

October 19, 1939

My dear Professor:

I want to thank you for your recent letter and the most interesting and important enclosure.

I found this data of such import that I have convened a Board consisting of the head of the Bureau of Standards and a chosen representative of the Army and Navy to thoroughly investigate the possibilities of your suggestion regarding the element of uranium.

I am glad to say that Dr. Sachs will cooperate and work with this Committee and I feel this is the most practical and effective method of dealing with the subject.

Please accept my sincere thanks.

Very sincerely yours,

Dr. Albert Einstein,
Old Grovo Road,
Massau Point,
Peconic, Long Island,
New York.

C O P Y

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Please accept my sincere thanks.

Very sincerely yours,

(signed) Franklin D. Roosevelt

Dr. Albert Einstein,
Old Grove Road,
Nassau Point,
Peconic, Long Island,
New York.

On Display in South Section

C O P Y

THE LEHMAN CORPORATION
1 & 3 SOUTH WILLIAM ST.
NEW YORK, N. Y.

FROM ALEXANDER SACHS

THE PRESIDENT
THE WHITE HOUSE
WASHINGTON, D. C.

JOHN MOYNAHAN & COMPANY, INC.

155 EAST 44TH STREET, NEW YORK, N. Y. 10017

MURRAY HILL 7-2545

CABLE: MOYNAJON

Public Relations

September 29, 1965

69-453
Miss Elizabeth B. Drewry, Director
Franklin D. Roosevelt Library
Hyde Park, New York

Dear Miss Drewry:

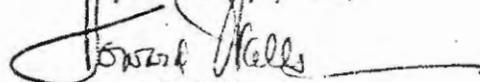
Thank you very much for your September 24 letter and the copies of four more letters on nuclear fission. We have carefully noted your statement that literary rights are limited to President Roosevelt's letters and Professor Einstein's 1939 letter to him.

You and Mr. Nixon have been so helpful to us that we should like to do something for you. In his September 9 letter to us, Mr. Nixon said it was not clear whether Leo Szilard's undated memorandum was an enclosure to Einstein's letter or to Sachs's letter. Our researches have revealed the following information, verified by Atomic Energy Commission history on this subject:

The Einstein letter dated August 2, 1939, emerged from conferences between Alexander Sachs and Leo Szilard. Einstein signed it at their request. Sachs asked Szilard to write an accompanying memorandum explaining more fully the underlying science of nuclear fission and stressing chain reaction. Sachs was to deliver both documents to President Roosevelt in an interview with him. President Roosevelt became very preoccupied with the international crisis and was busy trying to win repeal of the arms embargo from a reluctant Congress. Therefore Sachs waited for a more propitious time to see him, and arranged an appointment for October 11. He wrote his October 11 letter, placed it with the Einstein letter and the Szilard memorandum to form a dossier, and went to the White House. At the beginning of the interview, Sachs read his own October 11 letter as President Roosevelt listened, then delivered all three documents to him. As the interview came to a close, President Roosevelt called in his aide, "Pa" Watson, and said, "This requires action."

Therefore the three documents, taken together, may be characterized as a unit — the dossier which set in motion the machinery which produced The Bomb.

Very sincerely yours,


Howard Walls

RECEIVED
SEP 30 1965
THE FRANKLIN D. ROOSEVELT
LIBRARY

Albert Einstein
Old Grove Rd.
Nassau Point
Peconic, Long Island

August 2nd, 1939

F.D. Roosevelt,
President of the United States,
White House
Washington, D.C.

Sir:

Some recent work by E. Fermi and L. Szilard, which has been communicated to me in manuscript, leads me to expect that the element uranium may be turned into a new and important source of energy in the immediate future. Certain aspects of the situation which has arisen seem to call for watchfulness and, if necessary, quick action on the part of the Administration. I believe therefore that it is my duty to bring to your attention the following facts and recommendations:

In the course of the last four months it has been made probable - through the work of Joliot in France as well as Fermi and Szilard in America - that it may become possible to set up a nuclear chain reaction in a large mass of uranium, by which vast amounts of power and large quantities of new radium-like elements would be generated. Now it appears almost certain that this could be achieved in the immediate future.

This new phenomenon would also lead to the construction of bombs, and it is conceivable - though much less certain - that extremely powerful bombs of a new type may thus be constructed. A single bomb of this type, carried by boat and exploded in a port, might very well destroy the whole port together with some of the surrounding territory. However, such bombs might very well prove to be too heavy for transportation by air.

United States has only very poor ores of uranium in moderate quantities. There is some good ore in Canada and the former Czechoslovakia, while the most important source of uranium is Belgian Congo.

In view of this situation you may think it desirable to have some permanent contact maintained between the Administration and the group of physicists working on chain reactions in America. One possible way of achieving this might be for you to entrust with this task a person who has your confidence and who could perhaps serve in an unofficial capacity. His task might comprise the following:

a) to approach Government Departments, keep them informed of the further development, and put forward recommendations for Government action, giving particular attention to the problem of securing a supply of uranium ore for the United States;

b) to speed up the experimental work, which is at present being carried on within the limits of the budgets of University laboratories, by providing funds, if such funds be required, through his contacts with private persons who are willing to make contributions for this cause, and perhaps also by obtaining the co-operation of industrial laboratories which have the necessary equipment.

I understand that Germany has actually stopped the sale of uranium from the Czechoslovakian mines which she has taken over. That she should have taken such early action might perhaps be understood on the ground that the son of the German Under-Secretary of State, von Weizsäcker, is attached to the Kaiser-Wilhelm-Institut in Berlin where some of the American work on uranium is now being repeated.

Yours very truly,

A. Einstein

(Albert Einstein)

file
Vannevar C.
RSP
Dr. Bush
2-42

December 28, 1942.

Dear Van:-

I have yours of December sixteenth with postscript of December twenty-third in regard to the special project. I will approve the recommendations.

Please send me a memorandum as to how you think I should approach the Budget in asking for the appropriation.

I am returning your folder and letter duly sealed.

Always sincerely,

Dr. Vannevar Bush,
Office of Scientific Research and Development,
1530 P Street, N.W.,
Washington, D. C.

(1)

[Atomic Bomb]

Documents Concerning the "Tube Alloy" Project, 1941-1944

in the Franklin D. Roosevelt Library 36
Hyde Park, New York 19

L--Letter
M--Memo
C--Cablegram

- [L] Bush to Roosevelt, July 16, 1941, 1 page, with enclosures:
"Report of the National Defense Research Committee, June 27, 1940-
-June 28, 1941", ~~SECRET~~ (Frontpiece and pages 34 and 35 only).
PSF Safe File, Bush folder.
- [M] Roosevelt to Bush, March 20, 1942, 1 page. PSF Safe File, -Bush folder.
with two attachments, Bush to Forester, March 16, 1942, 1 page and
Bush to Roosevelt, March 16, 1942. All in PSF Safe File, Bush folder.
- [L] Bush to Roosevelt, June 19, 1942, 1 page, ~~SECRET~~, and FDR's reply,
July 11, 1942, 1 page, ~~SECRET~~. PSF Safe File, Bush folder.
for Hopkins
- [C] Churchill to Roosevelt / Feb. 16, 1943, 1 page, ~~SECRET~~
Hopkins Papers, A Bomb folder.
- [C] Hopkins to Churchill, Feb. 24, 1943, 1 page, ~~SECRET~~. Hopkins Papers,
A Bomb folder.
- [M] Bush to Hopkins, Feb. 26, 1943, 1 page, ~~SECRET~~, with enclosure:
[M] "Legal and Policy Basis for OSRD Interchange of Scientific
Information with the British," 22 pages, ~~SECRET~~. Hopkins Papers,
A Bomb folder.
- [C] Churchill to Roosevelt for Hopkins, Feb. 27, 1943, 3 pages, ~~SECRET~~
Summary of U.S.-U.K. relations on "Tube Alloy" project. Hopkins Papers,
A Bomb folder.
- [C] Churchill to Roosevelt for Hopkins, Feb. 27, 1943; 1 page, ~~SECRET~~.
Hopkins Papers, A Bomb folder.
- [C] Churchill to Roosevelt for Hopkins, March 20, 1943, 1 page, ~~SECRET~~
Hopkins Papers, A Bomb folder.
- [C] Hopkins to Churchill, March 20, 1943, 1 page, ~~SECRET~~. Hopkins Papers,
A Bomb folder.
- [M] James Conant to Bush, March 25, 1943, 6 pages, ~~SECRET~~. Hopkins Papers,
A Bomb folder.
- [M] Bush to Hopkins, March 31, 1943, 1 page, with enclosure:
[M] "Interchange on S-1", March 31, 1943, 5 pages, ~~SECRET~~
Hopkins Papers, A Bomb folder.
- [C] Hopkins to Lord Halifax, April 15, 1943, 1 page with attachments:
Hopkins to A. Eden, April 15, 1 page ~~SECRET~~; Halifax to Hopkins,
April 14, 1 page ~~SECRET~~; Bush to Hopkins, May 26, 1943, 1 page
with enclosure: Memo of Conference with Hopkins and Lord Cherwell,
May 25, 1943, 3 pages ~~SECRET~~. Hopkins Papers, A Bomb folder.

- [C] Churchill to Roosevelt for Hopkins, June 10, 1943, 1 page ~~Secret~~
Hopkins Papers, A Bomb folder.
- [C] Hopkins to Churchill, June 17, 1943, 1 page ~~Secret~~. Hopkins Papers,
A Bomb folder.
- [C] Roosevelt to Churchill, July 20, 1943, 1 page ~~Secret~~. Hopkins
Papers, A Bomb folder.
- [M] "DJB" to Roosevelt, July 28, 1943, 1 page, with enclosure:
[L] Carroll Wilson to Roosevelt, July 28, 1943, 1 page ~~Secret~~.
PSF - Bush folder.
- [M] Bush to McIntyre, Aug. 4, 1943, 1 page with enclosures: [L] Robert
Oppenheimer to Roosevelt, July 9, 1 page ~~Secret~~; [M] Tully to Conant,
July 1, 1 page; [L] Roosevelt to Oppenheimer, June 29, 2 pages ~~Secret~~
[L] Roosevelt to General Groves, June 29, 1 page ~~Secret~~; [M] Bush
to Forster, June 28, 1 page, enclosing drafts of above letters to
Oppenheimer and Groves. PSF, Bush folder.
- [M] Tully to Roosevelt, undated, c. Aug. 11, 1943, 1 page, with the
following attachments: [M] Roosevelt to Hopkins, July 14, 1 page;
Hopkins to Tully, Aug. 11, 1 page; [L] Bush to Roosevelt, Aug. 7,
2 pages ~~Secret~~; [L] Sir John Anderson to Bush, Aug. 6, 1 page ~~Secret~~
~~Secret~~; [L] Bush to Anderson, Aug. 6, 3 pages ~~Secret~~; Anderson
to Bush, Aug. 4, 4 pages ~~Secret~~. PSF, Bush folder.
- [L] Bush to Roosevelt, Aug. 23, 1943, 1 page ~~Secret~~, "Tubealloy
Interchange with the British". Hopkins Papers, A Bomb folder.
- [M] J.M. Martin to Churchill, Sept. 9, 1943, 1 page, with the following
attachments: Churchill to Lord President (Anderson?), Sept. 2, 1 page
~~Secret~~; Lord President to Churchill, Sept. 2, 1 page; extract
from "Who's Who" on Sir Edward Appleton, 1 page; paraphrase of [C]
Lord President to Churchill, Aug. 28, 2 pages. Hopkins Papers,
A Bomb folder.
- [M] Roosevelt to Bush, Oct. 12, 1943, 1 page ~~Secret~~. PSF, Bush folder.
- [L] Henry L. Stimson to Gen. Watson, June 8, 1944, 1 page ~~Secret~~,
with attachment: "Collaboration between ... the United States and
the United Kingdom in the matter of Tube Alloys," December 10, 1943,
1 page. PSF, Combined Policy Commission folder.
- [M] Aide Memoire of conversation between Roosevelt and Churchill,
Sept. 18, 1944, 1 page ~~Secret~~. Map Room Papers, Box 172.
[Document is located in front of Tab "A".]

Items in HLH papers relating to "Tube Alloys" (Sherwood # 23)

- (1) FDR to Bush, naming him head of the National Defense Research Committee, 6-15-40.
- (2) J.M. Martin (WC's aide) to HLH, 1-23-42, on Tube Alloys. (PERSONAL)
- (3) WC to HLH, 2-16-43, protesting U.S. refusal to carry out agreement to share information. [REDACTED]
- (4) ~~WC~~ HLH to WC, 2-24-43, asking for a report on the "misunderstanding" from Sir Hohn Anderson. [REDACTED]
- (5) Bush to HLH, 2-26-43, on exchange of information with the British, enclosing:
 - (a) Bush to Carrol L. Wilson, 2-24-43, on policy to be followed in exchanging information; [REDACTED]
 - (b) Wilson to Bush, 2-4-41, on the exchange of information; [Secret]
 - (c) John T. Connor to Wilson, 2-6-43, on "Foreign Liaison Activities of NDRC and OSRD [Canada mentioned];
 - (d) Sec. War Patterson to Bush, 9-12-40, hopes NDRC will get in touch with Tizard;
 - (e) Bush to Marshall and Stark, 9-30-40, on his recent meeting with the Tizard mission; [REDACTED]
 - (f) Knox and Stimson to Bush, 10-24-40, stating policy to be followed in exchange of information; [REDACTED]
 - (g) Memorandum by Bush, 10-25-40, proposing method to be followed in carrying out interchange policy [Canada mentioned] [REDACTED]
 - (h) Bush to Knox, 10-30-40: assumes Canada included in exchange agreement; [REDACTED]
 - (i) Bush to Stimson, 10-30-40, same as above; [Secret]
 - (j) Patterson and Forrestal to Bush, 11-20-40: Canada included; [REDACTED]
 - (k) Bush to Admiral Anderson, CNO, 9-28-40: may Tizard mission meet with Uranium Committee of the NDRC; [REDACTED]
 - (l) Admiral Anderson to Bush, 10-1-40, enclosing Sec. Navy memo of 9-28-40 on exchange of information. [REDACTED] [Secret] [REDACTED]
- (6) WC to HLH, 2-27-43, asking for decision on U.S. policy of interchange of information. [REDACTED]

- ✓ (7) WC to HLH, 2-27-43, summarizing history of U.S.-British exchange of information on Tube Alloys [secret].
- ✓ (8) WC to HLH, ³⁻²⁰⁻⁴³ 2-27-43, asking for reply to above [secret].
- ? (9) HLH to WC, 3-20-43: is "working on tube alloys." [secret]
- (12) WC to HLH, 4-1-43: concerned at no reply to his 2-27-43 [secret].
- (13) Bush to HLH, 4-5-43, encl. a New York Times clipping on German heavy water plant to show dangers of security leaks.
- (10) Conant to Bush, 3-25-43, on British demand for all information [secret].
- (11) Bush to Hopkins, 3-31-43, defending U.S. restrictions on interchange of information [secret].
- (14) HLH to Eden, 4-14-43. Will send a telegram on information matter. [secret]
- (16) Bush to HLH, 4-27-43, on a meeting with Dean Mackenzie, the Canadian scientist primarily concerned with tube alloys [secret].
- ✓ (17) Memo of conference of HLH and Lord ^{er}Churwell at White House, 5-25-43, on U.S. policy respecting exchange of information; memo by Bush [secret].
- ? (18) Churwell to HLH, 5-30-43, on his recent trip to U.S. (thanks HLH for hospitality).
- ✓ (15) Halifax to HLH, 4-14-43, sending message on tube alloys arrangement for information exchange [secret].
- ✓ (19) WC to HLH, 6-10-43: grateful for HLH's help in information exchange matter [secret].
- ✓ (20) HLH to WC, 6-17-43: "The matter of tube alloys is in hand and will be disposed of completely the first of the week." [secret].
- (21) HLH to Churwell, 6-28-43, replying to C.'s 5-30-43.
- (22) HLH to FDR, 7-20-43: FDR made a "firm commitment on exchange of information . . ." [secret].
- (23) FDR to Bush, 7-20-43. Arrangement with G.B. means "complete exchange of information." [secret].
- (24) ~~xxx Bush to FDR, 8-7-43, carrying on with the British xxx~~

(23A) Bush to FDR, 8-7-43, on manner of future exchange of info. (secret)

(24) FDR to WC, 7-20-43. "I have arranged satisfactorily for tube alloys." (secret)

(25) Bush to FDR, 8-23-43, on exchange of information with the British (secret)

(26) J.M. Martin (WC's aide) to WC, 9-9-43, enclosing an exchange of wires on make-up of the Combined Policy committee; Akers not acceptable to US; "our team in Canada" mentioned.

~~(27) Aide Memoire, FDR to WC, 9-18-44, on exchange of information.~~

THE ERNEST KEMPTON ADAMS FUND FOR PHYSICAL RESEARCH
OF COLUMBIA UNIVERSITY

REPRINT SERIES

INSTANTANEOUS EMISSION OF FAST NEUTRONS IN
THE INTERACTION OF SLOW NEUTRONS
WITH URANIUM

By

LEO SZILARD AND WALTER H. ZINN

Reprinted from THE PHYSICAL REVIEW, Vol. 55, No. 8, April 15, 1939

Instantaneous Emission of Fast Neutrons in the Interaction of Slow Neutrons with Uranium*

Recently it became known¹ that uranium can be split by neutrons into two elements of about equal atomic weight. In this fission of uranium the two elements produced have a large neutron excess; moreover they are probably produced in an excited nuclear state. One might therefore expect that these excited fragments instantaneously emit neutrons and that perhaps the number emitted is even larger than one per fission.

One might also expect a delayed emission of neutrons—as was first pointed out by Fermi—if some of the fragments go through one or more beta-transformations before they emit a neutron. Delayed emission of neutrons caused by the action of both slow and fast neutrons on uranium has recently been reported by Roberts, Meyer, and Wang,² who find a period of about 12 seconds.

In order to see if there is an instantaneous emission of neutrons from the fission of uranium we have performed the following experiment. We exposed uranium oxide to neutrons which were slowed down by paraffin wax, using as a source of neutrons a block of beryllium from which photoneutrons were liberated by the gamma-rays of radium. A helium-filled ionization chamber connected to a linear amplifier served as a detector for fast neutrons. The ionization pulses of the chamber were observed visually by means of a cathode-ray oscillograph and were recorded by the usual counting arrangement.

Figure 1 shows a diagram of the experimental arrangement. The ionization chamber is covered by a cadmium sheet cap *G* which prevents the thermal neutrons from penetrating to the helium ionization chamber. A cadmium sheet shield *H*, 0.5 mm thick, is used to cover the cylindrical box *E* which contains 2300 g of uranium oxide. The uranium oxide is screened from the thermal neutrons by this shield and can be exposed to them simply by removing the shield.

We observed about 50 pulses per minute from the helium chamber when we exposed the uranium oxide to the thermal neutrons in the absence of the cadmium shield *H*, but obtained only 5 pulses per minute when the uranium was screened from the thermal neutrons by the cadmium shield. The difference of about 45 pulses per minute we have to attribute to fast neutrons emitted from uranium under the action of thermal neutrons. It is reasonable to assume that this emission of fast neutrons is connected with the fission of uranium.

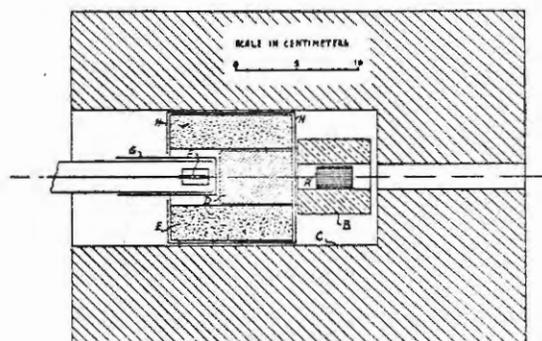


FIG. 1. Arrangement for the observation of the emission of fast neutrons from uranium. A, Radium. B, Beryllium block. C, Paraffin wax. D, Lead block. E, Box filled with uranium oxide. F, Ionization chamber. G, Cadmium sheet cap. H, Cadmium sheet shield.

Control experiments were carried out in which uranium was replaced by lead. The effect of the presence and absence of the cadmium shield *H* and the cadmium cap *G* was tested.

In order to estimate the number of fast neutrons emitted per fission under the action of thermal neutrons we used an ionization chamber lined with a thick layer of uranium oxide having an area of 25 cm². This uranium chamber was put in place of the helium chamber without otherwise materially changing the experimental arrangement. Under these conditions the uranium chamber gave about 45 fissions per minute. Assuming the range of the fission fragments to be about 0.005 g per cm² in uranium oxide, the observed 45 fissions per minute should occur in a surface layer, weighing 0.13 g, of the thick uranium oxide lining. Accordingly, about 800,000 fissions per minute should occur in the 2300 g of uranium oxide which was used in our experiment. By taking into account the solid angle, the size of the helium chamber and the pressure used, and by assuming that the "fission neutrons" have an average collision cross section in helium of 3.5×10^{-24} cm² we find the number of neutrons emitted per fission to be about two.

This number is of course only a rough estimate; the main cause of uncertainty is the considerable variation of the cross section of helium with the neutron energy in the region around one million volts.³ A hydrogen-filled

ionization chamber is now being used in order to obtain a more accurate estimate. It seems to be established, however, that the order of magnitude is one neutron per fission.

Anderson, Fermi and Hanstein have independently, and by a different method, carried out experiments on the neutron emission connected with the fission of uranium. Our observations are consistent with their results, and we wish to thank them for communicating their results to us before publication.

While from our observations we can only say that the time delay involved in this "instantaneous" neutron emission appears to be less than one second, we should expect, for theoretical reasons, this emission to take place within less than 10^{-14} second.

We have also looked for a delayed emission of fast neutrons by performing the following experiment. The uranium oxide was irradiated for some length of time in the arrangement shown in Fig. 1. Then the radium was quickly removed from the beryllium block and the cathode-ray oscillograph screen was watched for a period of 15 seconds for an indication of a delayed emission of fast neutrons. After the radium is removed there is no gamma-ray background to set a lower limit for the observable helium recoil energy; the only slight background remaining is due to electrical fluctuations of the amplifier. In 50 experiments, corresponding to a total observation time of

more than 12 minutes, we observed only two pulses which may or may not have been due to a delayed emission of fast neutrons. This is to be compared with the emission of 45 fast neutrons per minute, the number observed while the radium is inside the beryllium block. We conclude that, if slow neutrons falling on uranium cause a delayed emission of neutrons which are sufficiently fast for us to observe, their number must be very much smaller than the number of neutrons which we have observed in the instantaneous emission.

We are indebted to Dr. S. Seely for his assistance in carrying out some of these experiments. We wish to thank the Department of Physics of Columbia University for the hospitality and the facilities extended to us, and also wish to thank the Association for Scientific Collaboration for enabling us to use one gram of radium in these experiments.

LEO SZILARD
WALTER H. ZINN

Pupin Physics Laboratories,
Columbia University,
New York, New York,
March 16, 1939.

* Publication assisted by the Ernest Kempton Adams Fund for Physical Research of Columbia University.

¹ O. Hahn and F. Strassmann, *Naturwiss.* 27, 11 (1939); L. Meitner and R. Frisch, *Nature* (February, 1939).

² R. B. Roberts, R. C. Meyer, and P. Wang, *Phys. Rev.* 55, 510 (1939).

³ H. Staub and W. E. Stephens, *Phys. Rev.* 55, 131 (1939).

EXECUTIVE ORDER

There is hereby created a

National Defense Research Committee

to be composed of a Chairman, one member each from the War, Navy and Commerce Departments, and one from the National Academy of Sciences, together with three members at large who shall be distinguished scientists or engineers. The members shall serve, as such, without compensation, and shall receive remuneration only for their reasonable expenses of travel in connection with their duties.

This Committee shall be attached to the Advisory Commission to the Council of National Defense and shall be provided with office facilities in the manner provided for that Commission.

It shall be the function of this Committee to correlate and support scientific research on the mechanisms and devices of warfare, except on the problems of flight included in the field of activities of the National Advisory Committee for Aeronautics. It shall aid and supplement, rather than replace, the activities of the War and Navy Departments; and shall be concerned with research for the creation and improvement of instrumentalities, methods, and materials of warfare rather than with industrial development and manufacture. In carrying out its function it shall provide, by agreement with individuals, educational or scientific institutions, or industrial organizations, for studies, experimental investigations, and reports, within the limits of such funds as shall be provided for its purposes.

June 15, 1940

My dear Mr. Secretary:

I am enclosing a copy of the note which I wrote today to Dr. Vannevar Bush, which is self-explanatory. It is clearly understood between Dr. Bush and me that this does not in any way supplant any existing work now going on in the Navy Department. Naturally, you will want to cooperate closely with Dr. Bush and his committee.

It seems advisable to me that after conferences with Dr. Bush and appropriate persons in the Navy Department an officer be assigned to correlate the work of Dr. Bush and his committee with the Navy Department.

Very sincerely yours,

The Honorable
The Secretary of Navy x18
Washington, D. C.

Bush V.

THE WHITE HOUSE
WASHINGTON

COPY

JUN 15 1940

Dr. Vannevar Bush,
President of the Carnegie Institution of Washington,
Washington, D. C.

My dear Dr. Bush:

In order that scientific research on the mechanisms and devices of warfare may be more completely correlated and supported in the interests of national defense, I am creating a National Defense Research Committee.

I am happy to appoint you Chairman of this Committee, and to have your assurance from our recent conference that you will be willing to accept this post, and thus to contribute your services to the guidance of the work of this important Committee.

The Committee will consist of not less than eight members, and will be attached to the Advisory Commission to the Council of National Defense. Through this organization you will be provided with such facilities and funds as may be necessary for the operation of the office of the Committee. It is expected that, in the furtherance of the objective of the Committee, you will arrange, by agreement with research laboratories in educational and scientific institutions and in industry, for such studies, experimental investigations and reports, as may be found desirable in order to accelerate the creation or improvement of the instrumentalities of warfare. I feel sure that you will have the hearty support of the scientists of this country in these efforts, and that they will cooperate to the utmost under the guidance of your Committee.

Your Committee will include in its membership officers of distinction as representatives of the War and Navy Departments. I trust that there will be the closest of cooperation between the Committee and the armed services. It is not intended that the work of your Committee should replace any of the excellent work which these services are now carrying on, either in their own laboratories or by contract with

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FROM THE PAPERS OF
HARRY L. HOPKINS

industry. Rather it is to be hoped that you will supplement this activity by extending the research base and enlisting the aid of scientists who can effectively contribute to the more rapid improvement of important devices, and by study determine where new effort on new instrumentalities may be usefully employed. In order to facilitate your contact with the needs and opportunities of the armed services, I will request that an officer be detailed from the Army and from the Navy to your office.

You are authorized to appoint subcommittees on special fields, composed of scientists and engineers of distinction, together with officers designated by the services. It is understood that all members of the main Committee, and of the subcommittees, will serve as such without remuneration. It will be proper, however, to charge the reasonable travel expenses of such members to the funds of the Committee.

The National Academy of Sciences, and the National Research Council, were formed primarily to advise the agencies of government on scientific matters, when called upon for such service. They will, I feel sure, respond cordially to requests from your Committee for advice on such broad scientific problems as may arise. The members of the Academy and Council, when thus engaged, devote their services to government without remuneration, but it will be proper for your Committee to provide, by suitable agreement, for defraying the incidental expenses of such groups when they are thus engaged.

The National Bureau of Standards, and other government laboratories, may well be able to carry on effectively some of the research which your Committee deems necessary.

The National Advisory Committee for Aeronautics carries on research on the problems of flight. It is not expected, therefore, that your Committee will be directly concerned with problems in the special field already covered by the activities of the NACA. I trust that you will maintain close relationship with their affairs.

Recently I appointed a special committee, with Dr. Briggs of the Bureau of Standards as Chairman, to study into the possible relationship to national defense of recent discoveries in the field of atomistics, notably the fission of uranium. I will now request that this committee report directly to you, as the function of your Committee includes this special matter, and your Committee may consider it advisable to support special studies on this subject.

The Commissioner of Patents is considering plans for effectively evaluating, in cooperation with the Army and Navy, new ideas which may

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HARRY L. HOPKINS



Three Centimeters

be submitted by inventors in the form of patent applications or simple memorandum form in connection with national defense. I am appointing the Commissioner a member of your Committee in order that there may be the closest possible contact with any such activity in evaluating suggestions, and referring them to the proper individuals, as may be undertaken in addition to the procedure now available for this purpose.

I will shortly appoint one member to your Committee from the Army and from the Navy.

The function of your Committee is of great importance in these times of national stress. The methods and mechanisms of warfare have altered radically in recent times, and they will alter still further in the future. This country is singularly fitted, by reason of the ingenuity of its people, the knowledge and skill of its scientists, the flexibility of its industrial structure, to excel in the arts of peace, and to excel in the arts of war if that be necessary. The scientists and engineers of the country, under the guidance of your Committee, and in close collaboration with the armed services, can be of substantial aid in the task which lies before us. I assure you, as you proceed, that you will have my continuing interest in your undertakings.

Cordially yours,

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Three Centimeters

FROM THE PAPERS OF
HARRY L. HOPKINS

*All correspondence of others of these papers
should be sent to me
him*

June 15, 1940

Mr. Vannevar Bush
President of the Carnegie Institution of Washington
Washington, D. C.
x1975709

4010

My Dear Mr. Bush:

In order that scientific research on the mechanisms and devices of warfars may be more completely correlated and supported in the interests of national defense, I am creating a National Defense Research Committee.

#

I am happy to appoint you Chairman of this Committee, and to have your assurance from our recent conference that you will be willing to accept this post, and thus to contribute your services to the guidance of the work of this important Committee.

The Committee will consist of not less than eight members, and will be attached to the Advisory Commission to the Council of National Defense. Through this organization you will be provided with such facilities and funds as may be necessary for the operation of the office of the Committee. It is expected that, in the furtherance of the objective of the Committee, you will arrange, by agreement with research laboratories in educational and scientific institutions and in industry, for such studies, experimental investigations and reports, as may be found desirable in order to accelerate the creation or improvement of the instrumentalities of warfars. I feel sure that you will have the hearty support of the scientists of this country in these efforts, and that they will cooperate to the utmost under the guidance of your Committee.

x272
x2240

Your Committee will include in its membership officers of distinction as representatives of the War and Navy Departments. I trust that there will be the closest of cooperation between the Committee and the armed services. It is not intended that the work of your Committee should replace any of the excellent work which these services are now carrying on, either in their own laboratories or by contract with industry. Rather it is to be hoped that you will supplement this activity by extending the research base and enlisting the aid of scientists who can effectively contribute to the more rapid

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x172

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improvement of important devices, and by study determine where new effort on new instrumentalities may be usefully employed. In order to facilitate your contact with the needs and opportunities of the armed services, I will request that an officer be detailed from the Army and from the Navy to your office.

x382

You are authorized to appoint subcommittees on special fields, composed of scientists and engineers of distinction, together with officers designated by the services. It is understood that all members of the main Committee, and of the subcommittees, will serve as such without remuneration. It will be proper, however, to charge the reasonable travel expenses of such members to the funds of the Committee.

The National Academy of Sciences, and the National Research Council, were formed primarily to advise the agencies of government on scientific matters, when called upon for such service. They will, I feel sure, respond cordially to requests from your Committee for advice on such broad scientific problems as may arise. The members of the Academy and Council, when thus engaged, devote their services to government without remuneration, but it will be proper for your Committee to provide, by suitable agreement, for defraying the incidental expenses of such groups when they are thus engaged.

The National Bureau of Standards, and other government laboratories, may well be able to carry on effectively some of the research which your Committee deems necessary.

x249-A

The National Advisory Committee for Aeronautics carries on research on the problems of flight. It is not expected, therefore, that your Committee will be directly concerned with problems in the special field already covered by the activities of the NACA. I trust that you will maintain close relationship with their affairs.

Recently I appointed a special committee, with Dr. Briggs of the Bureau of Standards as Chairman, to study into the possible relationship to national defense of recent discoveries in the field of atomistics, notably the fission of uranium. I will now request that this committee report directly to you, as the function of your Committee includes this special matter, and your Committee may consider it advisable to support special studies on this subject.

The Commissioner of Patents is considering plans for effectively evaluating, in cooperation with the Army and Navy, new ideas which may be submitted by inventors in the form of patent applications or simple memorandum form in connection with national defense. I am appointing the Commissioner a member of your Committee in order that

there may be the closest possible contact with any such activity in evaluating suggestions, and referring them to the proper individuals, as may be undertaken in addition to the procedure now available for this purpose.

I will shortly appoint one member to your Committee from the Army and from the Navy.

The function of your Committee is of great importance in these times of national stress. The methods and mechanisms of warfare have altered radically in recent times, and they will alter still further in the future. This country is singularly fitted, by reason of the ingenuity of its people, the knowledge and skill of its scientists, the flexibility of its industrial structure, to excel in the arts of peace, and to excel in the arts of war if that be necessary. The scientists and engineers of the country, under the guidance of your Committee, and in close collaboration with the armed services, can be of substantial aid in the task which lies before us. I assure you, as you proceed, that you will have my continuing interest in your undertakings.

Very sincerely yours,

June 15, 1940

x813-A
Mr. William H. McReynolds,
Secretary,
The Advisory Commission to the
Council of National Defense,
Federal Reserve Building,
Washington, D. C.

Dear Mac:

I am enclosing copy of a letter I wrote to
Dr. Vannevar Bush. I wish you could see
Dr. Bush soon so that his work can be properly
correlated. I wish also that you would prepare
an appropriate executive order for me if one is
needed. A suggested executive order is attached.

Very sincerely yours,

Enclosures

With experiments
from Leo Szilard

Neutron Production and Absorption in Uranium

H. L. ANDERSON, E. FERMI AND LEO SZILARD

Reprinted from THE PHYSICAL REVIEW, Vol. 56, No. 3, August 1, 1939

Neutron Production and Absorption in Uranium*

H. L. ANDERSON, E. FERMI AND LEO SZILARD
Columbia University, New York, New York

(Received July 3, 1939)

IT has been found¹⁻³ that there is an abundant emission of neutrons from uranium under the action of slow neutrons, and it is of interest to ascertain whether and to what extent the number of neutrons emitted exceeds the number absorbed.

This question can be investigated by placing a photo-neutron source in the center of a large water tank and comparing, with and without uranium in the water, the number of thermal neutrons present in the water. In the previous experiments of this type^{1,3} it was attempted to have as closely as possible a spherically symmetrical distribution of neutrons. The number of thermal neutrons present in the water was determined by measuring along one radius the neutron density ρ as a function of the distance r from the center, and then calculating $\int r^2 \rho dr$. A difference in favor of uranium of about five percent was reported by von Halban, Joliot and Kovarski.⁴

Since one has to measure a small difference, slight deviations from a spherically symmetrical distribution might give misleading results. The present experiments which are based on the same general principle do not require such symmetry. In order to measure the number of thermal neutrons in the water we filled the tank with a ten-percent solution of MnSO_4 . The activity induced in manganese is proportional to the number of thermal neutrons present. A physical averaging was performed by stirring the solution before measuring the activity of a sample with an ionization chamber. To obtain an effect of sufficient magnitude, about 200 kg of U_3O_8 was used.

The experimental arrangement is shown in Fig. 1. A photo-neutron source, consisting of about 2 g of radium and 250 g of beryllium was

placed in the center of the tank. The geometry was such that practically all neutrons emitted by the source and by the uranium oxide were slowed down and absorbed within the tank. Each irradiation extended over several half-life periods of radiomanganese and the observed activity of the solution was about four times the background of the ionization chamber. Alternating measurements were taken with the cans filled with uranium oxide, and with empty cans of the same dimensions. The activity proved to be about ten percent higher with uranium oxide than without it. This result shows that in our arrangement more neutrons are emitted by uranium than are absorbed by uranium.

In order to find the average number of fast neutrons emitted by uranium for each thermal neutron absorbed by uranium, we have to determine what fraction of the total number of neutrons emitted by the photo-neutron source is, in our experiment, absorbed in the thermal region by uranium. The number of photo-neutrons

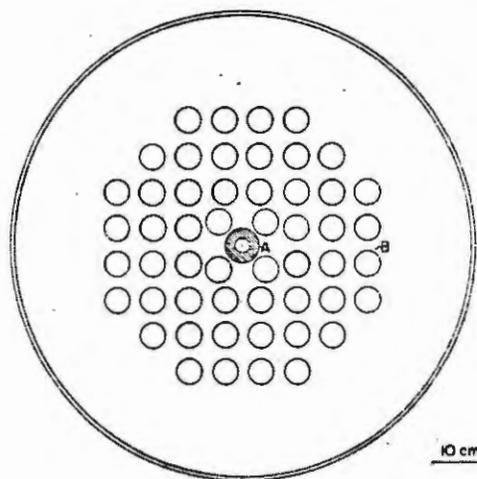


FIG. 1. Horizontal section through center of cylindrical tank which is filled with 540 liters of 10-percent MnSO_4 solution. A, Photo-neutron source composed of 2.3 grams of radium and 250 grams of beryllium. B, One of 52 cylindrical cans 5 cm in diameter and 60 cm in height, which are either empty or filled with uranium oxide.

* Publication assisted by the Ernest Kempton Adams Fund for Physical Research of Columbia University.

¹ v. Halban, Joliot and Kovarski, *Nature* **143**, 470 (1939).

² L. Szilard and W. H. Zinn, *Phys. Rev.* **55**, 799 (1939).

³ Anderson, Fermi and Hanstein, *Phys. Rev.* **55**, 797 (1939).

⁴ v. Halban, Joliot and Kovarski, *Nature* **143**, 680 (1939).

emitted by the source is indicated by the activity of the solution in the tank when the irradiation is carried out with empty cans surrounding the source. We obtained a measure of this number by taking into account that in our solution about 20 percent of the neutrons are captured by manganese and the rest by hydrogen. In order to obtain, in the same units, a measure of the number of neutrons absorbed by uranium we proceeded in the following way: A mixture of sand and manganese powder, having the same thermal neutron absorption as uranium oxide replaced the uranium oxide in $\frac{1}{4}$ of the cans which were distributed uniformly among the other uranium oxide-filled cans. After irradiation, all this powder was mixed together, a ten-percent MnSO_4 solution was prepared from a sample, and its activity was measured with our ionization chamber.

In this way we found that about 50 percent of the neutrons emitted by the source are absorbed as thermal neutrons by uranium in our arrangement. It follows that, if uranium absorbed only thermal neutrons, the observed ten-percent increase in activity obtained with uranium present would correspond to an average emission of about 1.2 neutrons per thermal neutron absorbed by uranium. This number should be increased, to perhaps 1.5, by taking into account the neutrons which, in our particular arrangement, are absorbed at resonance in the nonthermal region by uranium, without causing neutron emission.

From this result we may conclude that a nuclear chain reaction could be maintained in a system in which neutrons are slowed down without much absorption until they reach thermal energies and are then mostly absorbed by uranium rather than by another element. It remains an open question, however, whether this holds for a system in which hydrogen is used for slowing down the neutrons.

In such a system the absorption of neutrons takes place in three different ways: The neutrons are absorbed at thermal energies, both by hydrogen and uranium, and they are also absorbed by uranium at resonance before they are slowed down to thermal energies. Our result is independent of the ratio of the concentrations of hydrogen and uranium, insofar as it shows that, for thermal neutrons, the ratio of the cross

section for neutron production and neutron absorption in uranium is greater than one, and probably about 1.5. What fraction of the neutrons will reach thermal energies without being absorbed will, however, depend on the ratio of the average concentrations of hydrogen and uranium. Since there is an appreciable absorption even far from the center of the resonance band, it follows that the fraction of neutrons absorbed by uranium at resonance will increase with decreasing hydrogen concentration. This has to be taken into account in discussing the possibility of a nuclear chain reaction in a system composed essentially of uranium and hydrogen. A chain reaction would require that more neutrons be produced by uranium than absorbed by uranium and hydrogen together. In our experiment the ratio of the average concentration of hydrogen to uranium atoms was 17 to 1, and in the experiment of von Halban, Joliot and Kovarski this ratio was 70 to 1. At such concentrations the absorption of hydrogen in the thermal region will prevent a chain reaction. By reducing the concentration of hydrogen one would obtain the following effect: On the one hand a larger fraction of those neutrons which reach thermal energies will be absorbed by uranium; on the other hand fewer neutrons reach the thermal region due to an increased absorption by uranium at resonance. Of these two counteracting factors the first is more important for high hydrogen concentrations and the second is more important for low hydrogen concentrations. Starting with high hydrogen concentrations, the ratio of neutron production to total neutron absorption will thus first rise, then pass through a maximum, and, as the hydrogen concentration is decreased, thereafter decrease. We attempted to estimate the quantities involved from the information available about resonance absorption in uranium⁵⁻⁷ and from the observed net gain of 0.2 in the number of neutrons in our experiment. The effect of the absorption at resonance turns out to be so

⁵ Meitner, Hahn and Strassman, *Zeits. f. Physik* 106, 249 (1937).

⁶ v. Halban, Kovarski and Savitch, *Comptes rendus* 208, 1396 (1939).

⁷ H. L. Anderson and E. Fermi, *Phys. Rev.* 55, 1106 (1939).

large that even at the optimum concentration of hydrogen it is at present quite uncertain whether neutron production will exceed the total neutron absorption. More information concerning the resonance absorption of uranium as well as more accurate measurement of some of the values which enter into our calculation are required before we can conclude whether a chain reaction is possible in mixtures of uranium and water.

We wish to thank Dr. D. W. Stewart, of the Department of Chemistry, and Mr. S. E. Krewer, for advice and assistance in carrying out some of these experiments. We are much indebted to the Eldorado Radium Corporation for enabling us to work with large quantities of uranium oxide in our experiments, and to the Association for Scientific Collaboration for the use of the photo-neutron source and other facilities.

THE WHITE HOUSE
WASHINGTON

October 13, 1939.

MEMORANDUM FOR

GENERAL WATSON

Will you prepare a nice
note of thanks to Professor
Einstein and return his letter
to Grace for our very con-
fidential files?

F. D. R.

ONE SOUTH WILLIAM STREET
NEW YORK

October 11, 1939

Dear Mr. President:

With approaching fulfillment of your plans in connection with revision of the Neutrality Act, I trust that you may now be able to accord me the opportunity to present a communication from Dr. Albert Einstein to you and other relevant material bearing on experimental work by physicists with far-reaching significance for National Defense.

Briefly, the experimentation that has been going on for half a dozen years on atomic disintegration has culminated this year (a) in the discovery by Dr. Leo Szilard and Professor Fermi that the element, uranium, could be split by neutrons and (b) in the opening up of the probability of chain reactions, - that is, that in this nuclear process uranium itself may emit neutrons. This new development in physics holds out the following prospects:

1. The creation of a new source of energy which might be utilized for purposes of power production;
2. The liberation from such chain reaction of new radioactive elements, so that tons rather than grams of radium could be made available in the medical field;
3. The construction, as an eventual probability, of bombs of hitherto unenvisaged potency and scope: As Dr. Einstein observes, in the letter which I will leave with you, "a single bomb of this type carried by boat and exploded in a port might well destroy the whole port together with some of the surrounding territory!"

In connection, then, with the practical importance of this work - for power, healing and national defense purposes - it needs to be borne in mind that our supplies of uranium are limited and poor in quality as compared with the large sources of excellent uranium in the Belgian Congo and, next in line, Canada and former Czechoslovakia. It has come to the attention of Dr. Einstein and the rest of the group concerned with this problem that Germany has actually stopped the sale of uranium from the Czechoslovakian mines it seized. This action must be related to the fact that the son of the German Under-Secretary of State, Karl von Weizsaecker, had been an assistant at the Kaiser Wilhelm Institute in Berlin

to some of the great physicists now resident in this country who are carrying forward these experiments on uranium.

Mindful of the implications of all this for democracy and civilization in the historic struggle against the totalitarianism that has exploited the inventions of the free human spirit, Dr. Szilard, in consultation with Professor E. P. Wigner, head of the physics department of Princeton, and Professor E. Teller of George Washington University, sought to aid this work in the United States through the formation of an association for scientific collaboration, to intensify the cooperation of physicists in the democratic countries - such as Professor Joliot in Paris, Professor Lindemann of Oxford and Dr. Dirac of Cambridge - and to withhold publication of the progress in the work on chain reactions. As the international crisis developed this summer, these refugee scholars and the rest of us in consultation with them unanimously agreed that it was their duty, as well as desire, to apprise you at the earliest opportunity of their work and to enlist your cooperation.

In view of the danger of German invasion of Belgium, it becomes urgent to make arrangements - preferably through diplomatic channels - with the Union Miniere du Haut-Katanga, whose head office is at Brussels, to make available abundant supplies of uranium to the United States. In addition, it is necessary to enlarge and accelerate the experimental work, which can no longer be carried out within the limited budgets of the departments of theoretical physics in our universities. It is believed that public-spirited executives in our leading chemical and electrical companies could be persuaded to make available certain amounts of uranium oxide and quantities of graphite, and to bear the considerable expense of the newer phases of the experimentation. An alternative plan would be the enlistment of one of the foundations to supply the necessary materials and funds. For either plan and for all the purposes, it would seem advisable to adopt the suggestion of Dr. Einstein that you designate an individual and a committee to serve as a liaison between the scientists and the Executive Departments.

In the light of the foregoing, I desire to be able to convey in person, in behalf of these refugee scholars, a sense of their eagerness to serve the nation that has afforded them hospitality, and to present Dr. Einstein's letter together with a memorandum which Dr. Szilard prepared after some discussion with me and copies of some of the articles that have appeared in scientific journals. In addition, I would request in their behalf

taking action along this line it would not be necessary officially to disclose that the uranium content of the ore is the point of interest; action might be taken on the ground that it is of value to secure a stock of the ore on account of its radium content for possible future extraction of the radium for medical purposes.

Since it is unlikely that an earnest attempt to secure a supply of uranium will be made before the possibility of a chain reaction has been visibly demonstrated, it appears necessary to do this as quickly as possible by performing a large-scale experiment. The previous experiments have prepared the ground to the extent that it is now possible clearly to define the conditions under which such a large-scale experiment would have to be carried out. Still two or three different setups may have to be tried out, or alternatively preliminary experiments have to be carried out with several tons of material if we want to decide in advance in favor of one set-up or another. These experiments cannot be carried out within the limited budget which was provided for laboratory experiments in the past, and it has now become necessary either to strengthen - financially or otherwise - the organizations which concerned themselves with this work up to now, or to create some new organization for the purpose. Public-spirited private persons who are likely to be interested in supporting this enterprise should be approached without delay, or alternatively the collaboration of the chemical or the electrical industry should be sought.

The investigations were hitherto limited to chain reactions based on the action of slow neutrons. The neutrons emitted from the splitting uranium are fast, but they are slowed down in a mixture of uranium

and a light element. Fast neutrons lose their energy in colliding with atoms of a light element in much the same way as a billiard ball loses velocity in a collision with another ball. At present it is an open question whether such a chain reaction can also be made to work with fast neutrons which are not slowed down.

There is reason to believe that, if fast neutrons could be used, it would be easy to construct extremely dangerous bombs. The destructive power of these bombs can only be roughly estimated, but there is no doubt that it would go far beyond all military conceptions. It appears likely that such bombs would be too heavy to be transported by airplane, but still they could be transported by boat and exploded in port with disastrous results.

Although at present it is uncertain whether a fast neutron reaction can be made to work, from now on this possibility will have to be constantly kept in mind in view of its far-reaching military consequences. Experiments have been devised for settling this important point, and it is solely a question of organization to ensure that such experiments should be actually carried out.

Should the experiments show that a chain reaction will work with fast neutrons, it would then be highly advisable to arrange among scientists for withholding publications on this subject. An attempt to arrange for withholding publications on chain reactions has already been made early in March, but was abandoned in spite of favorable response in this country and in England on account of the negative attitude of certain French laboratories. The experience gained in March would make it possible to revive this attempt whenever it should be necessary.

Leo Szillard
(Signed)

MEMORANDUM

Much experimentation on atomic desintegration was done during the past five years, but up to this year the problem of liberating nuclear energy could not be attacked with any reasonable hope for success. Early this year it became known that the element uranium can be split by neutrons. It appeared conceivable that in this nuclear process uranium itself may emit neutrons, and a few of us envisaged the possibility of liberating nuclear energy by means of a chain reaction of neutrons in uranium.

Experiments were thereupon performed, which led to striking results. One has to conclude that a nuclear chain reaction could be maintained under certain well defined conditions in a large mass of uranium. It still remains to prove this conclusion by actually setting up such a chain reaction in a large-scale experiment.

This new development in physics means that a new source of power is now being created. Large amounts of energy would be liberated, and large quantities of new radioactive elements would be produced in such a chain reaction.

In medical applications of radium we have to deal with quantities of grams; the new radioactive elements could be produced in the chain reaction in quantities corresponding to tons of radium equivalents. While the practical application would include the medical field, it would not be limited to it.

A radioactive element gives a continuous release of energy for a certain period of time. The amount of energy which is released per unit weight of material may be very large, and therefore such elements might

be used - if available in large quantities - as a fuel for driving boats or airplanes. It should be pointed out however that the physiological action of the radiations emitted by these new radioactive elements makes it necessary to protect those who have to stay close to a large quantity of such an element, for instance the driver of the airplane. It may therefore be necessary to carry large quantities of lead, and this necessity might impede a development along this line, or at least limit the field of application.

Large quantities of energy would be liberated in a chain reaction which might be utilized for purposes of power production in the form of a stationary power plant.

In view of this development it may be a question of national importance to secure an adequate supply of uranium. The United States has only very poor ores of uranium in moderate quantities; there is a good ore of uranium in Canada where the total deposit is estimated to be about 3000 tons; there may be about 1500 tons of uranium in Czechoslovakia, which is now controlled by Germany; there is an unknown amount of uranium in Russia, but the most important source of uranium, consisting of an unknown, but probably very large amount of good ore, is Belgian Congo.

It is suggested therefore to explore the possibility of bringing over from Belgium or Belgian Congo a large stock of pitchblend, which is the ore of both radium and uranium, and to keep this stock here for possible future use. Perhaps a large quantity of this ore might be obtained as a token reparation payment from the Belgian Government. In

Hotel King's Crown
420 West 116th Street
New York City

November 11~~th~~, 1939

Dr. Alexander Sachs
One South William Street
New York City

Dear Dr. Sachs;

Dr. Fermi and I discussed the question which you have raised. It seems to us that it will be useful to have a small group of physicists, whose residence is not too far from Washington, D.C., consult with each other at regular intervals on questions connected with research on uranium. We attempted to draw up a list of names for this purpose. In our opinion such a list ought to include the following names to which others might be added, if required.

Beams - Charlottesville, Va.
Fermi - New York
Furry - Cambridge, Mass.
Szilard - New York
Teller - Washington, D.C.
Tuve - Washington, D.C.
Wheeler - Princeton.

In drawing up this list we kept in mind two points:

a) the question of residence of the man selected. The geographical boundary line was drawn at the distance Washington to Boston;

b) the advisability of having a number of the more important eastern universities represented, at which research on uranium has been carried on in the past or might be started in the near future.

Furthermore it seems to us that it might be useful to ask certain small groups of workers to consider themselves responsible for clearing up a given aspect of the question and to submit a report within six months' or a year's time. It would be the task of these groups to see to it that the questions involved are vigorously pursued, either by some members of the group or by others. Such a group would be expected to report at once if they encounter difficulties which they are unable to overcome, so that the help of others can be enlisted.

In our opinion the following persons might be asked to report on, and concern themselves with:

1. Slow Neutron Reaction: ^{all} (Columbia)
Fermi, Pegram, Szilard, Wheeler (Princeton)
2. Fast Neutron Reaction: (Carnegie Inst. Wash.)
Fermi, Szilard, Tuve, Wigner (Princeton)
3. The Question which of the Uranium Isotopes splits: (Columbia)
Dunning, Fermi, Tuve, Wheeler.
4. Small Scale Separation of Isotopes by any Method except Diffusion: (Univ. Va.)
Beams, Fermi, Tuve.
5. Small Scale Separation of Isotopes by Diffusion: (Harvard)
Fermi, Furry, Urey (Columbia)
6. Theoretical Possibility and Limitation of Large Scale Separation by Centrifuging:
Beams, Pegram, Szilard, Teller (George Wash. Univ.)

7. Theoretical Possibility and Limitation of Large Scale

Separation by Diffusion:

Fermi, Furry, ^(Yale) Onsager, Urey.

8. Possibility of Large Scale Production of Uranium Metal:

Pegram, Szilard, and somebody from the Department for
Chemical Engineering of MIT or Columbia.

These groups include the following names:

Beams - University of Virginia,
Fermi - Columbia,
Furry - Harvard,
Dunning - Columbia,
Pegram - Columbia,
Onsager - Yale,
Szilard - Columbia,
Teller - George Washington University,
Tuve - Carnegie Institute of Terrestrial Magnetism,
Urey - Columbia,
Wheeler - Princeton,
Wigner - Princeton.

We could not discuss the tentative proposals contained in this letter with Professor Pegram on account of his absence, and the time was too short to discuss it with anybody else.

Yours very sincerely


(Leo Szilard)

June 15, 1940

Dr. Karl T. Compton, President, ^{x 8/2/1975}
Massachusetts Institute of Technology,
Cambridge, Massachusetts.

My dear Dr. Compton:

In order that scientific research on the mechanisms and devices of warfare may be more completely correlated and supported in the interests of national defense, I am creating a National Defense Research Committee. This will be attached to the Advisory Commission to the Council of National Defense and will be under the chairmanship of Dr. Vannevar Bush. I enclose a copy of a letter to Dr. Bush which explains in some detail the functions of this new committee. ✓

I am happy to appoint you a member of this committee, for I feel sure that you can greatly aid in its deliberations, and thus contribute substantially to an important aspect of national defense.

I trust that you find it possible to accept this appointment, and I will be pleased to be so informed.

If, through the activities of this new committee, the efforts of American scientists throughout the country are effectively oriented in aid of the armed services in the serious problems which today confront them, an important piece of work will have been well accomplished.

Cordially yours,

Enclosure

June 15, 1940

Honorable Conway P. Coe, ^{x 3-72}
Commissioner of Patents,
Department of Commerce,
Washington, D. C.

My dear Mr. Coe:

In order that scientific research on the mechanisms and devices of warfare may be more completely correlated and supported in the interests of national defense, I am creating a National Defense Research Committee. This will be attached to the Advisory Commission to the Council of National Defense and will be under the chairmanship of Dr. Vannevar Bush. I enclose a copy of a letter to Dr. Bush which explains in some detail the functions of this new committee.

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Cordially yours,

Enclosure

June 15, 1940

Dr. James Bryant Conant,
President, Harvard University,
Cambridge, Massachusetts.

x 117791

My dear Dr. Conant:

In order that scientific research on the mechanisms and devices of warfare may be more completely correlated and supported in the interests of national defense, I am creating a National Defense Research Committee. This will be attached to the Advisory Commission to the Council of National Defense and will be under the chairmanship of Dr. Vannevar Bush. I enclose a copy of a letter to Dr. Bush which explains in some detail the functions of this new committee.

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Cordially yours,

Enclosure

June 15, 1940

Dr. Frank B. Jewett, President, x330
National Academy of Sciences,
195 Broadway,
New York City

My dear Dr. Jewett:

In order that scientific research on the mechanisms and devices of warfare may be more completely correlated and supported in the interests of national defense, I am creating a National Defense Research Committee. This will be attached to the Advisory Commission to the Council of National Defense and will be under the chairmanship of Dr. Vannevar Bush. I enclose a copy of a letter to Dr. Bush which explains in some detail the functions of this new committee.

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Cordially yours,

Enclosure

June 15, 1940

Dr. Richard C. Tolman, ×
California Institute of Technology, ×
c/o Lay-Adams House, ×
Washington, D. C.

My dear Dr. Tolman:

In order that scientific research on the mechanisms and devices of warfare may be more completely correlated and supported in the interests of national defense, I am creating a National Defense Research Committee. This will be attached to the Advisory Commission to the Council of National Defense and will be under the chairmanship of Dr. Vannevar Bush. I enclose a copy of a letter to Dr. Bush which explains in some detail the functions of this new committee. ✓

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Cordially yours,

Enclosure

FOR THE PRESS

June 17, 1940

The President has named the following to be members
of the new National Defense Research Committee:

Dr. Vannevar Bush, Chairman
President, Carnegie Institute of Washington

Dr. J. E. Conant,
President, Harvard University

Dr. Richard C. Tolman,
California Institute of Technology

Dr. Karl Compton,
President, Massachusetts Institute of Technology, Mass.

Hon. Conway P. Coe,
Commissioner of Patents, Commerce Dept.

Dr. Lyman J. Briggs,
Director, National Bureau of Standards.

Dr. F. B. Jewett,
President, National Academy of Sciences, New York City

The Secretary of War

The Secretary of the Navy

June 15, 1940

Dr. Lyman J. Briggs,
Director - National Bureau of Standards, x3-10
Washington, D. C.

My dear Dr. Briggs:

A short time ago I asked you to serve as chairman of a committee to study into the possible relationship to national defense of certain aspects of atomistics, notably the fission of uranium.

In order more fully to correlate the scientific efforts of the country with problems of national defense I am now creating a new committee under the chairmanship of Dr. Vannevar Bush, President of the Carnegie Institution of Washington, to be known as the National Defense Research Committee. This committee will be attached to the Advisory Commission to the Council of National Defense and will include representatives of the Army and Navy, and several distinguished scientists. ✓

Since the problem on which you are engaged is a part of this larger picture I am requesting Dr. Bush to arrange to reconstitute your committee as a subcommittee of the National Defense Research Committee with such rearrangement of membership as may prove desirable. I will appreciate it, therefore, if you will now report directly to this new committee. In your new association you will undoubtedly continue to maintain close and direct contact with those officers of the Army and Navy most directly interested in the field of your efforts.

I appreciate the thought and effort which you are devoting to this baffling and intricate matter.

Very sincerely yours,

THE WHITE HOUSE

WASHINGTON

June 18, 1940

FILE MEMO:

Mr. Hassett told me to tell Dr. Vannever Bush (who was asking if he might give out content of the President's letter to him of June 15, 1940 to the newspapermen) that it was O.K. to give it out.

Mr. Hassett read over the President's letter before giving his O.K.

dj

June 15, 1940

My dear Mr. Secretary:

I am enclosing a copy of the note which I wrote today to Dr. Vannevar Bush which is self-explanatory. It is clearly understood between Dr. Bush and me that this does not in any way supplant any existing work now going on in the War Department. Naturally, you will want to cooperate closely with Dr. Bush and his Committee.

It seems advisable to me that after conferences with Dr. Bush and appropriate persons in the War Department an officer be assigned to correlate the work of Dr. Bush and his committee with the War Department.

Very sincerely yours,

The Honorable
The Secretary of War x25
Washington, D. C.

4010

June 24, 1940

MEMORANDUM FOR DR. VANNEVAR BUSH:

For your information.

EDWIN M. WATSON
Secretary to the President

hm

letters from the following persons, accepting membership on the National Defense Research Committee:

- Dr. Karl T. Compton, President, Institute of Technology, Cambridge, Mass., 6/20/40 to the President.
- Dr. James B. Conant, President, Harvard University, Cambridge, Mass., 6/19/40 to the President.
- Hon. Conway P. Coe, Commissioner of Patents, Washington, D.C., 6/18/40 to the President.
- Hon. Lyman J. Briggs, Director, National Bureau of Standards, U.S. Dept. of Commerce, 6/18/40 to the President.
- Richard C. Tolman, President, National Academy of Sciences, Washington, D. C., 6/18/40 to the President.
- Frank B. Jewett, National Academy of Sciences, 195 Broadway, NYC, 6/19/40 to the President.

(Mr. Briggs states in his letter that arrangements are being made at once for the committee on atomistics to report to the Research Committee under the chairmanship of Dr. Bush)

THE ASSISTANT SECRETARY OF THE NAVY
WASHINGTON

27 June 1940

THE WHITE HOUSE
JUN 28 8 54 AM '40
RECEIVED

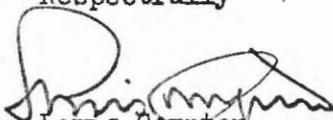
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My dear Mr. President:

Receipt is acknowledged of your letter of 15 June 1940, addressed to the Secretary of the Navy, with which you enclosed a copy of your letter to Doctor Vannevar Bush.

Rear Admiral Harold G. Bowen, U.S.N., has been in communication with Doctor Bush relative to the matter discussed in your letter, and he has been directed to cooperate with the Doctor and his committee.

Respectfully



Lewis Compton

The President
The White House

file

76/20/40

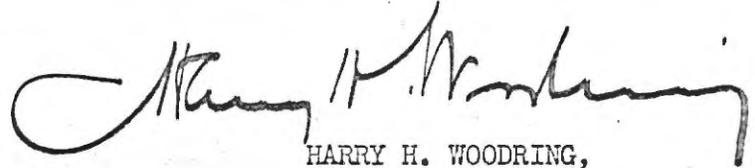
4010

WAR DEPARTMENT
WASHINGTON

June 18, 1940.

MEMORANDUM FOR THE PRESIDENT:

In compliance with your memorandum of June 15, 1940, I have designated Brigadier General George V. Strong, the Assistant Chief of Staff, War Plans Division, as the War Department Advisory Member on the National Defense Research Committee which is headed by Dr. Vannevar Bush. # *x25-T*



HARRY H. WOODRING,
Secretary of War. *x25*

DSF Sam Bush

OFFICE FOR EMERGENCY MANAGEMENT
OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT
1530 P STREET NW.
WASHINGTON, D. C.

VANNEVAR BUSH
Director

July 16, 1941.

The President,
The White House,
Washington, D.C.

Dear Mr. President:

I have the honor to submit herewith a report of operations of the National Defense Research Committee for the first year of its existence during which I was Chairman of the Committee.

This I have purposely made brief. The detailed reports of results obtained from the Committee's activities are placed in the hands of the Army and Navy as rapidly as they are obtained, and the full detailed record is thus available. I have hence confined this summary report to the more important programs, and have treated these generally. I shall of course be glad to extend this report to any extent you may wish.

The scientists of the country realize keenly their responsibilities in the present emergency, where the adequacy of new and sometimes intricate techniques have already profoundly influenced the course of events. They continue to be anxious to put forth their best efforts under your leadership.

Respectfully,



Vannevar Bush,
Director.

This page and pp 34, 35

Franklin D. Roosevelt Library

RECORDED

AEC to Director FDRL

2-12-70

~~CONFIDENTIAL~~

R E P O R T
of the
NATIONAL DEFENSE RESEARCH COMMITTEE
for the
First Year of Operation
June 27, 1940 to June 28, 1941

Contents

1. Scope of the Committee's activities.
2. Summary of the more important programs of research and development, and progress thereon.
3. Data concerning the Committee's activities:
 - a. Form of organization. p. 37
 - b. Scientific personnel involved. p. 38
 - c. Liaison arrangements with the War and Navy Departments. p. 48
 - d. Provision for interchange with British scientists. p. 53
 - e. Number and distribution of contracts. p. 56
 - f. Summary of financial operations. p. 60
 - g. Order establishing N.D.R.C. p. 61

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DATE MAR. 5200.9 (9/27/58)

Date- MAY 28 1974

Signature- *WBS*

f. Uranium

Early in the war the question arose whether it might be possible to obtain large sources of power from atomic fission, or even to create an explosive of tremendous power in this manner. The subject is highly abstruse, but one thing is certain: if such an explosive were made it would be thousands of times more powerful than existing explosives, and its use might be determining.

When the Committee was formed there was already in existence, in collaboration with the Navy Department, a special committee under the chairmanship of Dr. Briggs of the Bureau of Standards dealing with this subject. The Committee has continued this work under Dr. Briggs' direction.

For some time it appeared that the possibility of a successful outcome was very remote. The Committee was faced, on the one hand, with the responsibility of expending public money on what might eventually appear to have been a wild search. On the other hand, it was known that much work on this subject had been done on the continent of Europe, and it was felt to be highly

unsafe not to acquire knowledge concerning the underlying physics of the process. The Committee did not feel justified, in view of the apparently remote chance of success, in diverting to the work the efforts of scientists in considerable numbers, in view of the scarcity of highly qualified physicists for its other important work. It has therefore carried on a careful, but not an elaborate or expensive program.

The subject is too complex for brief summary. There has appeared recently, however, new knowledge which makes it probable that the production of a super-explosive may not be as remote a matter as previously appeared. A program to determine this adequately would be extensive, and expensive in the time of scientists and in direct costs. The subject is being intensively studied in England. The Committee is now making a reexamination of the matter. It is of sufficient importance so that the whole matter should be placed before the President, if this present study indicates any probability that super explosives are possible.

The list of contracts appended* shows a wide range of effort. Many more programs, while not as extensive as those treated above, might be similarly summarized. The full details are in the hands of the armed services. The Committee will be glad to report to the Commander-in-Chief upon any of these matters, and to the extent that further information is desired.



Vannevar Bush.

* List of contracts, p.56.

FORM OF ORGANIZATIONCommittee Members

Vannevar Bush, Chairman of the Committee, President of the Carnegie Institution of Washington.

Richard C. Tolman, Vice Chairman of the Committee and Chairman of Division A (armor and ordnance), Carnegie Institute of Technology

James B. Conant, Chairman of Division B (bombs, fuels and gases), President of Harvard University

Frank B. Jewett, Chairman of Division C (communication and transportation), President of National Academy of Sciences.

Karl T. Compton, Chairman of Division D (detection, controls and instruments), President of Massachusetts Institute of Technology

Conway P. Coe, Chairman of Division E (patents and inventions), Commissioner of Patents

Brigadier General Richard C. Moore, Deputy Chief of Staff

Rear Admiral Harold G. Bowen, Director of the Naval Research Laboratory

Chairman of the Committee on Uranium (Lyman J. Briggs, Director of National Bureau of Standards)

Secretary of the Committee (Irvin Stewart, Director of Committee on Scientific Aids to Learning)

NATIONAL DEFENSE RESEARCH COMMITTEE

Vannevar Bush, Chairman
Richard C. Tolman, Vice Chairman
Rear Admiral H. G. Bowen
Conway P. Coe
Karl T. Compton
James B. Conant
Frank B. Jewett
Maj. General R. C. Moore

Irvin Stewart, Secretary

OFFICE OF THE CHAIRMAN

Vannevar Bush, Chairman
F. L. Hovde, Tech. Aide
F. D. Lewis, Tech. Aide
John Howard, Consultant
C. L. Wilson, Liaison Officer
F. S. Cooper, Asst. Lia. Of.
C. P. Haskins, Asst. Lia. Of.

Committee on Uranium

L. J. Briggs, Chairman

Members:

J. W. Beams
Gregory Breit
Ross Gunn
G. B. Pegram
M. A. Tuve
H. C. Urey

Consultant:

P. H. Abelson

OFFICE OF THE SECRETARY

Irvin Stewart, Secretary to Committee
B. Thompson, Jr., Attorney
C. Norcross, Sr. Administrative Officer
C. Covington, Chief of Contract Section
M. L. Faris, Administrative Aide

RECORDED
INDEXED

Bush

OFFICE FOR EMERGENCY MANAGEMENT
OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT
1550 P STREET NW.
WASHINGTON, D. C.

JSH

July 16, 1941.

The President,
The White House,
Washington, D.C.

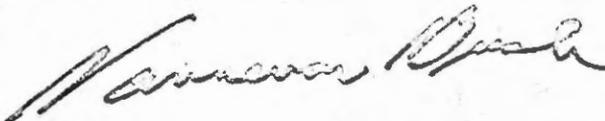
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Respectfully,



Vannevar Bush,
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This page

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AEC to Director FDRL

2-12-70

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of the
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For a complete copy of this NDRC report

see

PSF Safe File: Bush

11 October 1941

Letter from Roosevelt to Churchill, dated 11 October 1941

October 11, 1941.

My dear Mr. Churchill:-

It appears desirable that we should soon correspond or converse concerning the subject which is under study by your MAUD committee, and by Dr. Bush's organization in this country, in order that any extended efforts may be coordinated or even jointly conducted. I suggest, for identification, that we refer to this subject as MAUDSON.

I send this message by Mr. Hovde, head of the London office of our scientific organization, as he can, if necessary, identify the subject more explicitly, or answer your questions concerning the form of organization by which it is now being handled in this country.

With every good wish,

Always sincerely,

The Honorable
Winston Churchill,
Prime Minister of Great Britain,
10 Downing Street,
London,
England.

Private

DRAFT OF LETTER

The Honorable Winston Churchill,
10 Downing Street,
London, England.

My dear Mr. ^{Winston} Churchill:

It appears desirable that we should soon correspond or converse concerning the subject which is under study by your MAUD committee, and by Dr. Bush's organization in this country, in order that any extended efforts may be coordinated or even jointly conducted. I suggest, for identification, that we refer to this subject as W. May E. C.

I send this message by Mr. Hovde, head of the London office of our scientific organization, as he can, if necessary, identify the subject more explicitly, or answer your questions concerning the form of organization by which it is now being handled in this country.

Very sincerely yours,

THE WHITE HOUSE
WASHINGTON

October 11, 1941.

MEMORANDUM FOR DR. VANNEVAR BUSH

I have sent the letter, as you suggested, and I suggest we fill in the blank, not with a letter of the alphabet, but with the word "Maudson".

I enclose the letter to Mr. Churchill with that notation in it.

Is this all right?

FR
F. D. R.

REGRADED
UNCLASSIFIED

COPY *Boat*

FROM THE OFFICE OF

V. BUSH

October 13, 1941.

MEMORANDUM FOR THE PRESIDENT:

Unless you instruct otherwise, I will change the code word in the letter from Maudson to Mayson. On Friday I will seal it, and deliver it to Hovde, with explicit instructions. He will leave by plane Monday or very soon thereafter.

I suggest the change because I fear that the word Maud may convey too much. Someone may know on what the Maud Committee is working.

(Signed) V. B.
V. Bush

O. K.

F. D. R.

WASHINGTON
THE WHITE HOUSE

THE WHITE HOUSE
WASHINGTON

~~CONFIDENTIAL~~

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GENERAL SERVICES ADMINISTRATION

National Archives and Records Service

FRANKLIN D. ROOSEVELT LIBRARY
HYDE PARK, N. Y.

Papers of President Franklin D. Roosevelt



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Very sincerely yours,

GENERAL SERVICES ADMINISTRATION

National Archives and Records Service



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HYDE PARK, N. Y.

Papers of President Franklin D. Roosevelt

THE WHITE HOUSE
WASHINGTON

~~CONFIDENTIAL~~
October 11, 1941.

MEMORANDUM FOR DR. VAINNEVAR BUSH

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F. D. R.

- FDR

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10 Downing Street,
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Very sincerely yours,

6,7,8

Map Room - Bu

COPY

Book

FROM THE OFFICE OF

V. BUSH

October 13, 1941.

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V. Bush

O. K.

F. D. R.

GENERAL SERVICES ADMINISTRATION

National Archives and Records Service

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HYDE PARK, N. Y.

Papers of President Franklin D. Roosevelt

Map Room - WSC-FDR Box 1



Churchill & Roosevelt

The Complete Correspondence

I. Alliance Emerging

OCTOBER 1933 – NOVEMBER 1942

EDITED WITH
COMMENTARY BY

Warren F. Kimball

Princeton University Press, Princeton, New Jersey

- C-133x**, Nov. 26. Indicates concern that the Chinese are not receiving enough aid.
- C-134x**, Nov. 27. Acknowledges R-70x.
- C-135x**, Nov. 30. Suggests the best way to restrain Japan would be an announcement that Roosevelt will ask for a declaration of war if their aggression continues.
- C-136x**, Dec. ? Indicates British willingness to cooperate on atomic research (MAYSON).
- C-137x**, Dec. 7. Asks for Roosevelt's comments on the proposed draft declaration from Britain and the British Commonwealth to Japan.
- C-R/tel.-2**, Dec. 7. Summary of a telephone call from Churchill to Roosevelt after the Pearl Harbor attack.
- R-71x**, Dec. 8. Asks Churchill to delay asking for a declaration of war against Japan until after Roosevelt speaks to Congress to make a similar request; approves of Churchill's message to the Irish government.
- R-72x**, Dec. 8. Reports U.S. declaration of war against Japan.
- C-138x**, Dec. 9. Suggests a conference between himself and Roosevelt (ARCADIA).
- C-139x**, Dec. 10. Dismisses question of personal danger and reiterates desire for a meeting with Roosevelt.
- R-73x**, Dec. 10. Agrees to a meeting with Churchill in Washington; assures that production and allocation problems can be worked out.
- R-73x/A**, not sent; Dec. 10. Asks for a delay of a few weeks before any meeting while an assessment is made of the new situation following the Japanese attack.
- R-73x/B**, not sent; Dec. 10. Suggests one week delay before any meeting.
- C-140x**, Dec. 11. Asks United States not to break its relations with Vichy France.
- C-141x**, Dec. 12. Asks Roosevelt to divert U.S. transports carrying British troops to Bombay instead of Middle East.
- R-74x**, Dec. 12. Informs Churchill that his request in C-141x has been followed.
- C-142x**, Dec. 18. Forwards a proposed agenda for their upcoming meeting.
- C-143x**, Dec. 18. Accepts Roosevelt's invitation to stay at the White House.
- C-144x**, Dec. 21? Gives estimated time of arrival in the United States and suggests additional transportation arrangements.
- C-145x**, Dec. 16-20. Four long reports from the Prime Minister assessing the strategic situation on all fronts.

by encroachment without having before her fairly and squarely the dire character of a further aggressive step. I beg you to consider whether, at the moment which you judge right which may be very near, you should not say that "any further Japanese aggression would compel you to place the gravest issues before Congress" or words to that effect. We would, of course, make a similar declaration or share in a joint declaration, and in any case arrangements are being made to synchronize our action with yours. Forgive me, my dear friend, for presuming to press such a course upon you, but I am convinced that it might make all the difference and prevent a melancholy extension of the war.

[PSF:GB:WSC*. WSC, III, 599. *Pearl Harbor Attack*, pt. 14, p. 1300. R&C.]

Ultimately of more importance than the cables which sped across the Atlantic in December 1941 was this letter in which Churchill formally agreed to work with the United States in developing the atomic bomb. Frederick L. Hovde, in charge of the London branch of the Office of Scientific Research and Development, had already begun discussions on such cooperation with Home Secretary Sir John Anderson and with Churchill's scientist in residence, Lord Cherwell (Frederick Lindemann).

C-136x, letter

London
December, 1941

Private

My dear Mr. President,

Thank you so much for your letter of October 11 on the subject of MAYSON [R-62x].

I need not assure you of our readiness to collaborate with the United States Administration in this matter. I arranged for Mr. Hovde to have a full discussion with the Lord President (Sir John Anderson) and Lord Cherwell, and I hope it will be possible for them shortly to hand him a detailed statement for transmission to America. [Copy initialed] W.S.C.

[PREM 3/139/8A/570]

The Churchill-Roosevelt channel apparently lay unused during the first week in December, but the two were in regular contact via third parties. Anthony Eden and Alexander Cadogan both mention messages sent via Lord Halifax on December 4 and 5 in which the President finally agreed to a joint Dutch, British, and American warning to Japan that any attack on Thailand, Malaya, or the Dutch East Indies would have the most serious consequences (Eden,

I have seen
R Miller

THE WHITE HOUSE
WASHINGTON

January 13, 1942.

[REDACTED]
MEMORANDUM FOR THE
DIRECTOR OF THE BUDGET,
FOR RECOMMENDATION.

F.D.F.

Letter to the Pres. from Vannevar Bush,
Director of Office of Scientific Research
and Development 1/9/42 re Civilian
Scientific Corps and the mobilization of
same.

GENERAL SERVICES ADMINISTRATION

National Archives and Records Service

FRANKLIN D. ROOSEVELT LIBRARY
HYDE PARK, N. Y.

Papers of President Franklin D. Roosevelt



PS F Nash folder
file
Confidential

THE WHITE HOUSE
WASHINGTON

March 11, 1942.

MEMORANDUM FOR DR. VANNEVAR BUSH

I am greatly interested in your report of March ninth and I am returning it herewith for your confidential file. I think the whole thing should be pushed not only in regard to development, but also with due regard to time. This is very much of the essence. I have no objection to turning over future progress to the War Department on condition that you yourself are certain that the War Department has made all adequate provision for absolute secrecy.

F.D.R.

From the Office of

file V. BUSH *file*

March 16, 1942.

Mr. Rudolph Forster,
The White House,
Washington, D.C.

I hand you a report for the President. It contains secret and confidential material which should be securely guarded, for much is here summarized.

5 I have thus far transmitted no copies of this report, and I will appreciate it if you will advise me if the President indicates his wishes in this regard. He may wish to see me to have certain points expanded, and, if so, I am always at his call. This week I plan to be in New York on Wednesday and Thursday, but I can always cancel when needed.

V.B.

V. Bush.

THE WHITE HOUSE
WASHINGTON

March 20, 1942.

MEMORANDUM FOR

DR. VANNEVAR BUSH

I have read your extremely interesting report and I agree that the time has come for a review of the work of the Office on New Weapons. I think you had better go ahead and work this out with the Chief of Staff and Chief of Naval Operations -- confining the whole thing to a very small number of people.

I am returning the report for you to lock up, as I think it is probably better that I should not have it in my own files.

F. D. R.

SECRET

OFFICE FOR EMERGENCY MANAGEMENT

OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT

1530 P STREET NW.
WASHINGTON, D. C.

VANNEVAR BUSH
Director

March 16, 1942.

Franklin D. Roosevelt Library

DECLASSIFIED

*AEC to Director FDRL
2-12-70*

The President,
The White House,
Washington, D.C.

Dear Mr. President:

I transmit herewith a report on the operations of the Office of Scientific Research and Development.

This consists of a brief statement of the status of research on new weapons in various fields. The opinions expressed in regard to relative importance and promise are my own, not the results of study by a group. Medical research is summarized very briefly: the principal point here is that the work is proceeding entirely harmoniously. Appendices give the usual summaries of organization and operations.

Nearly all of the relations of my Office with the Armed Services are on the tactical level, and are cordial and effective on this basis. Much is being done. In my opinion, however, the time has come for a complete review of the work of this Office on new weapons, for the scientists of the country skilled in the necessary ways are limited in number. This review should be on the strategic level, to determine emphasis and be sure that striking opportunities are not being overlooked or inadequately pushed. If there are steps which you wish me to take in order to bring this about, or if you would care to have me express more completely my thoughts on the matter, I await your instructions.

Respectfully yours,



V. Bush,
Director.

From the Office of

V. BUSH

PST
filed
V. Bush
April 23, 1942.

Mr. Forster:

These are films of the "amphibious jeep". I think the President, when he has a moment to relax, may enjoy seeing them. They are confidential, of course, but not extremely so, for the vehicle itself has been seen on the road and there was a brief statement about it released by the Army.

This is one of the fastest jobs on record. My group were turned loose on it about December 10, and by March 10 we had a finished vehicle on test, and it is now under production.

One would expect that, when a jeep is made to swim, it would become a poor land vehicle. Quite the contrary, the amphibious jeep outperforms the ordinary jeep on land. Also it does well in surf, as the film shows.

Uses are of course being held closely confidential. Please tell the President, however, that the British Commandos know all about it, and are following it closely.

My group of engineers is now busy making other things swim.

V. Bush

THE WHITE HOUSE

May 7 4 24 PM '42

OFFICE FOR EMERGENCY MANAGEMENT

OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT

1530 P STREET NW.
WASHINGTON, D. C.

VANNEVAR BUSH
Director

May 7, 1942.

Handwritten:
Cush
5/8/42
H.W.

Honorable Franklin D. Roosevelt,
The White House,
Washington, D.C.

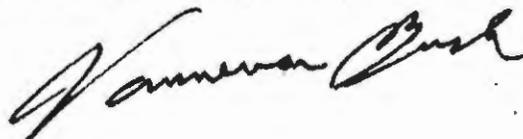
Dear Mr. President:

By action of the Joint U. S. Chiefs of Staff there has been set up a Joint Committee on New Weapons and Equipment charged with the duty of preparing directives for the Joint U. S. Chiefs of Staff concerning development of new weapons, and advising concerning new weapons in connection with strategical planning. I feel sure, from your message to me at the time of submission of my last report, that this will meet your full approval and that I will be acting in accordance with your wishes in accepting membership on this Committee. The other members will be Rear Admiral Lee, head of the Readiness Section of the Navy, and Brigadier General Moses, Assistant Chief of Staff, G-4, of the Army. I believe the move is highly significant and capable of being of genuine aid in the war effort.

Since I report directly to you, it will complete the file if I may have your instructions in this connection, and I have taken the liberty of preparing a draft which I enclose.

The subject designated as Mayson has been discussed with General Marshall, and I believe should be in such form as to be turned over to the Army and increased in scope within a few months. Unless you instruct otherwise, I will apprise my colleagues on the new Committee of its status.

Respectfully yours,



Vannevar Bush, Director,
Office of Scientific Research and Development.

H946

7

May 8, 1942

My dear Dr. Bush:

This will acknowledge your letter of May seventh concerning the new Joint Committee on New Weapons and Equipment, set up by directive of the Joint U. S. Chiefs of Staff. Your acceptance of membership on this Committee meets with my approval.

#

x5014

Very sincerely yours,

FRANKLIN D. ROOSEVELT

Dr. Vannevar Bush, ^{xw.c.} x4482
Director, Office of Scientific
Research and Development,
1530 P Street, Northwest,
Washington, D. C.

hm

DRAFT OF LETTER

May , 1942.

Dr. Vannevar Bush, Director,
Office of Scientific Research and Development,
1530 P Street, N.W.,
Washington, D.C.

Dear Dr. Bush:

This will acknowledge your letter of May 7th concerning the new Joint Committee on New Weapons and Equipment, set up by directive of the Joint U.S. Chiefs of Staff. Your acceptance of membership on this Committee meets with my approval.

Sincerely yours,

From the Office of
V. BUSH

file format
PST. V. Bush Folder
Subj: File
June 24, 1942.

Mr. Forster:

The accompanying memorandum
is in reply to the memorandum from
the President to me of yesterday,
reading "Do you have the money?".

V.B.

V. Bush.

June 24, 1942.

MEMORANDUM FOR THE PRESIDENT:

We have the money. The Army plans to use available funds to be later replaced.

Arthur Compton has plenty of reason for being excited, but like many a scientist is not noted for staying in channels. He is getting results, however, and I hope he gets them fast enough.

V.B.

V. Bush.

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DECLASSIFIED AEC to
Director, 2-12-70

Bush Folder

THE WHITE HOUSE
WASHINGTON

June 23, 1942.

~~CONFIDENTIAL~~

MEMORANDUM FOR DR. VANNEVAR BUSH:

Do you have the money?

F.D.R.

Copy of the Vice President's letter attached for our files, original sent with telegram from Arthur H. Compton to the Vice President "I suspect Bush is having trouble getting suitable financing of work we have discussed. Have strong evidence Germans will have this weapon ready for use in 1943? If we are not similarly ready this would mean disaster. Can see no safety from this threat short of all out effort to develop counter measures. Please check with Bush to ensure making such effort possible." from Pittsburgh, Penna.

June 20, 1942

The President

The White House

Dear Mr. President:

You might take the enclosed wire from Arthur Compton into account along with the report submitted to you by Vannevar Bush and signed by myself and the Secretary of War.

Respectfully yours,

H. A. Wallace

Enclosure

THE WHITE HOUSE
WASHINGTON

Boyd

July 11, 1942.


MEMORANDUM FOR DR. VANNEVAR BUSH:

I do not think I have replied to yours of June 19th in relation to the purchase of certain ore in Canada. I agree with you that we should encourage the Canadians to go ahead.

Also, I wholly approve your patent control policy.

I talked with Mr. Churchill in regard to this whole matter and we are in complete accord.

F.D.R.

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AEC to Director, FDRL

2-12-70

17-1000-1000

~~SECRET~~

OFFICE FOR EMERGENCY MANAGEMENT
OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT
1530 P STREET NW.
WASHINGTON, D. C.

VANNEVAR BUSH
Director

June 19, 1942.

The President,
The White House,
Washington, D.C.

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AEC to Director, FDR

2-12-70

Dear Mr. President:

The program of very confidential nature which you initialled on the seventeenth is now being put into effect. In accord with our policy, I am informing the British of our technical and organizational plans, and they will presently send to me the program which they are just now considering. I feel sure these two plans will fit together adequately.

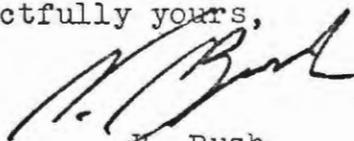
In this connection I have occasionally been consulted by the British concerning after-the-war relationships on this matter, and my reply has always been that you will presumably discuss these with Mr. Churchill. These relationships may be of exceedingly great importance, for one thing because of the power production aspects.

On one point, however, I would like to be in a position to give a reply. The Canadians are considering quietly purchasing the principal ore source in Canada so that it will be under their government control. The British seem to approve this move, but ask our reactions. I am inclined to encourage them to go ahead, with the thought that international relationships will be more readily handled if control of the matter is in government hands. Do you wish me to indicate that such a step would be considered appropriate?

With this same thought in mind, I am providing for adequate records of our research on the basis of which patents can later be prepared, and I intend to see to it, so far as possible, that these are assigned outright to the United States Government. Unfortunately, complete patent control may not be possible in this way, but sufficient may be obtained so that the method could not be applied in peace time except under government license.

Otherwise, I will take steps on control of the matter, or on international relationships concerning it, only as you may direct.

Respectfully yours,



V. Bush,
Director.