be entirely accurate. In the next to the last paragraph, Dr. Bush, by the end of this month, will have run his honorary degree total to 14 and the medal total up to 10.

In the first column on page 9, last paragraph, eighth line, the justifying typewriter on which Dr. Bush holds a patent is not in the strict sense an electronic machine. This adjective, however, is properly applicable to the differential analyzer. On page 9, column 2, 7th line from the bottom, James B. Jewett should be Frank B. Jewett. On page 10, column 1, line 14, James P. Baxter should be James P. Baxter, III.

With all good wishes,

Very truly yours,

F. G. Fassett, Jr.
Director
OFFICE OF PUBLIC RELATIONS

Clear copy
Vannevar Bush

July 7, 1947.

1950 on
Gold Leaf
Vannevar Bush

Captain John E. Fondahl,
No.3 Police Precint,
13th and Nicholson Streets, N.W.,
Washington, D.C.

Dear Captain Fondahl:

Mrs. Bush and I are leaving Washington on Wednesday evening, July 9, and will probably be away until after Labor Day. This year we shall not have a caretaker and the house will therefore be completely unattended with the exception of occasional visits by people from the office to pick up mail for forwarding. The purpose of this note, therefore, is to ask if you will be good enough to instruct your patrolmen to give the house a little attention and, if occasion arises, to make any necessary report to Mr. Callaway or Mr. Sullivan at the Carnegie Institution office (DUpont 6400). My house address is 4901 Hillbrook Lane, N.W.

I shall of course be most appreciative of any cooperation you may be able to give in this connection.

Very truly yours,

V. Bush.

CONFIDENTIAL

HEADQUARTERS, ARMY AIR FORCES
WASHINGTON

REPLY REFER TO:

7 July 1947

Dr. Vannevar Bush, Chairman
Joint Research and Development Board
1712 G Street N.W.
Washington 25, D. C.

Dear Dr. Bush:

I have received your letter of June 25, 1947, enclosing a copy of a letter from Dr. Berkner to you concerning the approach of the Armed Forces, and particularly the Air Forces, to our future research and development program.

I very much appreciate both yours and Dr. Berkner's comments in these respective letters. I agree that the problems before all of us are of extreme importance to the future of our research and development programs and, in turn, to the welfare of the nation, and that between us we must use all of our ingenuity to arrive at a satisfactory and workable solution to the problems raised by Dr. Berkner. However, he has raised the question as to the advisability of the Air Engineering Development Center and as to whether or not this is an effective method of assisting in carrying out the Air Forces' research and development program. It would appear to me in reading Dr. Berkner's letter that he may not fully understand the purpose and use of the facilities now in existence at Wright Field and those proposed for the A.E.D.C. I would like to say that our installations at Wright Field are not, and never have been, considered to be fundamental research laboratories. The funds received by the Air Forces for research and development purposes are expended totally with industry, commercial research laboratories and educational institutions, except for personnel, small amounts of materials for the repair of experimental airplanes and equipment and for maintenance of our facilities, to carry out research and development projects.

At Wright Field, we do not nor have we ever tried to carry on fundamental research. We cannot do this for many reasons, among which are that we cannot compete with industry as a whole due to lack of funds and qualified personnel, and because we also believe it is good policy to encourage industry and the educational institutions to do this work for us. In carrying out our research and development programs, we try to set up requirements and specifications to meet our needs and present these requirements to industry to produce the equipment we require. Upon receipt of the equipment, we use the facilities at Wright Field to test this equipment to determine whether or not it meets our requirements, and to assist in the development of the equipment mutually with the initial contractor. For instance, in our wind tunnel, we test full scale engine nacelles to

determine proper air flow characteristics, cooling requirements, etc. In our Engine Laboratories, we test full scale engines to determine whether or not they meet our power and mechanical endurance requirements. This is true throughout our laboratories to a very great extent. Wright Field was started in the middle '20's and in building the facilities, we tried to look forward into the future as far as we could to determine the size and capacity of the various testing equipments which would be needed by the Air Forces. In many cases, these facilities are no longer of a sufficient capacity to meet the present requirements or those foreseen within the near future.

This really is the basis behind the requirement to develop the Air Engineering Development Center, not only to meet our needs but also those of industry. We cannot afford to build large test facilities at contractors' plants. The A.E.D.C. has never been considered as a fundamental research center. It is to be a development and evaluation test facility. It is not a duplication of Wright Field, although most of the facilities contemplated in A.E.D.C. will be similar in purpose but will be built to enlarge the outgrown capacity of many of the Wright Field installations. The usefulness of the Wright Field installations will in no way be decreased by the new A.E.D.C. facility and are being continually modified to keep pace with AAF test requirements; however, space, power and water requirements have reached the limits of the area.

The A.E.D.C. program has been carefully considered over the last two years and has met the approval of the Aeronautical Board and the Committee of Aeronautics of the J.R.D.B. The wind tunnel portion of A.E.D.C. has also met the approval of N.A.C.A. and two sub-committees of N.A.C.A. which included members of industry. The wind tunnel projects fall within the National Program of Transonic and Super-sonic Wind Tunnels. I feel that the project has been completely coordinated by all interested agencies, and although perhaps not perfect in every detail, it appears to me to be reasonable and practical. The Joint Research and Development Board approval of the program would enable the project definitely to get started. It must be assumed that an intelligent review of the entire construction program will be continuously carried out by the AAF and that corrections, when required, will be made.

The problems raised by Dr. Berkner with respect to research and development organizations of the Services are very far-reaching and are subject to many opinions as to methods of implementation. To await a complete agreement on them before the initiation of the A.E.D.C. facilities or any other thoroughly coordinated research and development program, would probably delay all of our development programs for such a long time as to have very serious consequences to our national security.

Letter to Dr. Bush

It is my hope that the Joint Research and Development Board will see fit to pass favorably upon the Air Engineering Development Center program, as revised finally by the Board, within the very near future.

Sincerely,

Hoyt S. Vandenberg

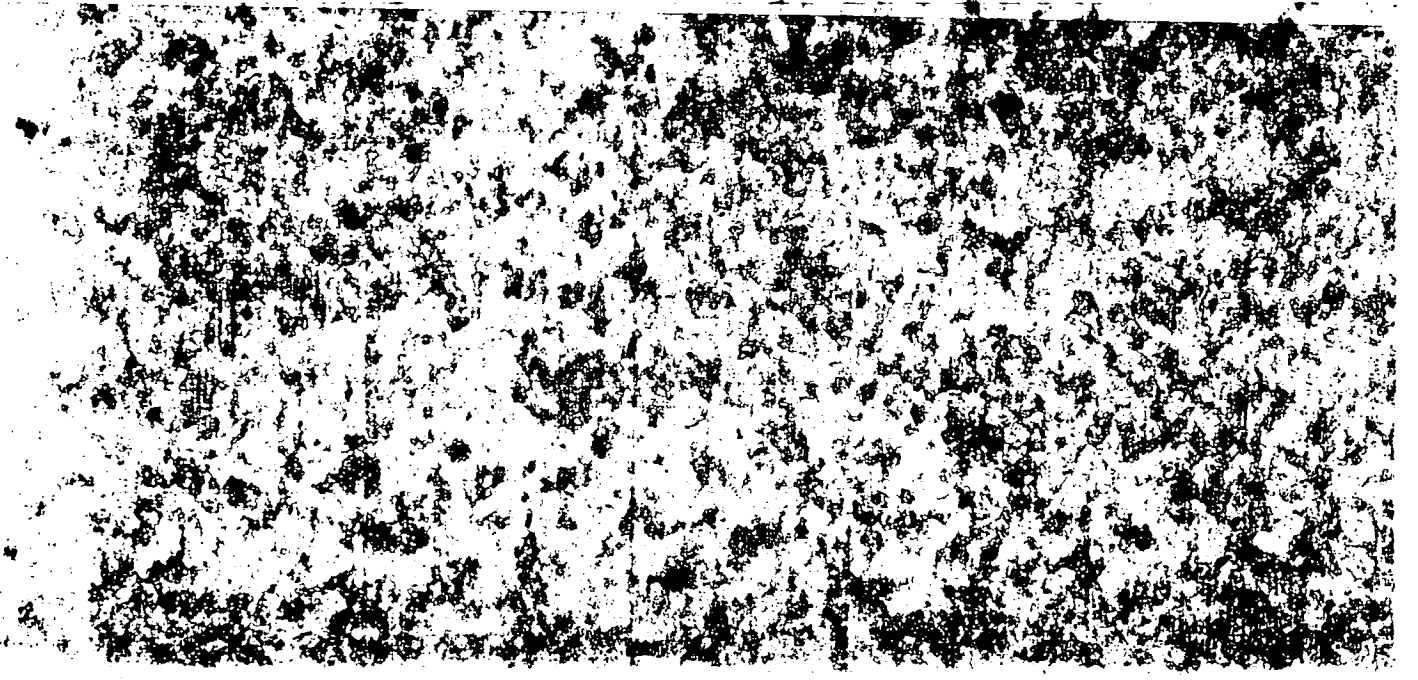
for CARL SPAATZ
General, U. S. Army
Commanding General, Army Air Forces

From Day Log of Secy of War Robt. P. Patterson.

1947 July 10th 2:40 P.M. T. R. Groves to present Genl.

Robt. M. Montague who is to command a special

atomic energy project at Albuquerque, N.M.



NATIONAL ADVISORY COMMITTEE
FOR AERONAUTICS
1724 F STREET, NORTHWEST
WASHINGTON 25, D. C.

TELEPHONES: EXECUTIVE 3515, 3516, 3517

LANGLEY AERONAUTICAL LABORATORY
LANGLEY FIELD, VA.

AMES AERONAUTICAL LABORATORY
MOFFETT FIELD, CALIF.

LEWIS FLIGHT PROPULSION LABORATORY
CLEVELAND AIRPORT, CLEVELAND 11, OHIO

November 10, 1948

To General Hoyt S. Vandenberg, USAF
Member, National Advisory Committee for Aeronautics.

Dr. Karl T. Compton, the new Chairman of the Research and Development Board, of the National Military Establishment, took the oath of office as a member of the National Advisory Committee for Aeronautics on November 9, 1948, succeeding Dr. Vannevar Bush, resigned.

Sincerely yours,

Executive Secretary.

July 17, 1947.

General Carl Spaatz,
Room 3E 1020, Pentagon Building,
Washington 25, D.C.

Dear General Spaatz:

Your letter of July 7 to Dr. Bush, in reply to his letter to you of June 25, did not reach this office until today. Dr. Bush is now away from Washington and does not expect to return until early September, but I am forwarding a copy of your letter to his present address on the chance that he may have opportunity to reply before he starts a journey to the Pacific Coast.

Very truly yours,

Secretary to Dr. Bush.

Copy no #2

TOP SECRET

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON

WAR COUNCIL

TENTATIVE AGENDA for Meeting of the War Council at 10:00 AM on 15 December 1947

1. Progress Reports on Unfinished Items Considered at Prior Meetings:

a. Report of the Pay Committee of the Joint Army-Navy Personnel Board on Service Pay (Unclassified)

There will be a brief summary of developments since the last meeting. No preparation is required, but the Army and Air Force are requested to submit their comments on this report promptly.

b. Procurement of Air Force Officers from the Naval Academy (Restricted)

This item, which is on the regular agenda of the Committee of Four Secretaries, is listed so that prompt consideration may be given to the matter if Secretaries Sullivan and Symington have had an opportunity to review and discuss the Navy Department's study of this matter.

c. MATS and ATC (Confidential)

This item, which is on the regular agenda of the Committee of Four Secretaries, is listed so that prompt consideration may be given to the matter if Secretaries Sullivan and Symington have had an opportunity to complete their joint study of the matter.

(*) 2. Dr. Bush's Letter of 13 November 1947 (Top Secret) (Submitted by the Secretary of Defense)

There was transmitted to each member of the Council, under date of 13 November 1947, a letter from Dr. Bush to the Secretary of Defense dated 13 November 1947. Each member of the Council is requested to be prepared to discuss this matter and to submit recommendations as to the way in which the problems involved can best be tackled.

3. Joint Recruiting (Unclassified) (Submitted by the Secretary of Defense)

Under date of 28 November 1947, the inter-departmental study of joint recruiting (prepared in response to a request from Mr. Forrestal, dated 8 November 1947) was submitted. The several departments already have copies of this study. Attached hereto is a letter from Secretary Sullivan, dated 9 December 1947, with respect to this study and making

Copies to: Mr. Whitney
Gen. Spaatz
COPY
Gen. Vandenberg
Gen. Norstad
Gen. Lindsay
Col. Sweeney

14

TOP SECRET

16 December 1947

MEMORANDUM FOR DR. BUSH:

Subject: Preparations Against a Sneak Attack.

1. At the meeting of the War Council on 18 December the following decision was reached:

> Secretary Forrestal appointed a committee consisting of Dr. Bush, Mr. Souers, and General Gruenther, with Dr. Bush as chairman, to examine this problem in all its facets, particularly in its relation to civil defense. This committee is to render a report covering the best manner of handling these problems from an organizational standpoint.

2. Your committee will be considered a committee of the War Council, and this office is prepared to furnish such personnel, funds, and other forms of assistance as may be required in the prosecution of the committee's work. As in the case of all committees of the War Council, your committee will be authorized to call on all agencies under the Secretary of Defense for such assistance as the committee may from time to time require.

3. I recognize that the problem before your committee is a difficult one and that it will require some time for you to prepare any recommendations. At the same time, I would appreciate it if you would keep the War Council periodically advised as to the progress which is being made.

JOHN H. OHLY
Special Assistant to the Secretary

BOHEMIANS IN EXILIO

NOV 21 1947

Washington, D. C.
November 18, 1947

Your Excellency:

As most of those to whom this letter goes have already been forewarned, the members of Bohemia (and such former Encampment guests as can be corralled) who find themselves in unhappy exile in these benighted parts propose to foregather for an "Afterglow" at 5:30 P.M. on the evening of Thursday, December 11, 1947, at the Burning Tree Country Club, there to pour libations to the gods of the forest, to bury for the nonce the body of Dull Care, and to dedicate in song and fellowship

THE POTOMAC THICKET OF BOHEMIA'S WOODS.

We want you with us on that occasion. Don a "black tie" if you must, but if you do you will be alone, for the correct costume of the evening will be that of The Grove and The Encampment. (A prize to him whose togs are most appropriate!)

There will be plenteous libations and generous slabs of juicy steak, -- not to mention the feast of wit and wisdom over which our Sire of the evening, the ebullient "Ed" Goodrich, will preside. The cost will be $15.00 per person, and if there is anything left over (which seems highly dubious) we promise that it will be used as a "kitty" to foster future gatherings of a similar nature.

Whether or no you can be present, please fill out the enclosed card and mail it at once. We must know your intent as soon as possible.

And may Bohemia's joys be yours.

Carl I. Wheat
Spear Carrier pro tem.

The Board of Directors

extends to

Dr Vannevar Bush

The Privilege of Attending

The 1947 Midsummer Encampment

at Bohemian Grove

Please present this invitation at the Gate

Jno. A. Moore

Secretary

THIS SIDE OF CARD IS FOR ADDRESS

Carl I. Wheat

520 Shoreham Building

Washington 5, D. C.

that could be expected from the German designs. The designers of the aircraft themselves were contacted. "Could the Russians develop a flying saucer from their designs?" The answer was, "No, there was no conceivable way any aircraft could perform that would match the reported maneuvers of the UFO's." The Air Force's Aeromedical Laboratory concurred. If the aircraft could be built, the human body couldn't stand the violent maneuvers that were reported. The aircraft-structures people seconded this, no material known could stand the loads of the reported maneuvers and heat of the high speeds.

Still convinced that the UFO's were real objects, the people at ATIC began to change their thinking. Those who were convinced that the UFO's were of Soviet origin now began to eye outer space, not because there was any evidence that the UFO's did come from outer space but because they were convinced that UFO's existed and only some unknown race with a highly developed state of technology could build such vehicles. As far as the effect on the human body was concerned, why couldn't these people, whoever they might be, stand these horrible maneuver forces? Why judge them by earthly standards? I found a memo to this effect was in the old Project Sign files.

Project Sign ended 1947 with a new problem. How do you collect interplanetary intelligence? During World War II the organization that was ATIC's forerunner, the Air Matériel Command's secret "T-2," had developed highly effective means of wringing out every possible bit of information about the technical aspects of enemy aircraft. ATIC knew these methods, but how could this be applied to spaceships? The problem was tackled with organized confusion.

If the confusion in the minds of Air Force people was organized the confusion in the minds of the public was not. Publicized statements regarding the UFO were conflicting.

A widely printed newspaper release, quoting an unnamed Air Force official in the Pentagon, said:

> The "flying saucers" are one of three things:
> 1. Solar reflections on low-hanging clouds.
> 2. Small meteors that break up, their crystals catching the rays of the sun.
> 3. Icing conditions could have formed large hailstones and they might have flattened out and glided.

A follow-up, which quoted several scientists, said in essence that the unnamed Air Force official was crazy. Nobody even heard of crystallized meteors, or huge, flat hailstones, and the solar-reflection theory was absurd.

Life, *Time*, *Newsweek*, and many other news magazines carried articles

about the UFO's. Some were written with tongue in cheek, others were not. All the articles mentioned the Air Force's mass-hysterical induced hallucinations. But a Veterans' Administration psychiatrist publicly pooh-poohed this. "Too many people are seeing things," he said.

It was widely suggested that all the UFO's were meteors. Two Chicago astronomers queered this. Dr. Gerard Kuiper, director of the University of Chicago observatory, was quoted as flatly saying the UFO's couldn't be meteors. "They are probably man-made," he told the Associated Press. Dr. Oliver Lee, director of Northwestern University's observatory, agreed with Dr. Kuiper and he threw in an additional confusion factor that had been in the back of many people's minds. Maybe they were our own aircraft.

The government had been denying that UFO's belonged to the U.S. from the first, but Dr. Vannevar Bush, the world-famous scientist, and Dr. Merle Tuve, inventor of the proximity fuse, added their weight. "Impossible," they said.

All of this time unnamed Air Force officials were disclaiming serious interest in the UFO subject. Yet every time a newspaper reporter went out to interview a person who had seen a UFO, intelligence agents had already been flown in, gotten the detailed story complete with sketches of the UFO, and sped back to their base to send the report to Project Sign. Many people had supposedly been "warned" not to talk too much. The Air Force was mighty interested in hallucinations.

Thus 1947 ended with various-sized question marks in the mind of the public. If you followed flying saucers closely the question mark was big, if you just noted the UFO story titles in the papers it was smaller, but it was there and it was growing. Probably none of the people, military or civilian, who had made the public statements were at all qualified to do so but they had done it, their comments had been printed, and their comments had been read. Their comments formed the question mark.

CHAPTER THREE

The Classics

1948 was only one hour and twenty-five minutes old when a gentleman from Abilene, Texas, made the first UFO report of the year. What he saw, "a fan-shaped glow" in the sky, was insignificant as far as UFO

BUSH, VANNEVAR (vă-nē'vär) Mar. 11, 1890- Electrical engineer; United States Government official; scientific institute administrator

Address: b. c/o Carnegie Institution of Washington, Washington 5, D.C.

NOTE: This biography supersedes the article which appeared in *Current Biography* in 1940.

Of Vannevar Bush it was once said that he was one scientist whose manifold talents had been recognized as fully by his Government as by his professional colleagues. After a career as a professor of electrical engineering at Massachusetts Institute of Technology and inventor of electronic calculating machines, culminating in his election to the presidency of the Carnegie Institution of Washington, he was appointed director of the Government's wartime National Defense Research Committee and Office of Scientific Research and Development. He was administrator of the atomic bomb project during its early stages, and in 1947 he also heads the Research and Development Board, formerly the Joint Research and Development Board of the Army and Navy.

Wide World Photos

VANNEVAR BUSH

Grandson of a Yankee whaling captain and son of a Universalist minister, Vannevar Bush (who was named after the clergyman who married his parents, Richard Perry Bush and the former Emma Linwood Paine) was born in Everett, Massachusetts, on March 11, 1890. He grew up in Chelsea, Massachusetts, where it was possible for him to spend his idle hours sailing small boats in Boston Bay and during the summer vacation to serve as a cook on a mackerel smack. On Sundays he would pump the manual organ in his father's church and wonder about an electrical installation. In 1909, having completed his preliminary education in the Chelsea public schools, young Bush entered Tufts College. He was graduated in 1913, with both the B.S. and the M.S. degrees, but, he has said, with no certain knowledge of the career he wanted to follow. His first job was in the testing department of the General Electric Company in 1913; his second, with the inspection department of the United States Navy in 1914. Then, when Tufts College offered him a position as instructor in mathematics for the academic year 1914-15, he accepted.

While holding these early jobs, Bush also pursued graduate studies at Harvard University and the Massachusetts Institute of Technology, and in 1916 he received Doctor of Engineering degrees from both institutions. Immediately thereafter, Tufts College promoted him to an assistant professorship of electrical engineering. When the United States entered World War I in 1917, Bush was chosen to work at the New London, Connecticut, antisubmarine laboratory for a special board of the Navy. At the same time, and until 1922, he was also a consulting engineer to the American Radio and Research Corporation. In 1919 the young engineer joined the Massachusetts Institute of Technology faculty as associate professor of electrical power transmission. In 1923 he was appointed full professor in the same field. Nine years later he was made vice-president of M.I.T. and dean of its School of Engineering, and in this position he remained until 1938.

The years of his association with M.I.T. were for Vannevar Bush also years of scientific fruitfulness. Among his important contributions were: improvements in the design of vacuum tubes and four-engine bombers; important studies on transients in machines and on dielectric phenomena; the invention of such machines as the justifying typewriter (which spaces the lines of type so that they come out exactly the intended length), the rapid selector, the cinema integraph, and especially the differential analyzer (a mathematical robot designed to solve lengthy and intricate differential equations and capable of caculating the answers to as many as twenty-five sets of data in a few minutes). The latter, together with the network analyzer (a mechanism for the electrical reproduction in miniature of complicated electric power systems to test their performance under strain), and their variants, were developed with the close cooperation of the department of electrical engineering of M.I.T. During World War II the differential analyzer, the invention for which Bush is most widely known, solved problems in ballistics, acoustics, structures, and atomic physics.

It was in recognition of his work with advanced mathematical analyzing instruments that Dr. Bush was awarded the Levy Medal of the Franklin Institute in 1928 and the Lamme Medal of the American Institute of Electrical Engineers in 1935. His career as an educator, stated the periodical *School and Society* when it reported his election as president of the Carnegie Institution of Washington in June 1938, "has been no less notable." During his later years at M.I.T., as dean of engineering, Bush had directed a survey of the undergraduate

curriculum in his field with a view to increasing the value of an engineering education. Commenting on Bush's Carnegie post, President Karl T. Compton[*] of M.I.T. said: "Dean Bush is so eminently qualified for his new position, and the post is of such great influence and opportunity in the field of science and human welfare, that his colleagues at Technology are unanimous in their approval of his selection. . . . [Yet they] will sadly miss his keen and ever constructive counsel and direction . . . [and the] good judgment and analytical power [he has shown] in his administrative work as vice-president of the Institute."

The Carnegie Institution of Washington was founded by Andrew Carnegie in 1902 "to encourage in the broadest and most liberal manner, investigation, research, and discovery, and the application of knowledge to the improvement of mankind." When Vannevar Bush assumed its presidency in January 1939, its research budget amounted to approximately $1,500,000 annually and its far-flung activities concerned astronomy, archeology, geology, biology, botany, entomology, embryology, nutrition, and many other branches of science. Bush's first major task was a closer coordination of the Institution's program with other research and educational organizations, and, according to the *National Cyclopædia of American Biography*, "definite progress in this direction had been attained by the time of the outbreak of the second world war."

After the outbreak of World War II, Bush became increasingly conscious of the uncoordinated state of science in the United States and the need for its all-out mobilization for defense. As a remedy for the situation he proposed a general directive agency in the Federal Government, and in 1939 often discussed such a project with his colleagues on the National Advisory Committee for Aeronautics (of which he was a member after 1938 and chairman from 1939 to 1941), with President Compton of M.I.T., President James B. Conant[*] of Harvard University, and President Frank B. Jewett[*] of the National Academy of Sciences. Early in 1940, at Bush's suggestion, the secretary of NACA began preparing a draft of the proposed National Defense Research Committee to be presented to Congress; but when Germany invaded France, Bush decided that speed was necessary and approached President Roosevelt[*] directly. In little more than a month NDRC, with Bush as chairman and the others as members, was functioning, even before it was brought into official existence by order of the Council of National Defense on June 27, 1940. The Office of Scientific Research and Development, consisting of NDRC and a newly formed Advisory Council and Committee on Medical Research, was created by Executive order on June 28, 1941.

The story of OSRD is told in *Fortune* of June 1946, and at greater length in *Scientists Against Time* by James P. Baxter[*], president of Williams College and OSRD historian. From the outset Bush determined on two cardinal policies: to delegate supervision of divisions to his colleagues according to their qualifications so that he would be free to direct over-all policy; and to interpret as narrowly as possible the terms "instrumentalities, methods and materials of war" so that his office would neither be overworked nor duplicate the efforts of other agencies. Perhaps his most difficult problem, according to *Fortune*—and principal achievement because he handled it successfully—was at the same time to keep the confidence of the military, with its distrust of civilian ability to observe security regulations, and to fight the draft of young scientists into the armed forces. Other problems were to see that funds were adequate and to determine the apportionment of research among Government, academic, and industrial facilities. The main technique employed was radial research, in which, instead of advancing step by step, OSRD defined the problem for solution and then set teams investigating from all angles at once. Until May 1943 the atomic bomb project was under the administration of OSRD, but at that time it was transferred to the Army's Corps of Engineers because only under military control could funds and priorities on the scale which became necessary have been obtained. In all, OSRD alone developed some two hundred weapons and instrumentalities of war, in addition to many advances in the medical, physical, and chemical fields. It continued to function actively until some time after the end of hostilities and was then (in 1946 and 1947) reduced to a skeleton staff charged with winding up the work remaining from the war period.

It had been hoped by many, including Bush, that by the time of the dissolution of OSRD there would have been created a national science foundation to organize science for peace as the OSRD had organized it for war. The Kilgore[*] bill of July 1945 had proposed a single administrator appointed and removable by the President, heavy emphasis on applied research, and a patent clause favoring Government monopoly. The Magnuson[*] bill, leaning heavily on Bush's 1945 report to the President on a program for postwar scientific research (*Science, the Endless Frontier*), countered with a proposal to vest control in a panel of top scientists and civilian administrators with the executive director appointed by them, to place emphasis on basic research, and to protect private patent rights. But (as outlined by *Science* in its issue of December 27, 1946, and earlier numbers) S.1850, the compromise Kilgore-Magnuson bill of February 1946 seemingly acceptable to most, after passing in the Senate 48 to 18, died in the Interstate and Foreign Commerce Committee of the House because that committee was undecided between it and a virtual duplication of the original Magnuson bill, H.R.6448, to which Bush had transferred his support from S. 1850.

In February 1947 Senator H. Alexander Smith of New Jersey introduced S.526, a bill which incorporated most of the features advocated by Bush, including the controversial administration by an autonomous scientific panel. This was passed by the Senate on May

BUSH, VANNEVAR—*Continued*

20, 1947, and by the House on July 16. Designed to supersede OSRD, its veto by President Truman on August 6—on the ground that under it the administrative officers were not properly responsible either to the President or to Congress—left Bush still in charge of what remained of that agency. Meanwhile, he had also been directing the Joint Research and Development Board of the Army and Navy. In atomic energy legislation, Bush had supported the May"-Johnson"" bill, thereby disagreeing with the many scientists who supported the Magnuson"" bill. He was also actively fulfilling the demands of his presidency of the Carnegie Institution of Washington.

In September 1947 the Joint Research and Development Board of the Army and Navy was superseded by the Research and Development Board, established in the National Security Act which replaced the War and Navy offices with a Department of Defense. Bush was named chairman of the group, whose duties were much the same as the joint body's. *United States News*, in reviewing some of the problems which will confront Bush, reported that in 1947 about 465 million dollars will be spent on "research and development for military purposes." A directive, issued by Secretary of Defense Forrestal late in 1947, defined the duties of the members of the board and assigned to it the responsibility and authority "to resolve differences among the several departments and agencies of the military establishments."

Since 1932 (and as of 1947) Bush has received fourteen honorary degrees and ten medals. He is a fellow of the American Academy of Arts and Sciences, the National Academy of Sciences, the American Institute of Electrical Engineers, and the American Physical Society; a member of the American Association for the Advancement of Science, the Society for the Promotion of Engineering Education, the American Philosophical Society, and the American Mathematical Society; a trustee of Tufts College, the Woods Hole Oceanographic Institution, Johns Hopkins University, and the Brookings Institution; a life member of the Massachusetts Institute of Technology corporation; a regent of the Smithsonian Institution. In 1928 he was elected an alumnus member of Phi Beta Kappa. In addition to contributing numerous articles to scientific periodicals, he is the author of three books, *Principles of Electrical Engineering*, with W. H. Timbie, (1923), *Operational Circuit Analysis* (1929), and *Endless Horizons* (1946).

Bush and Phoebe Davis, of his home town, were married on September 5, 1916, and are the parents of Richard Davis and John Hathaway. S. J. Woolf of the New York *Times*, watching Bush at the head of an OSRD conference table, described him as "tall, gaunt and angular, with a humorous twinkle in his small blue eyes and an obstinate lock of coarse, straight hair shooting forward from his slightly bulging forehead." A variety of interests is reflected in his hobbies, which extend from quoting Kipling and Omar Khayyám "by the yard," listening to good music, and playing the flute, to raising turkeys on his New Hampshire farm, and keeping an aquarium. A color photography enthusiast, he has also experimented with a method of "painting" with transparent color on ground glass illuminated from behind. And when pigeons threatened to usurp the feeding station he had built for wild birds, he devised a perching rod with a trick spring which unceremoniously dumped any such heavier visitors to the ground.

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BUTLER, NICHOLAS MURRAY Apr. 2, 1862—Dec. 7, 1947 Educator; political figure; began his career at Columbia College in 1885 as an assistant in philosophy, attaining the rank of professor of philosophy and education in 1890; was one of the organizers at Columbia of the New York College for the Training of Teachers (later Teachers College); became president of Columbia College in 1902, and until his retirement as president emeritus in October 1945, was responsible for many academic reorganizations, including the development of Columbia College into Columbia University; founded the *Educational Review* (1891), helped form the National Education Council; active in Republican politics, being the Vice-Presidential candidate (1912) on the Taft ticket; attended numerous post-World War I international peace conferences; shared with Jane Addams the Nobel peace prize in 1931. See *Current Biography* 1940 Yearbook.

Obituary

N Y Times p1+ D 7 '47 por; p21 D 8 '47 por

CAFFREY, JAMES J(OSEPH) Nov. 29, 1897- Lawyer; former United States Government official

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When James J. Caffrey was elected by his fellow commissioners to the chairmanship of